APPENDIX D
ECONOMIC ANALYSIS
BROWARD COUNTY, FLORIDA
SHORE PROTECTION PROJECT
GENERAL REEVALUATION REPORT

SEGMENT III

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INTRODUCTION

D-1. The contents and results included in this appendix are based upon economic principles and analyses that reflect the assessment of damages and project benefits for Segment III of Broward County from engineering information provided to make the final conclusions and recommendations.

Objective

D-2. The objective of this Appendix is to reevaluate the economics of the authorized Segment III beach erosion control project and assess the benefits of required project modifications. Proposed project modifications are formulated based upon engineering and economic benefits to the project performance. Economic benefits associated with the project modifications proposed herein are based upon current storm protection needs and overall project cost minimization.

Study Area

D-3. The study area extends from the south jetty of Port Everglades (approximately FDEP monument R-86) to the Broward-Dade County Line (FDEP monument R-128). The area includes John U. Lloyd Beach State Park, the city of Dania Beach, the city of Hollywood, and the city of Hallandale Beach. The study area is about 8.1 miles in length and the upland infrastructure includes single-family houses, condominiums, retail businesses, public building, and public recreational areas. The extent of the Segment III project area is shown in Figure D-1.

Problem Identification

D-4. The general problem along the Segment III shoreline is the socio-economic losses in revenue to the County from potential storm damages to upland buildings and infrastructure and the continued loss of land along the Atlantic coastline. The continued erosional stress along the Segment III shoreline has resulted an increased threat to upland development and properties. Past attempts to reduce the storm related damages along the shoreline Segment had been mostly successful with the appropriate renourishment of the shoreline. Areas of the constructed project, however, have not performed as intended due to the unusually high localized erosional stress. These areas include the terminal ends of the beach fill at the northern end of Hollywood and the southern end of John U. Lloyd and the northernmost 2,800 feet of shoreline along the John U. Lloyd Beach State Park. The latter is located immediately downdrift of the Port Everglades Entrance. Modifications to the authorized project are proposed to address these areas of the project that have not met the original objects of the authorized project.

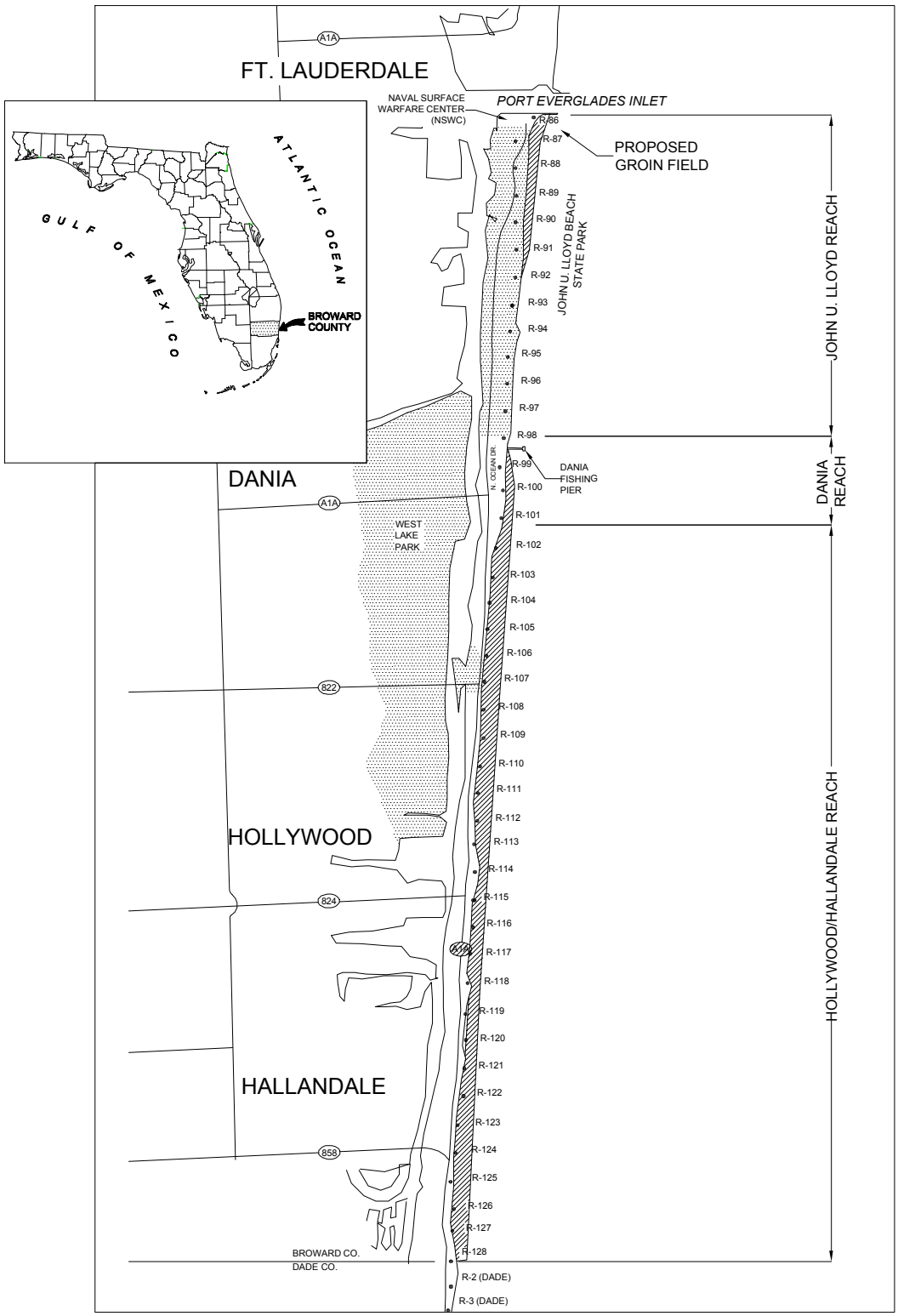

Figure D-1: Location and extent of Segment III reaches.

Description of Authorized Project (1965)

D-5. The Broward County, Florida Shore Protection Project was authorized by Section 301 of Public Law 89-298, passed on 27 October 1965. The project was authorized in accordance with the report of the Chief of Engineers dated 15 June 1964 and is described in House Document 91, 89th Congress. The project was to be constructed in three separable segments. These three segments are: I) the north county line to Hillsboro Inlet, II) Hillsboro Inlet to Port Everglades, and III) Port Everglades Inlet to the south county line. This appendix is concerned with Segment III of the authorized project. Since the Broward County Shore Protection Project was authorized, two reaches of Segment III have been constructed. These are (1) the northern section of the John U. Lloyd State Park shoreline and (R-86 to R-94) and (2) the Hollywood/Hallandale Beach shoreline (R-101 to R-128).

D-6. The authorization for the Segment III shoreline provided for the restoration of 8.1 miles of shoreline and periodic nourishment for a period of 10 years following initial construction of the project. Following a 1991 Reevaluation Report Section 934 Study, Federal participation in the authorized project was extended to 50 years after initial construction.

Description of Authorized Project (Constructed)

D-7. Northern John U Lloyd (R-86 through R-94) was initially nourished in 1976 with approximately 1.09 million cubic yards of fill. That project extended along 1.52 miles of shoreline between FDEP monuments R-86 and R-94. It is assumed for the purposes of this analysis that the background erosion rate between R-86 and R94 prior to construction was 46,400 cubic yards per year. Berm elevation was constant at +10 feet, MSL. Constructed beach slopes were 1:20 above MLW and 1:30 below MLW. The General Design Addendum (GDA) (1976) for this project indicated a design beach measuring 150 feet wide at the berm.

D-8. Considering the renourishment interval and erosion rate, the design volume placed along the 1.52 miles of shoreline between R-86 and R-94 during initial construction was approximately 768,000 cubic yards. Applying the average beach slopes and berm elevation, it is estimated that the design berm width at that location measured approximately 100 feet at the MHW line.

D-9. The Hollywood and Hallandale Beach project reach was originally constructed in 1979. This project included about 5.25 miles of shoreline between R-101 and R-128. According to the original General and Detail Design Memorandum (G&DDM) (1978) a design beach along Hollywood and Hallandale Beach (R-101 to R-128) was constructed using 1,589,600 cubic yards of sediment producing equilibrated design beach widths from 34.4 to 98.7 feet at the local MHW elevation. Beach slopes constructed along this reach were 1:15 above MLW and 1:45 below MLW. Berm elevations were reportedly +7 feet, NGVD with an intermediate berm placed at +4 feet, NGVD.

D-10. Along the Hollywood/Hallandale Beach reach of Segment III it is estimated that the average equivalent design beach width along the 28,800 feet of shore is about 50-foot at the MHW.

D-11. In summary, it is assumed that the authorized design beach widths for the constructed reaches of Segment III include a 100-foot MHW extension in northern John U. Lloyd combined with a 50-foot MHW extension along Hollywood/Hallandale Beach. Table D-1 includes a summary of the dimensions of the authorized Segment III project reaches.

Table D-1: Summary of authorized project dimensions.

	R-86 to R-94	**R-101 to R-128**
Design Volume (cy)	768,000	1,589,600
Berm Elevation (ft)	+10, MSL	+7 & +4, NGVD
Erosion Rate (cy/yr)	46,400	55,560
Renourishment Interval (yr)	5	5
1976 & 1978 Reported Design Width (ft)	150 - berm	34 to 99 - MHW
1999 Equivalent Design Width (ft)	100 - MHW	50 – MHW

Methodology of the Study

D-12. The study will reevaluate the dimensions and economic benefits of the authorized project. This will include computation of the costs and benefits of various design berm widths using current structure and land values and construction price levels. The reevaluation will consider the entire 50-year project life and the required sand volume necessary to construct and maintain a project along the authorized shoreline reach. Simplistically, this analysis assumes that the project had not been built and that sand resources that have been used in the past are available for the 50-year project. The results of the reevaluation will demonstrate economically optimal project dimensions under current economic conditions. These dimensions will represent the National Economic Development (NED) Plan.

D-13. Economic justification for this project is based on the protection of an estimated $562 million of structural improvements located along the shoreline of the study area. Shorefront development within this segment is a mixture of single and multi-family dwellings, commercial properties and park improvements. The value of shorefront development was determined by the Jacksonville District Real Estate Division from information collected from the Broward County Tax Appraiser's Office. The values reflect current dollars.

D-14. Recreational benefits will also be computed for the Segment III. The recreational benefits will reflect the current cost of beach visit and the existing recreational infrastructure (i.e., parks, parking, beach accesses, etc.) that exists along the Segment III shoreline.

D-15. The cost to implement the reevaluated project over the remainder of the project life will also be developed. Project implementation, however, may require modifications to the authorized plan. Modifications to the reevaluated project are proposed and evaluated based on their ability to improve the physical performance of the project and/or reduce average annual project costs. Modifications investigated include the addition of beach fill tapers at the terminal ends of the authorized project, construction of a design beach section between R-94 and R-101, construction of a groin field in John U. Lloyd, and implementation of sand bypassing at Port Everglades.

REEVALUATION OF AUTHORIZED FEDERAL PROJECT (1976-2026)

D-16. Federal Shore Protection Project benefits are categorized as primary and incidental. Primary benefits are realized through the reduction or prevention of damage to upland development and infrastructure caused by storms. Primary benefits also include those gained through stabilization of the shoreline thereby preventing land loss in the project area. Incidental benefits include the increased recreational capacity attributable to an increase in beach width and shoreline stability accompanying the project. Increased recreational capacity serves to meet an existing and expected surplus demand of beach users on the project shoreline.

D-17. Guidance for the inclusion of incidental project benefits such as recreation are set forth in Engineering Regulation (ER) 1105-2-100. This regulation states “recreation benefits produced 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 the total project benefits.” That is, despite the allowance for inclusion of incidental benefits, the NED plan must formulated on the basis that average annual equivalent primary benefits must exceed 50% of the average annual project costs. Formulation of the National Economic Development (NED) Plan for Segment III was based on the determination of the plan resulting in the maximization of net primary benefits as defined by the difference between total average annual primary benefits and average annual costs.

PRIMARY BENEFITS

D-18. Primary benefits include storm damage reduction and loss of land benefits. Storm damage benefits accrue from a reduction in storm damage to upland structures as a result of a shore protection project. Storm damage benefits are estimated by computing storm-induced damage to upland structures, infrastructure, and coastal armor for with and without project conditions. The without project condition is defined as the status of the beach prior to the implementation or authorization of any project. The with-project condition, or damage that is prevented, is defined as the authorized project condition.

The reduction in computed storm damage is equivalent to the storm damage benefit provided by the shore protection project.

The Storm Damage Model

D-19. The Risk and Uncertainty Storm Damage Model Version 0.2 (RU SDM) relates changes in shoreline and bluff position, due to annual shoreline and storm-induced beach recession, to the location of upland property and infrastructure. The shoreline position and location of the upland properties are related to one another using a common baseline. The common baseline is defined as the approximate pre-project (1977) mean high water shoreline. In this instance, the established Erosion Control Line (ECL) is assumed to represent the location of the pre-project mean high water shoreline. Storm damage is defined as losses incurred by the temporary deterioration of a given amount of shoreline as a direct result of erosion which is caused by a storm of a given magnitude and frequency. In this analysis, damages to buildings, pools, patios, parking lots, utilities, seawalls, revetments, bulkheads, and backfill are considered.

D-20. Specification of Risk. The Risk and Uncertainty Storm Damage Model Version 0.2 is capable of incorporating the uncertainty associated with the quantification of specific input parameters into estimates of storm-induced damages. Using a deterministic approach, the storm damage model generates many multi-year simulations of possible storm and recession damages to the study area. In other words, the RU SDM randomly produces multiple repetitions of multi-year damage scenarios. For example, every project alternative modeled in Segment III required 3,000 randomly generated simulations each representing possible average annual damages incurred during a 50-year project life. Simulations for with and without project conditions are then statistically compared to yield average annual storm damage reduction benefits.

D-21. For each 50-year simulation, the RU SDM randomly generates input parameters based upon uncertainty values specified by the user. Input parameters whose uncertainties are considered by the storm damage model include a) coastal armor cost b) structure value c) backfill cost d) coastal armor protective level e) future shoreline position f) structure setback and g) recession associated with a given storm event.

D-22. Storm Frequency and Shoreline Recession. To estimate storm damages, a relationship is developed between storm frequencies and shoreline recession using the storm response model SBEACH and the empirical simulation technique (EST) outlined in Appendix B. The uncertainty associated with a given level of recession is computed as one standard deviation, calculated directly from EST output. Shoreline recession due to storms is defined as the distance from a pre-storm baseline to the landward limit of 0.5-foot erosion following a weather event. Computed shoreline recession estimates along with the probability of occurrence associated with each storm event are used to assign a frequency of storm-induced shoreline recession to storms of varying magnitude. The probability of an occurrence for each event is defined on the basis that a storm event could be equaled or exceeded in any given year.

D-23. Shoreline Recession and Future Damages. The shoreline recession-damage relationship has been formulated to account for the expected shoreline position in future years with respect to the reference shoreline. The location and uncertainty of future shoreline positions were estimated using measured historical erosion rates along with the calculated statistical deviation of those measurements. In this investigation the historical erosion rate was programmed to vary from 4 to 10 feet per year along the Segment III shoreline. Statistical uncertainty associated with this erosion rate varies from 3 to 8 feet per year. The storm damage model halts future long-term recession at the year an existing seawall or protective structure is encountered. For each iterative cycle, predicted damages were converted to average annual equivalent values using the 2001 direct interest rate of 6 and 1/8 percent over the 50-year period of analysis.

D-24. In this analysis, the storm damage model predicts 3,000 randomly generated values of storm-induced damage for each with and without project alternative. A sensitivity analysis was conducted to determine an appropriate number of model iterations. The analysis consisted of running the RU SDM for 5,000 iterations and plotting the standard deviation as a function of iteration number. It was found that the standard deviation of storm damages stabilizes after about 3,000 iterations. The random damage reduction predicted by the storm damage model is the difference between with and without project damages for each random iteration. Storm-induced damages are computed for each iterative cycle by relating the distance and frequency of storm-induced recession to the location of the upland development. The location (i.e., setback) of the upland development was estimated using aerial photographs dated March 1999. Using the relationship between the positions of upland development and the frequency of occurrence of shoreline recession, the frequency and magnitude of storm damage is estimated. Average annual equivalent damages for each alternative are determined by integrating the frequency-damage curve. Storm-induced shoreline recession is simulated by the storm damage model, and average annual equivalent damages for the without and with project conditions were amortized and discounted in a manner consistent with shoreline recession damage estimates. The average of all iterative cycles was used in forming comparisons between differing project alternatives. Confidence limits were placed around the average benefits on the basis of percent occurrence of the random benefit values.

General Model Assumptions

a) The relationship of probability to shoreline recession is randomly assigned based upon input uncertainty levels.
b) Damage to improvements will not occur until shoreline recession has exceeded the seaward edge of the improvement.
c) When the shoreline erodes to the full value point of a structure the structural value of the first two floors is considered lost. The full value point has been defined as that which must be exceeded by shoreline recession (storm-induced or otherwise) in order to incur 100 percent damage to the structure.
d) Improvements which were permitted and constructed under the Coastal Construction Program specifically Section 161.041 and Part IV of Chapter 373,

Florida Statutes, and Rule 62B-41 of the Florida Administrative Code are assumed to be able to withstand complete erosion of their substrate and remain structurally sound; thus, the full value point of such structures is considered to be the distance from the reference shoreline to 100 percent of the structure depth. Should full value be realized, only the structural value of the first two floors is considered lost.

e) Structures not constructed under the guideline required by the aforementioned legislation are assumed to have a full value point equal to the distance from the reference shoreline to 50 percent of the structure depth.
f) The full value point of a swimming pool is reached once the shoreline erodes a distance of one foot beyond the pool's seaward edge.
g) If a structure is undermined, damage is assumed to be equal to the product of the structural value available for damage calculations and the ratio of the horizontal distance eroded through the structure and the full value distance of the structure.
h) All market values of improvements are replacement cost new less depreciation.
i) Structure contents damage is not evaluated in this report.
j) Repair cost to the coastal armor and the cost of backfill is based upon current engineering estimates. Backfill repair is valued at $12 per cubic foot.
k) After structural failure occurs, the shoreline development, roads, and parking lots will be repaired to a condition similar to and in the same location as the project conditions. The roadway value is based upon a gross estimate of the time and materials required to repair an asphalt surface. The roadway is valued at $2.25 per square foot.
l) Structures currently without coastal armor in immediate danger of sustaining storm damage shall be protected from damage caused by subsequent storms through the construction of coastal armor in compliance with current legislative requirements.

Storm Damage Model Input

D-25. Data input to the storm damage model include existing and future shoreline position, storm frequency and corresponding recession, risk and uncertainty estimates, coastal armor information, along with a detailed structural inventory. A partial input file is shown in Table D-2 and has been supplemented with explanations of various input items. The complete storm damage model input files used in this analysis are attached in Sub-appendix D-1 and include a structural inventory, shoreline position, frequency versus recession distances, coastal armor types, and estimates of uncertainty associated with modeled parameters.

D-26. Shoreline Position. Damages to the upland development with no project in place are based upon pre-construction (1977) conditions. To simulate the normal erosion process, the storm damage model requires a database of expected future shoreline positions and their level of uncertainty. The uncertainty of shoreline locations is computed as the standard deviation of measured historical shoreline positions. The storm damage model assumes shoreline location varies according to a normal distribution centered about the mean shoreline position. The location and standard deviation of future

Table D-2: Sample storm damage model input data file.

START YEAR - 2001 **DURATION - 50-yrs**

SHORELINE POSITION INFORMATION

Historic Erosion Rate (ft/yr)	-4				
Shoreline Position (years 1-5)	0	4	8	12	16
Shoreline Position (years 6-10)	20	24	28	32	36
Shoreline Position (years 11-15)	40	44	48	52	56
Shoreline Position (years 16-20)	60	64	68	72	76
Shoreline Position (years 21-25)	80	84	88	92	96
Shoreline Position (years 26-30)	100	104	108	112	116
Shoreline Position (years 31-35)	120	124	128	132	136
Shoreline Position (years 36-40)	140	144	148	152	156
Shoreline Position (years 41-45)	160	164	168	172	176
Shoreline Position (years 46-50)	180	184	188	192	196

STORM DAMAGE

PROBABILITY	RECESSION (ft)
0	177
0.01	160.5
0.02	129
0.05	90
0.1	80
0.2	71
0.5	58.5
1	33

COASTAL ARMOR

ARMOR DESCRIPTION	COST	PROTECTION LEVEL	HALT EROSION	PERCENT REPLACEMENT	ID NUMBER
'CSP-SMALL CAPPED '	625	71	1	1	1
'CSP-MEDIUM CAPPED '	750	75.5	1	1	2
'CSP-LARGE CAPPED '	850	80	1	1	3
'CSP-SMALL CAPPED W/TOE '	0	0	1	1	4
'CSP-MEDIUM CAPPED W/TOE '	0	0	1	1	5
'CSP-LARGE CAPPED W/TOE '	0	0	1	1	6
'ROCK REVETMENT-SMALL '	0	0	1	1	7
'ROCK REVETMENT-LARGE '	0	0	1	1	8
'DUMMY '	0	0	0	0	9
'DUMMY '	0	0	0	0	10
'DUMMY '	0	0	0	0	11
'DUMMY '	0	0	0	0	12
'RUBBLE - SMALL '	200	75.5	0	0.65	13
'RUBBLE - LARGE '	0	0	0	1	14
'DO NOTHING '	0	0	0	0	15
'ROCK REVETMENT-MEDIUM '	0	0	0	0	16

Cost of Backfill - 1.33

STRUCTURAL INVENTORY

PROPERTY DESCRIPTION	VALUE	LOT WIDTH	# FLOORS	EXISTING ARMOR	REPLACEMENT ARMOR	DIST. TO ARMOR
'PRESIDENTIAL 514224010400'	20188188	352	16	3	3	68
'HOLIDAY INN 514224010401'	8019804	245	5	3	3	39
'CONDOS BLDG #1 514224BB'	16860902	250	18	1	1	25
'BUILDING #2'	16610902	250	18	15	15	285
'PARKING LOT'	79650	120	1	1	1	30
'AQUARIUS 514224010420'	14732190	238	15	2	2	32
'OCEAN VIEW 514224010430'	4382364	240	5	1	1	36
'ALEXANDER 514224010450'	14287800	281	15	1	1	39

STRUCTURAL INVENTORY (CONTINUED)

PROPERTY DESCRIPTION	DIST TO STRUCTURE	DIST TO FULL VALUE	LAND TYPE	LAND LOSS	DUPLICATE	DNR	CONDEMN
'PRESIDENTIAL 514224010400'	68	290	'VC'	-1	0	'120'	1
'HOLIDAY INN 514224010401'	55	260	'VC'	-1	0	'120'	1
'CONDOS BLDG #1 514224BB'	45	170	'VC'	-1	1	'121'	1
'BUILDING #2'	305	418	'VC'	-1	1	'121'	1
'PARKING LOT'	28	170	'VC'	-1	0	'121'	1
'AQUARIUS 514224010420'	35	320	'VC'	-1	0	'121'	1
'OCEAN VIEW 514224010430'	35	215	'VC'	-1	0	'121'	1
'ALEXANDER 514224010450'	35	285	'VC'	-1	0	'121'	1

shoreline positions in this modeling study are based upon historical erosion rates of 10 ± 8 feet per year in John U. Lloyd and 4 ± 3 feet per year in Hollywood and Hallandale Beach. Shoreline data are simulated under the assumption that the shoreline position will be maintained at the initial project location throughout the life of the project.

D-27. Simulation of shoreline change due to storms is controlled through the input of shoreline recession values, the uncertainty of these values, and their probability of occurrence. In order to calculate the storm erosion frequency parameters during each iteration, the storm damage model calculates an error term based on a normal distribution of mean 0 and standard deviation of 1. The error term is then multiplied by the input standard deviations for each of the erosion distances and the derived recession value is computed as

Computed Recession = Mean Recession + ((standard deviation)*error term)

It is important to note that the frequency of occurrence values remain constant for each simulation, only the respective recession distances vary. These relationships are shown in Table D-3 for each of the sub-reaches modeled in Segment III.

Table D-3: Storm damage model input shoreline recession data for Segment III sub-reaches.

Return Period (yr)	REACH			
	R-86 to R-94		R-101 to R-128	
	MEAN (ft)	STANDARD DEVIATION (ft)	MEAN (ft)	STANDARD DEVIATION (ft)
200	187	16	177	10
100	171	14.9	160.5	10
50	148	13.4	129	10.4
20	103	10.7	90	13
10	65	9.9	80	12.8
5	52	9.9	71	13.2
2	41	10	58.5	14.2
1	26.5	2	33	3

D-28. Structural Inventory. Lot widths and structural setbacks were assigned and measured from aerial photographs dated March 1999 where lot boundaries generally correspond with the boundaries of structural features. The uncertainty associated with measuring structural setbacks in this fashion is assumed to be the setback distance ± 1 foot. Property amenities, coastal armor presence, and number of floors were field

verified in August 1999. Coastal armor is grouped and categorized by unit cost, level of protection and the ability to halt erosion. Armor type is categorized based on field inspection utilizing engineering judgment and reflects the mean protective value of each armor class (Table D-2). For each iterative cycle, a protection level is randomly selected from input values representing minimum and maximum levels of armor protection. Minimum and maximum protection levels were calculated according to the assumption that their values respectively reflect 75 and 125 percent of the mean. Mean unit replacement cost per linear foot was based on engineering cost estimates. The damage factor is a measure of armor repair needed after failure.

D-29. Value estimates were developed for the oceanfront properties (primarily structural improvements) as well as the second row structures. A Jacksonville District staff appraisal provided structural values for use in the determination of storm damage for first and second row structures.

D-30. Armor Costs and Structural Values at 95% Uncertainty. This is a single global value of uncertainty, applied to the unit cost for each armor type and each structural value. For this modeling effort, the uncertainty at 95% confidence is input as 0.1 for both armor costs and structural values. The storm damage model uses these uncertainty values to compute a standard deviation for each iterative cycle as

$$\text{Standard Deviation at 95\% Confidence} = (0.1 * \text{value})/1.96$$

This formulation is repeated for each armor cost and structural value. The resulting standard deviation is applied assuming a normal distribution centered about the mean value.

D-31. Standard Deviation of Backfill Cost. Uncertainty relating to the cost of backfill in the study area was based upon engineering judgment. A standard deviation of $2 per cubic foot of backfill is applied in a normal distribution about the mean value of $12 per cubic foot to calculate the backfill cost applied during each iterative cycle. The storm damage model requires backfill be input in units of square feet, resulting in an input value of $\$1.33 \pm 0.22$. Backfill is assumed to be three feet deep.

D-32. Navy Infrastructure. The Navy's Surface Warfare Center located adjacent to Port Everglades incurs continued damage to its infrastructure along the intertidal beach and nearshore area. It is estimated that $80,000 per year is expended by the Navy for repairs to the cable field due to wave and storm damage. Coverage of this cable field in the intertidal zone and nearshore area by sand will completely eliminate these continued damages to the cables. Therefore an additional average annual storm damage benefit of each alternative considered of $80,000 is included in this storm damage reduction analysis. Costs required to repair storm damage to the upland seawall are included in the storm damage model.

Loss of Land Benefits

D-33. Prevention of loss of land associated with shoreline stabilization in Segment III is based upon a nearshore land value of $25 per square foot. The real estate division of the Jacksonville USACE District Office determined the value of nearshore land. Evaluation of benefits at Federally owned and non-federal public shores must reflect their special use to which the shore is dedicated, and the value of output produced by the use. Normally, non-Federal public shores are dedicated to park and conservation areas, and the benefits for protecting such shores are based on the loss of in recreation outputs. Private lands subject to erosion are the lands between the pre-project MHW line and the existing or future line of coastal armor. Construction of the project will prevent the loss of both the public and private lands. Public loss of land benefit is not claimed since the primary output of these non-Federal public shores is recreation.

Seed Number

D-34. Input parameters are randomly selected each time the storm damage model begins a new iterative cycle. Reproduction of identical input strings used in complete simulations is essential in effectively comparing damages estimated between with and without project conditions. A seed number may be input into the storm damage model that initiates random number generation and consequently selects input parameters. Using a consistent seed value for each project simulation provides a method of achieving perfect correlation between multiple sets of randomly selected input parameters. The assumption that perfect correlation exists between output data sets is assumed correct due to the perfect correlation of input values provided by supplying a constant seed value. For this investigation, the default seed number of 1701 was input for each simulation.

Summary of Primary Benefits

D-35. The average annual damages and benefits for Segment III are included in Table D-4. Benefits for each design beach width configuration are computed as the average of the iteration-by-iteration difference between the damages that are computed to occur with and without project construction. A confidence interval plan has been established on the basis of percent occurrence of these random damage reduction benefit values. Table D-4 likewise presents the 5% and 95% percentiles for benefits attributed to each design beach width. These percentiles represent the frequency with which damage reduction benefits are greater than or equal the displayed benefit value.

Table D-4: Average annual damages and benefits along the Segment III shoreline.

Component	Average Damages	Average Benefits	95% Chance of Benefits Exceeding	5% Chance of Benefits Exceeding
		No-Project		
Structural	$11,662,600			
Armor	$1,165,800			
Backfill	$409,800			
Land Loss	$572,400			
TOTAL	$13,810,600			
		25-Foot Design Berm		
Structural	$1,168,700	$10,574,000		
Armor	$103,000	$1,062,800		
Backfill	$244,300	$165,500		
Land Loss	$0	$572,400		
TOTAL	$1,515,900	$12,374,700	$3,997,196	$25,826,902
		50-Foot Design Berm		
Structural	$451,200	$11,291,300		
Armor	$40,500	$1,125,300		
Backfill	$109,900	$299,900		
Land Loss	$0	$572,400		
TOTAL	$601,700	$13,288,900	$4,471,478	$27,994,570
		75-Foot Design Berm		
Structural	$170,700	$11,571,900		
Armor	$14,600	$1,151,200		
Backfill	$34,600	$375,200		
Land Loss	$0	$572,400		
TOTAL	$219,900	$13,670,700	$4,599,325	$28,594,318

MAXIMUM NET PRIMARY BENEFITS (NED SELECTION)

D-36. The optimum or NED project configuration is that which maximizes the primary net project benefits. The net benefits are the difference between average annual primary benefits and the annual costs of each project alternative. For the purposes of this reevaluation investigation, the project design berm width for those reaches of the Segment III shoreline that have been previously constructed was varied to determine the optimum project dimensions under current economic conditions. The project berm width was varied between 25 and 75 feet.

D-37. The primary benefits for each design berm width were summarized and compared to the respective project costs. The primary benefits, costs, and net primary benefits for each of these project configurations are summarized in Table D-5. Considering a project life of 50 years and interest rate of 6 and 1/8 percent, the 50-ft design beach produces the maximum net primary benefits.

Table D-5: Optimum Segment III design beach width.

	Project Extension		
	25-ft	50-ft	75-ft
Primary Benefits	$12,374,700	$13,288,900	$13,670,700
Costs	$2,692,000	$3,151,000	$3,835,000
Net Primary Benefits	$9,682,000	$10,137,900	$9,835,700

INCIDENTAL BENEFITS

Recreational Benefits

D-38. Recreational usage of the beaches in Segment III contributes millions of dollars annually to the local economy of Broward County, the State of Florida, and the Nation. Generation of recreational benefits is not a primary project purpose, but all benefits associated with Federal shore protection projects are evaluated in order to determine the net benefits generated by the projects. In order to identify the recreational benefits generated by the reevaluated authorized plan, with and without project saltwater beach demands in Broward County were projected through the year 2050 in ten-year increments. These beach demands were then compared with beach capacity for with and without project conditions throughout 50-year duration of the project. The travel cost method was then used to determine an average cost per beach visit and assign a dollar value to visits attributable to the proposed project. The average annual value of beach visits attributed to the project is the recreational benefit.

D-39. Annual Beach Activity. Annual beach activity on a countywide basis is a combination of Broward County resident, other Florida resident, and tourist participation. The countywide saltwater beach demand for Broward County, CD, was determined by

$$CD = (P_C N_c + P_s N_s + P_t N_t)K$$

where,

P_c = constant from State SCORP, denotes participation rate by county residents.
N_c = county population from State Statistical Abstract.
P_s = constant from State SCORP, denotes participation from residents of other Florida counties who recreate on Broward County beaches.
N_s = State population, less Broward County Population, from State Statistical Abstract.
P_t = constant from State SCORP, denotes participation rate for tourists who visit Broward beaches.
N_t = Tourist population for Broward County, from Florida Department of Natural Resources.
K = constant as determined from actual counts.

D-40. Table D-6 shows the projected population and demand for Broward County as provided by various State of Florida agencies. The 1998 Florida Statistical Abstract is a compilation of timely economic and demographic information from which the county and state population projections were taken. These projections include the years 1995 through 2020, and linear interpolation was used to estimate populations for the years 2030, 2040 and 2050. Tourist populations for Broward County in years 1995 and 2000 were provided by the Jacksonville District Office and based upon State Comprehensive Outdoor Recreation Planning (SCORP) county and statewide projections. The demand constant for county resident per capita participation was derived from a 1985 survey of 245 residents, whereas 792 tourists were interviewed to arrive at the tourists per capita participation rate (USACE, 1990). Participation rates are shown in Table D-6.

Table D-6: Beach demand for Broward County and Segment III.

	YEAR						
	1995	2000	2010	2020	2030	2040	2050
Resident Population	1364.2	1493.0	1707.8	1926.6	2161.0	2387.9	2614.8
Resident Demand	6230.3	6818.5	7799.5	8798.8	9869.4	10905.6	11941.9
Other Florida Population	12785.1	14019.9	16220.1	18482.6	20692.7	25309.3	27764.8
Other Florida Demand	1183.8	1295.5	1481.9	1671.8	1875.2	2072.1	2269.0
Tourist Population	3221.0	3525.1	4032.3	4548.9	5102.4	5625.2	6156.1
Tourist Demand	9959.3	10899.6	12467.8	14065.1	15776.6	17393.0	19034.8
Total Demand	17373.4	19013.7	21749.2	24535.7	27521.1	30370.7	33245.6
Segment III Demand	6358.7	6959.0	7960.2	8980.1	10072.7	11130.3	12187.9
JUL Demand	600.0	656.6	751.1	847.4	950.5	1050.3	1150.0
Dania Demand	378.8	414.6	474.2	535.0	600.1	663.1	726.1
H/H Demand	4812.4	5266.8	6024.5	6796.4	7623.4	8423.8	9224.2

Resident Participation	4.567
Tourist Participation	3.092
Other Florida Demand	0.19

The value of K is an adjustment factor for the SCORP data that enables actual beach counts to be included in the analysis. Due to good correlation between SCORP demand for Segment III and actual beach counts, a K value of one was used. Demand within Segment III was found by separating the entire reach into two sub-segments and computing demand based upon each regions' respective percent of county-wide beach use as determined by Broward County for 1995 (BDNRP, 1997). John U. Lloyd and Dania Beach demand was separated by dividing the combined sub-regional total beach usage based upon beach counts taken by county officials in John U. Lloyd Beach State Park and Dania Beach.

D-41. Daily Beach Activity Demand. Daily beach activity demand varies considerably from day-to-day with the greatest demand occurring on weekends, holidays and other special events. Daily demand also varies seasonally throughout the year. The distribution of daily beach demand is determined by performing a frequency analysis on actual beach activity data collected within the study area where possible. Once this distribution is determined, annual beach activity demand can be confidently distributed into daily demand.

D-42. The daily attendance record for one-year (January 1, 1998 to December 31, 1998) along the Hollywood shorefront was the basis for this frequency analysis. The Broward County Department of Planning and Environmental Protection supplied daily beach count data. Results indicate that there are 10 user groups characterizing beach attendance in Broward County during the 364 days in 1998 when records were kept. The 10 user groups identified are shown in Table D-7.

Table D-7: Daily beach activity demand.

User Group	Percent of Total	Number of Days	1998	2000	2010	2020	2030	2040	2050	% Annual Total
1	2.27	2	114592	148841	170255	192068	215438	238058	260678	4.55
2	1.08	4	54184	70379	80504	90818	101869	112565	123260	4.30
3	0.82	4	41544	53960	61724	69632	78104	86305	94505	3.30
4	0.68	17	34151	44358	50740	57240	64205	70947	77688	11.52
5	0.53	23	26471	34383	39329	44368	49767	54992	60217	12.08
6	0.45	26	22657	29428	33662	37975	42596	47068	51540	11.69
7	0.35	50	17495	22724	25994	29324	32892	36345	39799	17.36
8	0.24	59	12334	16020	18325	20673	23188	25623	28057	14.44
9	0.14	133	6972	9029	10329	11652	13070	14442	15814	18.35
10	0.05	46	2628	3414	3905	4406	4942	5461	5979	2.40
		364								100

D-43. With and Without Project Beach Capacity. After daily beach demand has been considered, with and without project beach capacities were analyzed to pinpoint constraints that might limit full participation. Capacity of the beaches in Segment III can be limited by beach area, available access points, and the ability of the public to use public access points. Availability of public parking within a reasonable distance from access points to the shoreline must be open to the public on equal terms. It was assumed that on average, there will be four people in a car and each parking space is turned over twice per day. Thus, each parking space is able to accommodate eight people per day. The resulting increased parking capacity is referred to as “notional” parking. Inventory of public parking spaces and public beach access points were taken using 1999 aerial photographs. For calculation purposes, consolidation of the 75 parking lots, 4,356 parking spaces, and 115 recognized beach access points contained in Segment III was necessary; thus, total public parking spaces and beach access points have been grouped by sub-reach. There are two large, multi-deck parking garages in Hollywood/Hallandale Beach that account for approximately 1,490 individual parking spaces. Because there is ample surrounding infrastructure that is not directly related to beach recreation, assuming that each of these parking spaces would be utilized for beach access is not reasonable. In

order to determine the sensitivity of this analysis to garage usage, recreation benefits for both with and without garage conditions are included herein. However, in order to maintain conservative projections, recreation benefits realized for the without parking garage alternative were considered for project optimization calculations. The resulting without and with project capacities (no parking garages) for the Segment III beaches are shown in Tables D-8 and D-9. A detailed inventory summarizing the specific location of each Segment III public beach access and public parking space is presented in the main text of this report (see Plates 15 through 29).

D-44. Without project beach widths represent pre-project conditions and were taken from aerial photographs and surveys performed in 1976. Beach width is measured from the MHW line to the vegetation line. With project conditions assume that a 50-foot extension of the ECL would be maintained throughout the life of the project in northern John U. Lloyd and Hollywood/Hallandale Beach respectively. The resulting with project MHW location was estimated using computed post-equilibrium beach widths superimposed upon existing conditions. Additionally, a turnover rate of two beach users per 100 square feet of dry beach per day was used in developing capacity estimates.

D-45. In the analysis, beach area necessary to provide space for each beach user anticipated by the available notional parking was compared to the actual beach area provided by with and without project conditions. Excess demand was computed by comparing with and without project capacities with daily beach demands for each user group and simulation year. Excess demand met by the with-project condition can be considered to be the additional visitors attributable to the project. Results are shown for a 50-foot project and each incremental project year in Table D-10.

Table D-8: Broward County, Segment III beach capacity projections (without project).

WITHOUT PROJECT DAILY BEACH CAPACITY

	APPROX. PUBLIC PARKING SPACES	PARKING & NOTIONAL CAPACITY (VISITS)	APPROX. PUBLIC SHOREFRONT (FEET)	1995		2000		2010		2020		2030		2040		2050		SHORELINE EROSION RATE (FT/YR)
				WIDTH (FEET)	CAPACITY (VISITS)	WIDTH (FEET)	CAPACITY (VISITS)	WIDTH (FEET)	CAPACITY (VISITS)	WIDTH (FEET)	CAPACITY (VISITS)	WIDTH (FEET)	CAPACITY (VISITS)	WIDTH (FEET)	CAPACITY (VISITS)	WIDTH (FEET)	CAPACITY (VISITS)	
JUL	1221	9768	8138	45	7324	11	1790	0	0	0	0	0	0	0	0	0	0	-6.8
Dania	529	4232	3007	60	3608	48	2857	23	1353	0	0	0	0	0	0	0	0	-2.5
Hollywood / Hallandale	2606	20848	26820	55	20848	35	18774	0	0	0	0	0	0	0	0	0	0	-4
TOTALS	4356	34848	37965		31781		23421		1353		0		0		0		0	

Table D-9: Broward County, Segment III beach capacity projections (with 50-foot project).

WITH PROJECT DAILY BEACH CAPACITY

	APPROX. PUBLIC PARKING SPACES	PARKING & NOTIONAL CAPACITY (VISITS)	APPROX. PUBLIC SHOREFRONT (FEET)	1995		2000		2010		2020		2030		2040		2050	
				WIDTH (FEET)	CAPACITY (VISITS)	WIDTH (FEET)	CAPACITY (VISITS)	WIDTH (FEET)	CAPACITY (VISITS)	WIDTH (FEET)	CAPACITY (VISITS)	WIDTH (FEET)	CAPACITY (VISITS)	WIDTH (FEET)	CAPACITY (VISITS)	WIDTH (FEET)	CAPACITY (VISITS)
JUL	1221	9768	8138	95	9768	95	9768	95	9768	95	9768	95	9768	95	9768	95	9768
Dania	529	4232	3007	60	3608	60	3608	60	3608	60	3608	60	3608	60	3608	60	3608
Hollywood / Hallandale	2606	20848	26820	105	20848	105	20848	105	20848	105	20848	105	20848	105	20848	105	20848
TOTALS	4356	34848	37965		34224		34224		34224		34224		34224		34224		34224

Table D-10: Project benefit (additional beach visitors).

1995

Without Project Capacity:

JUL	Dania	H/H
7324	3608	20848

With Project Capacity:

JUL	Dania	H/H
9768	3608	20848

				1995 Demand/day			Without Project Annual			With Project Annual			Additional Annual Visits		
User Group	Percent of Total	Number of Days	% Annual Total	JUL	Dania	H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	JUL Benefit	Dania benefit	H/H benefit
1	2.274	2	4.55	13646	8616	109450	12643	10015	177204	7756	10015	177204	4888	0	0
2	1.075	4	4.30	6452	4074	51753	0	1862	123620	0	1862	123620	0	0	0
3	0.825	4	3.30	4947	3124	39680	0	0	75327	0	0	75327	0	0	0
4	0.678	17	11.52	4067	2568	32619	0	0	200099	0	0	200099	0	0	0
5	0.525	23	12.08	3152	1990	25283	0	0	102011	0	0	102011	0	0	0
6	0.450	26	11.69	2698	1703	21640	0	0	20594	0	0	20594	0	0	0
7	0.347	50	17.36	2083	1315	16710	0	0	0	0	0	0	0	0	0
8	0.245	59	14.44	1469	927	11780	0	0	0	0	0	0	0	0	0
9	0.138	133	18.35	828	523	6640	0	0	0	0	0	0	0	0	0
10	0.052	46	2.40	313	198	2511	0	0	0	0	0	0	0	0	0
TOTAL		364	100	600000	378827	4812429	12643	11877	698855	7756	11877	698855	4888	0	0

2000

Without Project Capacity:

JUL	Dania	H/H
1790	2857	18774

With Project Capacity:

JUL	Dania	H/H
9768	3608	20848

				2000 Demand/day			Without Project Annual			With Project Annual			Additional Annual Visits		
User Group	Percent of Total	Number of Days	% Annual Total	JUL	Dania	H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	JUL Benefit	Dania benefit	H/H benefit
1	2.274	2	4.55	14934	9429	119784	26288	13145	202020	10333	11642	197872	15955	1504	4149
2	1.075	4	4.30	7062	4459	56639	21085	6408	151462	0	3401	143165	21085	3007	8297
3	0.825	4	3.30	5414	3418	43426	14495	2247	98609	0	0	90312	14495	2247	8297
4	0.678	17	11.52	4451	2810	35698	45227	0	287717	0	0	252454	45227	0	35263
5	0.525	23	12.08	3450	2178	27670	38169	0	204624	0	0	156914	38169	0	47709
6	0.450	26	11.69	2953	1864	23683	30222	0	127647	0	0	73715	30222	0	53932
7	0.347	50	17.36	2280	1440	18288	24486	0	0	0	0	0	24486	0	0
8	0.245	59	14.44	1607	1015	12893	0	0	0	0	0	0	0	0	0
9	0.138	133	18.35	906	572	7267	0	0	0	0	0	0	0	0	0
10	0.052	46	2.40	343	216	2748	0	0	0	0	0	0	0	0	0
TOTAL		364	100	656649	414593	5266791	199972	21800	1072080	10333	15042	914431	189639	6758	157648

2010

Without Project Capacity:

JUL	Dania	H/H
0	1353	0

With Project Capacity:

JUL	Dania	H/H
9768	3608	20848

				2010 Demand/day			Without Project Annual			With Project Annual			Additional Annual Visits		
User Group	Percent of Total	Number of Days	% Annual Total	JUL	Dania	H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	JUL Benefit	Dania benefit	H/H benefit
1	2.274	2	4.55	17083	10786	137017	34166	18865	274035	14630	14355	232339	19536	4511	41696
2	1.075	4	4.30	8078	5100	64788	32310	14987	259152	0	5966	175760	32310	9021	83392
3	0.825	4	3.30	6193	3910	49674	24773	10228	198695	0	1207	115303	24773	9021	83392
4	0.678	17	11.52	5091	3214	40834	86548	31641	694181	0	0	339765	86548	31641	354416
5	0.525	23	12.08	3946	2492	31651	90763	26183	727981	0	0	248477	90763	26183	479504
6	0.450	26	11.69	3378	2133	27091	87817	20264	704354	0	0	162306	87817	20264	542048
7	0.347	50	17.36	2608	1647	20919	130406	14678	1045950	0	0	3550	130406	14678	1042400
8	0.245	59	14.44	1839	1161	14747	108482	0	870100	0	0	0	108482	0	870100
9	0.138	133	18.35	1036	654	8312	137832	0	1105514	0	0	0	137832	0	1105514
10	0.052	46	2.40	392	247	3143	18025	0	144572	0	0	0	18025	0	144572
TOTAL		364	100	751122	474242	6024532	751122	136847	6024532	14630	21529	1277499	736492	115319	4747033

Table D-10: Project benefit (additional beach visitors) (cont'd).

2020

Without Project Capacity:

JUL	Dania	H/H
0	0	0

With Project Capacity:

JUL	Dania	H/H
9768	3608	20848

				2020 Demand/day			Without Project Annual			With Project Annual			Additional Annual Visits		
User Group	Percent of Total	Number of Days	% Annual Total	JUL	Dania	H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	JUL Benefit	Dania benefit	H/H benefit
1	2.274	2	4.55	19272	12168	154572	38543	24335	309143	19007	17118	267447	19536	7217	41696
2	1.075	4	4.30	9112	5753	73088	36450	23014	292354	0	8580	208962	36450	14434	83392
3	0.825	4	3.30	6987	4411	56038	27947	17645	224151	0	3211	140759	27947	14434	83392
4	0.678	17	11.52	5743	3626	46066	97637	61646	783118	0	303	428702	97637	61343	354416
5	0.525	23	12.08	4452	2811	35706	102391	64647	821248	0	0	341744	102391	64647	479504
6	0.450	26	11.69	3810	2406	30561	99068	62549	794594	0	0	252546	99068	62549	542048
7	0.347	50	17.36	2942	1858	23599	147113	92884	1179955	0	0	137555	147113	92884	1042400
8	0.245	59	14.44	2074	1310	16637	122380	77268	981576	0	0	0	122380	77268	981576
9	0.138	133	18.35	1169	738	9377	155491	98174	1247150	0	0	0	155491	98174	1247150
10	0.052	46	2.40	442	279	3546	20334	12838	163094	0	0	0	20334	12838	163094
TOTAL		364	100	847354	535000	6796383	847354	535000	6796383	19007	29213	1777716	828347	505788	5018667

2030

Without Project Capacity:

JUL	Dania	H/H
0	0	0

With Project Capacity:

JUL	Dania	H/H
9768	3608	20848

				2030 Demand/day			Without Project Annual			With Project Annual			Additional Annual Visits		
User Group	Percent of Total	Number of Days	% Annual Total	JUL	Dania	H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	JUL Benefit	Dania benefit	H/H benefit
1	2.274	2	4.55	21616	13648	173380	43233	27296	346759	23697	20080	305063	19536	7217	41696
2	1.075	4	4.30	10221	6453	81982	40885	25814	327927	1813	11380	244535	39072	14434	83392
3	0.825	4	3.30	7837	4948	62856	31347	19792	251426	0	5358	168034	31347	14434	83392
4	0.678	17	11.52	6442	4067	51671	109517	69147	878406	0	7804	523990	109517	61343	354416
5	0.525	23	12.08	4993	3153	40051	114850	72514	921176	0	0	441672	114850	72514	479504
6	0.450	26	11.69	4274	2698	34280	111122	70160	891279	0	0	349231	111122	70160	542048
7	0.347	50	17.36	3300	2084	26471	165014	104186	1323530	0	0	281130	165014	104186	1042400
8	0.245	59	14.44	2327	1469	18661	137271	86670	1101012	0	0	0	137271	86670	1101012
9	0.138	133	18.35	1311	828	10518	174411	110119	1398901	0	0	0	174411	110119	1398901
10	0.052	46	2.40	496	313	3977	22808	14401	182939	0	0	0	22808	14401	182939
TOTAL		364	100	950458	600099	7623356	950458	600099	7623356	25510	44622	2313656	924948	555476	5309700

2040

Without Project Capacity:

JUL	Dania	H/H
0	0	0

With Project Capacity:

JUL	Dania	H/H
9768	3608	20848

				2040 Demand/day			Without Project Annual			With Project Annual			Additional Annual Visits		
User Group	Percent of Total	Number of Days	% Annual Total	JUL	Dania	H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	JUL Benefit	Dania benefit	H/H benefit
1	2.274	2	4.55	23886	15081	191584	47772	30162	383167	28236	22946	341471	19536	7217	41696
2	1.075	4	4.30	11294	7131	90589	45178	28524	362357	6106	14091	278965	39072	14434	83392
3	0.825	4	3.30	8660	5467	69456	34638	21870	277824	0	7436	194432	34638	14434	83392
4	0.678	17	11.52	7119	4495	57096	121016	76407	970634	0	15064	616218	121016	61343	354416
5	0.525	23	12.08	5518	3484	44256	126908	80127	1017895	0	0	538391	126908	80127	479504
6	0.450	26	11.69	4723	2982	37879	122789	77527	984859	0	0	442811	122789	77527	542048
7	0.347	50	17.36	3647	2303	29250	182340	115125	1462494	0	0	420094	182340	115125	1042400
8	0.245	59	14.44	2571	1623	20621	151684	95770	1216612	0	0	0	151684	95770	1216612
9	0.138	133	18.35	1449	915	11622	192723	121681	1545778	0	0	0	192723	121681	1545778
10	0.052	46	2.40	548	346	4394	25203	15913	202147	0	0	0	25203	15913	202147
TOTAL		364	100	1050251	663106	8423768	1050251	663106	8423768	34342	59536	2832382	1015910	603569	5591385

Table D-10: Project benefit (additional beach visitors) (cont'd).

2050

Without Project Capacity:

JUL	Dania	H/H
0	0	0

With Project Capacity:

JUL	Dania	H/H
9768	3608	20848

				2050 Demand/day			Without Project Annual			With Project Annual			Additional Annual Visits		
User Group	Percent of Total	Number of Days	% Annual Total	JUL	Dania	H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	Excess Demand JUL	Excess Demand Dania	Excess Demand H/H	JUL Benefit	Dania benefit	H/H benefit
1	2.274	2	4.55	26156	16514	209788	52311	33028	419575	32775	25811	377879	19536	7217	41696
2	1.075	4	4.30	12368	7809	99197	49470	31235	396788	10398	16801	313396	39072	14434	83392
3	0.825	4	3.30	9482	5987	76056	37930	23948	304222	0	9514	220830	37930	14434	83392
4	0.678	17	11.52	7795	4922	62521	132515	83667	1062862	0	22324	708446	132515	61343	354416
5	0.525	23	12.08	6042	3815	48461	138967	87741	1114614	0	4747	635110	138967	82993	479504
6	0.450	26	11.69	5171	3265	41478	134457	84893	1078438	0	0	536390	134457	84893	542048
7	0.347	50	17.36	3993	2521	32029	199665	126064	1601457	0	0	559057	199665	126064	1042400
8	0.245	59	14.44	2815	1777	22580	166097	104870	1332213	0	0	102181	166097	104870	1230032
9	0.138	133	18.35	1587	1002	12727	211035	133243	1692655	0	0	0	211035	133243	1692655
10	0.052	46	2.40	600	379	4812	27598	17425	221354	0	0	0	27598	17425	221354
TOTAL		364	100	1150044	726113	9224179	1150044	726113	9224179	43174	79198	3453289	1106871	646915	5770889

D-46. Beach usage is limited by parking constraints in John U. Lloyd and Dania Beach for all project conditions. Because construction of new parking is not included in the shore protection works, not all of the excess demand can be met by the project. Beach capacity in Hollywood and Hallandale Beach is limited by a lack of public parking and public access to portions of Hallandale Beach. However, the unmet demand in Segment III is relatively small when compared to total demands on the beaches in Segment III.

D-47. Travel Cost Method. The final step in the recreational benefit analysis is to determine willingness to pay, or assign a value to the recreational usage generated by the proposed project. The travel cost method is based upon the assumption that as out-of-pocket and time costs incurred for traveling to the project area increase, the per capita participation of that recreation site will decrease. The average price associated with a visit to the site is arrived at through the consideration of costs of travel and the opportunity cost of the round trip to and from the site. Procedures for using the travel cost method include estimating use and deriving a demand curve for the project.

D-48. Estimating use of Broward County beaches was based upon data provided directly by the Jacksonville District, Corps of Engineers. Jacksonville District investigators have divided the site into six zones noting the travel distance from each zone to the beach. Participation and population estimates were formulated for each of the six zones within the study area. Once the participation rate as a function of travel distance was known, a demand curve representing beach demand vs. travel distance was developed. Total estimated visits in ten-mile increments are plotted in Figure D-2.

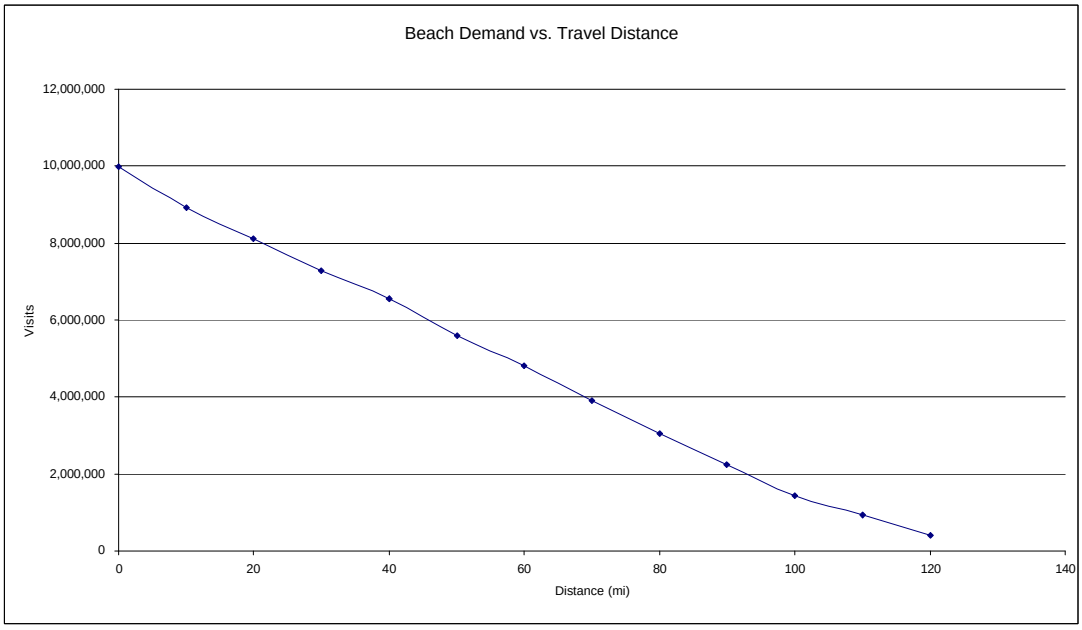

Figure D-2: Beach visitation as a function of increased travel distance.

D-49. The value of a beach visit was assigned a dollar value by considering the cost of owning and operating a vehicle and opportunity costs to the beach user. Operation costs have been updated using data from the American Automobile Association (1998). The American Automobile Association's updated variable cost (per mile) to operate an average automobile was estimated to be 10.7 cents in 1998.

D-50. The opportunity cost of time is computed by following procedures outlined in IWR Report 91-R-12 prepared by the USACE Institute for Water Resources (1991). In this report, the time saved during social/recreational trips on an hourly basis is valued as 60% of the hourly family income of the driver. The US Census Bureau found that the median income in the United States was $38,885 (U.S. Dept. of Commerce, 1998). Therefore, the hourly value of time saved per vehicle is computed as

$$\left[\left(\frac{\$38{,}885}{52}\right)\div 40\right]\times 0.60 = \$11.22 \quad \text{per vehicle per hour.}$$

Based on the *Florida Statistical Abstract* (1998), the median income family income in Broward County was $31,264. The hourly opportunity cost of time per Broward County visitor is computed by assuming 4 persons per vehicle per visit and is found by

$$\left(\frac{\$11.22\times\$31{,}364}{\$38{,}885}\right)\div 4 = \$2.26 \text{ per hour per visitor.}$$

The average cost per vist was computed by dividing the product of the area under the demand curve and the average cost of travel by the number of visits with no mileage increase. The average cost of a beach visit is $3.87 and was multiplied by the average annual increase in participation attributable to the project in order to find the average annual recreations benefit. The benefit stream of annual benefits for each year of the 50-year project were calculated in this manner, and from this point present worth of this stream were summed and discounted resulting in the average annual benefit. Average annual recreation benefits for the reevaluated authorized project (50-foot) along with +/- 25-foot extension variations are shown in Table D-11 while typical calculations used for the 50-foot scenario are presented in Table D-12. It is noted that the recreational benefits computed for the Dania Beach shoreline result from the shore stabilizing effects of sand feeding from the north and south. Therefore, it is assumed that the feeding effects will prevent continued erosion of the Dania Beach shoreline, thus perserving the recreational area.

Table D-11: Average annual recreation benefits ($) by project width.

Without Hollywood/Hallanale Beach parking garages:

JUL Width	25	JUL Width	50	JUL Width	75
Dania Width	0	Dania Width	0	Dania Width	0
H/H width	25	H/H width	50	H/H width	75
Reach	Benefit	Reach	Benefit	Reach	Benefit
JUL	1,865,600	JUL	1,865,600	JUL	1,865,600
Dania	667,600	Dania	667,600	Dania	667,600
H/H	10,183,200	H/H	10,183,200	H/H	10,183,200
TOTAL	12,716,400	TOTAL	12,716,400	TOTAL	12,716,400

With Hollywood/Hallanale Beach parking garages:

JUL Width	25	JUL Width	50	JUL Width	75
Dania Width	0	Dania Width	0	Dania Width	0
H/H width	25	H/H width	50	H/H width	75
Reach	Benefit	Reach	Benefit	Reach	Benefit
JUL	1,865,600	JUL	1,865,600	JUL	1,865,600
Dania	667,600	Dania	667,600	Dania	667,600
H/H	12,758,200	H/H	12,758,200	H/H	12,758,200
TOTAL	15,291,400	TOTAL	15,291,400	TOTAL	15,291,400

D-51. Projects in John U. Lloyd and Hollywood/Hallandale Beach are limited by the area's available parking and cannot generate additional recreational benefits without the construction of new parking facilities. Despite the absence of any authorized project in southern John U. Lloyd and Dania Beach (R-94 to R-101), some incidental benefits are realized. These benefits are due to the halt of shoreline erosion as a result of feeding from the terminal points of John U. Lloyd and Hollywood/Hallandale Beach nourishment efforts. Because the shoreline from R-94 to R-101 is not included in the reevaluated authorized project, adjacent benefits realized along this reach can not be included in optimization calculations.

D-52. Table D-12 was formulated by assuming the travel cost simulation begins at the first year of the Segment III project construction (1976) and runs for a 50-year project life. This assumption is consistent with the methodology used in the storm damage model investigation and obtains optimization through consideration of the most current data available. The simulation was run for a 50-year period to reevaluate benefit based upon current value and demand estimates while assuming no previous project construction.

Table D-12: Travel cost method for 50-foot project in Segment III.

Total Average Annual Recreation Benefits

Interest Rate: 6.125%
Project Life (yrs): 50
Capital Recovery Factor 0.06455398

Year	Visits Attributable to Project	Benefit ($)	Present Valuation ($)
1	**4,888**	18,900	17,800
2	74,719	289,200	256,800
3	144,551	559,400	468,000
4	214,382	829,700	654,100
5	284,214	1,099,900	817,100
6	**354,045**	1,370,200	959,100
7	878,525	3,399,900	2,242,600
8	1,403,005	5,429,600	3,374,600
9	1,927,485	7,459,400	4,368,600
10	2,451,965	9,489,100	5,236,600
11	2,976,444	11,518,800	5,989,800
12	3,500,924	13,548,600	6,638,700
13	4,025,404	15,578,300	7,192,700
14	4,549,884	17,608,100	7,660,600
15	5,074,364	19,637,800	8,050,600
16	**5,598,844**	21,667,500	8,370,000
17	5,674,239	21,959,300	7,993,100
18	5,749,635	22,251,100	7,631,900
19	5,825,031	22,542,900	7,285,700
20	5,900,427	22,834,700	6,954,100
21	5,975,823	23,126,400	6,636,500
22	6,051,219	23,418,200	6,332,300
23	6,126,614	23,710,000	6,041,200
24	6,202,010	24,001,800	5,762,600
25	6,277,406	24,293,600	5,496,000
26	**6,352,802**	24,585,300	5,241,000
27	6,396,534	24,754,600	4,972,500
28	6,440,267	24,923,800	4,717,600
29	6,483,999	25,093,100	4,475,500
30	6,527,731	25,262,300	4,245,600
31	6,571,463	25,431,600	4,027,400
32	6,615,196	25,600,800	3,820,200
33	6,658,928	25,770,100	3,623,500
34	6,702,660	25,939,300	3,436,800
35	6,746,393	26,108,500	3,259,600
36	**6,790,125**	26,277,800	3,091,400
37	6,832,199	26,440,600	2,931,000
38	6,874,273	26,603,400	2,778,800
39	6,916,347	26,766,300	2,634,500
40	6,958,421	26,929,100	2,497,500
41	7,000,495	27,091,900	2,367,600
42	7,042,568	27,254,700	2,244,400
43	7,084,642	27,417,600	2,127,500
44	7,126,716	27,580,400	2,016,600
45	7,168,790	27,743,200	1,911,400
46	**7,210,864**	27,906,000	1,811,700
47	7,242,245	28,027,500	1,714,600
48	7,273,626	28,148,900	1,622,600
49	7,305,007	28,270,400	1,535,600
50	7,336,388	28,391,800	1,453,100
		TOTAL	$ 196,989,100
	Annual Equivalent Benefit		$ 12,716,400

SUMMARY OF REEVALAUTED (NED) PLAN ECONOMICS

D-53. Although the optimum project is determined solely on primary benefits, the total project benefit is the combination of both primary and incidental benefits. A summary of the total average annual benefits for each project configuration included in the reevaluation of the NED plan are outlined in Table D-13. Again, the NED plan is that project configuration that produced the maximum net primary benefits. The total average annual benefits for the 50-ft shoreline extension (NED plan) are $26,005,300. These include $13,288,900 in primary benefits (storm damage and land loss reduction) and $12,716,400 in incidental benefits (recreation). Considering an average annual cost to construct and maintain this project for a 50-year project life of $3,151,000, the benefit-to-cost ratio for the NED plan is 8.3 to 1.0.

Table D-13: Summary of NED plan economics.

	Project Extension		
	25-ft	50-ft	75-ft
Primary Benefits	$12,374,700	$13,288,900	$13,670,700
Costs	$2,692,000	$3,151,000	$3,835,000
Net Primary Benefits	$9,682,700	$10,137,900	$9,835,700
Incidental Benefits	$12,716,400	$12,716,400	$12,716,400
Total Benefits	$25,091,100	$26,005,300	$26,387,100
BC Ratio	9.3 to 1.0	8.3 to 1.0	6.9 to 1.0

IMPLEMENTATION OF THE REEVALUATED (NED) PLAN (2002-2026)

D-54. The economics of implementing the reevaluated NED plan for the remainder of the project life are evaluated. To accomplish this, the shoreline and economic conditions expected at time of construction of the 2002 project and over the remaining project life cycle are considered. Since the John U. Lloyd and Hollywood/Hallandale Beach project reaches have been constructed and renourished once, a portion of the fill material remains along the project shoreline. Therefore, the next renourishment will not include the placement of the entire initial project requirement.

D-55. Evaluation of John U. Lloyd as Separable Element. It is noted that the density of shorefront development along Segment III is highly variable. The densest and most valuable shorefront development in Segment III is in Hollywood and Hallandale. Thus, these shoreline reaches generate most of the Segment III storm damage reduction benefits for the Segment III. Since Segment III was initially constructed as a continuous segment, the reevaluation treated the project as such. Thus, the John U. Lloyd reach was not evaluated as a separable element. For the purposes of implementation, however, an additional analysis was conducted to confirm that the John U. Lloyd Reach is justified as a separable project element. This analysis included consideration of the separable costs and benefits of the John U. Lloyd reach.

D-56. There is a relatively small amount of development along the John U. Lloyd project reach. The most notable development at that location is infrastructure associated with the Naval Surface Warfare Facility immediately downdrift of the Port Everglades south jetty. There are also scattered structures and other infrastructure associated with John U. Lloyd Beach State Park and Nova University. The John U. Lloyd project output includes storm damage reduction, recreation, and environmental enhancement and preservation. The latter two outputs are considered incidental.

D-57. The separable element evaluation for John U. Lloyd included consideration of three project alternatives. These are the 50-ft design berm as identified in the Segment III reevaluation, a 25-ft design berm, and a 0-ft design berm. The latter is essentially the periodic nourishment alternative where the pre-project shoreline is reestablished and maintained. The design berm would be situated along the previously constructed section of the John U. Lloyd reach between the south jetty and R-94. Six years of advance fill with overfill is applied to each alternative. A design berm wider than 50-ft is not considered due to the increased nearshore hardbottom impacts that would be associated with a wider berm. It is noted that reestablishment and maintenance of a 50-ft design berm along John U. Lloyd would impact approximately 10 acres of nearshore hardbottom based upon 2001 conditions.

D-58. A summary of the separable project economics for each alternative is included in Table D-14. The average annual project costs and benefits are based upon a 6 and 1/8 percent interest rate for the remaining 24 years of the project life. The details of the cost formulation are included in Sub-appendix B-3. The input files to the SDM-RU for the separable John U. Lloyd project evaluation are included in Sub-appendix D-2.

D-59. As indicated in the Table D-14, there are sufficient storm damage reduction benefits along the John U. Lloyd reach to justify sand placement at that location as a separable Segment III project element. However, reestablishment and maintenance of the 50-ft NED design berm at John U. Lloyd does not maximize the separable net primary benefits along that reach. Instead, reestablishment of pre-project shoreline conditions and periodic nourishment sufficient to maintain the pre-project shoreline produces the maximum net primary benefits. Therefore, the John U. Lloyd project will only include the reestablishment of the pre-project shoreline and the placement of periodic nourishment.

Table D-14: Summary of separable John U. Lloyd reach economics.

	Project Extension		
	0-ft	25-ft	50-ft
Primary Benefits	$1,028,000	$1,067,000	$1,096,000
Costs	$1,410,000	$1,735,000	$1,895,000
Net Primary Benefits	$ -382,000	$ -668,000	$ -799,000
Incidental Benefits	$1,432,000	$1,457,000	$1,457,000
Total Benefits	$2,460,000	$2,524,000	$2,553,000
BC Ratio	1.7 to 1.0	1.5 to 1.0	1.4 to 1.0

D-60. The quantified incidental benefits include recreation. The recreational benefits analysis for the John U. Lloyd separable evaluation was performed for a 24-year economic period using an interest rate of 6 and 1/8 percent. The analysis also considers current and proposed beach conditions without and with the project as well as current parking availability and the cost of a beach visit as determined by the travel cost method described herein. The results of the analysis are summarized in Table D-14 and detailed in Sub-appendix D-3.

D-61. Other benefits of the project not quantified in this analysis are the eco-system restoration, improvement and protection. These benefits specifically include the reestablishment and maintenance of sea turtle nesting habitat, protection of the thin beach barrier that fronts the upland and sensitive back marsh and mangrove areas.

D-62. Implementation of Plan. Considering the project beach conditions as of August 1998, approximately 1,540,000 cubic yards of sand will be required to reestablish and maintain the pre-project shoreline at John U. Lloyd and reconstruct and maintain the 50-ft design beach section along the Hollywood/ Hallandale Beach shoreline. This volume

includes design beach fill, advance nourishment, overfill, and material required to construction fill transitions as the terminal ends of the project. Beach fill transitions and tapers have been added to the optimum NED plan as engineering features. These fill tapers are included to minimize fill loss rates at the terminal ends of the project thus reducing the overall average annual cost of maintaining the project. The details of all the engineering components of the plan are included in Appendix B.

D-63. The details of the cost to reconstruct the optimal configuration of the authorized project are presented in Appendix B. For the purposes of evaluation the future project components, it is assumed that current sand prices and availability apply. That is, it is assumed that no immediate sand resources are available to the Segment III shoreline and future sand will be transported from distances greater than 15 miles. The average annual cost of maintaining the design beach over the next 24 years was computed using an interest rate of 6 and 1/8 percent.

D-64. Consideration of the project costs and the primary and secondary benefits associated with the implementation of the reevaluated authorized plan suggest that the project is economically justified. The average annual project cost to build the reevaluated NED plan in 2002 and maintain it over the remainder of the project life is $4,488,000.

MODIFICATIONS TO THE REEVALUATED (NED) PLAN

D-65. Modifications to the authorized project are proposed to reduce the overall average annual project costs. The proposed modifications include (1) the construction of a full design section along the Dania and southern John U. Lloyd shorelines, (2) the construction of groins along the northernmost end of John U. Lloyd, and (3) the implementation of sand bypassing at Port Everglades. The benefits and comparative costs of each of the proposed modifications relative to the reevaluated NED plan are outlined in the following paragraphs. Details of the physical components and expected performance of each of these project modifications are discussed in Appendix B.

Fill Dania Beach Gap (R-94 to R-101)

D-66. The previously constructed beach fills along John U. Lloyd and Hollywood/ Hallandale Beach experienced high sand loss rates at the terminal points of the fill in south John U. Lloyd and north Hollywood. End losses were particularly prominent during the first year after construction and are largely attributable to dramatic planform equilibration caused by inadequate fill transitions. The currently authorized project does not specifically include a project element that addresses the terminal ends of the fill sections. Beach fill tapers, however, have been added to the NED plan as an engineering feature for purposes of reducing the effects of fill end losses.

D-67. An alternative method by which to reduce endlosses from the southern end of the John U. Lloyd project reach and the northern end of the Hollywood/Hallandale project reach would be to construct a continuous design section between the two projects, thereby eliminated the terminal ends of those project reaches. This would consist of

placing a full design section between R-94 and R-101. Considering that the optimum design berm widths along the adjacent reaches, the berm between R-94 and R-101 is widened accordingly. The results of a berm that transitions uniformly between 0 and 50-ft. Berm widths of narrower or wider dimensions would require complicated transition sections.

D-68. Creation of a design section along this reach of shoreline would potentially produce additional storm damage reduction, loss of land, and recreational benefits for the project. Likewise, the addition of this project reach would increase the overall average annual project costs. To evaluate the economic efficiency of this proposed project modification, the incremental primary benefits and costs over the remaining 24-years of the project life are compared. If the incremental primary benefits are greater than the incremental project costs, then the modification would be economically feasible. The average annual project costs and benefits used to evaluate modifications to the reevaluated NED plan are based upon a percent rate of 6 and 1/8 for the remaining 24 years of the project life.

D-69. The incremental additional sand volume required to construct a transitional design beach with advance nourishment would be approximately 360,000 cubic yards. It is estimated that a fill of these dimensions would cover about 13 acres of nearshore hardbottom in southern John U. Lloyd and Dania Beach areas.

D-70. Project Costs. The total average annual cost to implement the reevaluated plan with a fill section between R-94 and R-101 is $5,206,000. This results in an incremental increase in average annual project costs over implementation of the reevaluated NED plan of $735,000. The details of this cost estimate are included in Sub-appendix B-5.

D-71. Benefits. The total average annual incremental primary benefit (i.e., storm damage reduction and loss of land) to implement the reevaluated plan with a fill section between R-94 and R-101 is $328,000. A copy of the input file for computing the storm damage estimates along this reach of shoreline is included in Sub-appendix D-4.

D-72. Summary. Comparison of the incremental average annual costs and benefits for the above described project modifications yields a net average annual benefit deficit of $407,000. Thus, the incremental primary benefits do not equate to at least 50 percent of the incremental cost to implement the additional project reach. Therefore, this project modification is not economically justified. Furthermore, the additional impact of 13 acres of nearshore hardbottom that would be associated with the project modifications is considered to be unnecessary considering the predicted performance and comparable minimal hardbottom impacts of beach fill tapers. Therefore, this project modification is not is not recommended at this time.

Groin Field In Northern John U. Lloyd

D-73. Modifications to the Segment III authorized project are also proposed for the northernmost shoreline along John U. Lloyd Beach State Park. To date, only advance fill

has been placed in attempt to offset the erosion rate immediate to this area. Advance fill volumes placed during the projects, however, have not provided long-term protection of the design beach section at that location. In fact, the design section along the northern 2,800 feet of the John U. Lloyd shoreline has been impacted by shoreline recession within the first two years following construction of both the 1977 and 1989 projects.

D-74. In addition to advance fill, a measure to reduce the sand loss rate from the northern John U. Lloyd shoreline included sand tightening the south jetty as part of the 1989 renourishment project. Although the jetty sand-tightening most likely reduced the sand loss rate to the inlet, the shoreline immediately downdrift of the inlet continued to erode more or less at historical rates. This may suggest that the sand loss rates to the inlet were relatively low compared to alongshore and offshore sand losses prior to the sand-tightening project.

D-75. Project configurations considered in the engineering analysis (Appendix B) intended to address the erosion problem along the northern John U. Lloyd shoreline included (1) advance fill only, (2) 2 groins with advance fill and, (3) 10 groins with advance fill. The location and quantity of advance fill for each alternative was configured to maximize protection of the design beach while minimizing the quantity of advance fill. The two-groin alternative was configured so as to stabilize the northernmost 700 feet of shoreline where the net sand transport potential is to the north. The 10-groin alternative was configured to stabilize the entire reach of shoreline defined by the largest measured shoreline recession and the steepest gradient in alongshore sand transport potential (i.e., about 2,800 feet immediate to the inlet).

D-76. Two Groins. The two-groin alternative would include the construction of two, rubble mound T-head groins within 700 feet of the Port Everglades south jetty and a spur attached to the south jetty. The configuration would address the shoreline instabilities associated with the net northerly sand transport potential along this reach of shoreline.

D-77. The total average annual cost to implement the modified reevaluated plan with tapers and two groins is $4,429,000. Project costs required to implement the reevaluated authorized project were formulated using a percent rate of 6 and 1/8 for the remaining 24 years of the project life.

D-78. Ten Groins. For completeness, a ten-groin alternative is also considered to extend the shore stabilizing features of a structural field throughout the most highly erosional section of shoreline. The purpose and physical benefit of the extended groin field would be to stabilize the most highly erosional section of shoreline and apply advance fill along areas of shoreline with lower net longshore sand transport potential (i.e., south of a point some 2,800 feet south of the inlet). The ten-groin alternative would include ten T-head groins placed along about 2,800 feet of shoreline and a jetty spur. The alongshore extent of the groin field was developed to be consistent with the limits of the most highly erosional section of shoreline. Stabilizing this northern reach of shoreline with T-head groins would allow the placement of advance fill beyond the direct of the influence of the inlet.

D-79. The total average annual cost to implement the modified reevaluated plan with tapers and ten groins is $4,432,000. Project costs required to implement the reevaluated authorized project were formulated using a percent rate of 6 and 1/8 for the remaining 24 years of the project life.

D-80. Although the ten-groin alternative demonstrates a net economic benefit (i.e., cost reduction) over the two-groin alternative, it is currently the position of the State of Florida's Department of Environmental Protection and Department of Parks and Recreation (the upland land owner) that structural stabilization of the northern 2,800 feet of the John U. Lloyd Beach State Park shoreline is not in the best interest of the State and would not be permitted at this time. Nonetheless, the results of this analysis demonstrate the physical and economic benefits of this project configuration. However, without the consent of the State of Florida, this alternative cannot be considered for implementation.

Mechanical Sand Bypassing at Port Everglades

D-81. Cost-effective sand sources for Segment III beach renourishment will become more important in the future as nearby offshore sand deposits are depleted. One alternative future sand source is sand bypassing at Port Everglades. Although the economic benefit of sand bypassing is often related to reduced maintenance at navigation projects, sand bypassing at Port Everglades would provide both physical and economic benefits to the Segment III Federal Shore Protection Project. The physical benefits would include access to a reliable future sand source that is compatible with the native sediments of the Segment III shoreline and reduced sand shoaling within the Port Everglades navigation project. These latter benefits are not considered in this analysis. The economic benefits would include an overall reduction in the cost to maintain the Segment III project. The results of the engineering analyses included in Appendix B demonstrate the physical benefit of sand bypassing at Port Everglades.

D-82. Costs. The project cost associated with implementation of a sand bypass operation at Port Everglades would include the initial capital layout for the sand bypassing infrastructure, inlet jetty, shoreline and shoal modifications, and the annual cost to bypass sand and maintain the bypassing equipment. For the purposes of this investigation it is assumed that annual maintenance cost are incorporated in the unit cost of bypassed sand. The cost to construct the sand-bypassing infrastructure would include the bypassing equipment and any modifications to the inlet's jetties and sand trapping areas and any modification to the proposed groin field.

D-83. It is assumed that the initial cost to construct the sand-bypassing infrastructure would be approximately $7,000,000. This estimate is based upon the assumption that some form of plant infrastructure would be purchased or constructed for site specific use. A more detailed evaluation of the most feasible bypassing physical plant should be conducted prior to implementation of the operation. For the purposes of this evaluation, however, this estimate is considered conservatively high compared to estimates outlined in the Port Everglades Inlet Management Plan (Coastal Tech., 1994). The unit cost of

bypassed sand once the bypassing infrastructure is in place and operational is assumed to be about $3.50 per cubic yard. For the purposes and planning, it is assumed that the sand bypassing plant infrastructure and the physical benefits of sand bypassing would be available at year 6 of the analysis.

D-84. The total average annual cost to implement the Segment III Federal shore protection project over the remaining 24 years of the project life cycle with bypassing at Port Everglades and two groins is estimated to be $4,287,000. The cost reduction over the no-bypassing, two-groin plan would be $142,000 per year. The cost reduction over the reevaluated NED plan would be $184,000 per year. The computed cost savings would be due to the lower unit cost of bypassed sand compared to the expected cost of future off-site sand resources. The details of the cost estimate for these plans are included in Sub-Appendix B-6.

SUMMARY OF THE RECOMMENDED MODIFIED PLAN

D-85. Based upon the average annual costs of alternate project modifications outlined in Table D-15, it is recommended that the NED plan include reconstruction of the pre-project shoreline at John U. Lloyd and reestablishment of a 50-ft extension of the ECL along the Hollywood/Hallandale shoreline. The plan shall also include 6 years of advance fill along the John U. Lloyd (south jetty of Port Everglades to R-94) and Hollywood/Hallandale Beach (R-101 to R-128) reaches. In addition to the renourishment of those shoreline reaches, it is recommended that beach fill transitions be constructed along the northern end of the Hollywood/ Hallandale reach to reduce endlosses and protect the design section. A two-groin and jetty spur structural field is also recommended for construction along the northern 700 feet of the John U. Lloyd shoreline to stabilize that section of shoreline and reduced sand losses to the Port Everglades.

D-86. It is also recommended that sand bypassing be implemented at Port Everglades following construction of the recommended project to provide an alternative sand source for future maintenance of the Segment III Shore Protection Project. The cost to implementation the Segment III project with the two groins and jetty spur at John U. Lloyd and sand bypassing at Port Everglades would be $4,287,000. This would reduce the average annual cost to implement the Segment III project by $184,000.

Table D-15: Annualized cost summary for project modifications.

Project Plan	AVERAGE ANNUAL COST
Reevaluated NED Plan with Added Beach Fill Tapers	$4,471,000
Modifications to the Authorized Plan (R-94 to R-101) ***	
Design Section along Dania and Southern JUL (R-94 to R-101)	$5,206,000
Modifications to the Authorized Plan (Groin Field)	
Two-Groin Alternative	$4,429,000
Ten-Groin Alternative	$4,432,000
Modifications to the Authorized Plan (Bypassing)	
Two-Groin Alternative with Future Sand Bypassing at Port Everglades	$4,287,000

Notes:

GENERAL: Project benefits are the same for all alternatives included in this table, except for the project that would include a design section between R-94 and R-101 (see note below).

*** This project modification results in increased project costs and primary benefits. The incremental increase in primary benefits, however, is less than the incremental increase in project costs. Thus, this modification is not

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SUB-APPENDIX D-1

Example of Segment III
Storm Damage Model Input Files
(Project Reevaluation)

Hollywood/Hallandale (R101-R128) .rsk file

"Uncertainties Broward COunty Segment III - Hollywood/Hallandale reach"
3.0,"Shorelien position sd"
.100,"Armor cost uncertainty at 95% confidence limit"
.100,"structure value cost uncertainty"
1.0,"sd of setback distance"
.22,"sd of backfill cost per ft^3"
8,"# of storm probablilties"
10
10
10.4
13
12.8
13.2
14.2
3
1,53.8,88.8
2,56.6,94.4
3,60,100
4,0,0
5,0,0
6,0,0
7,0,0
8,0,0
9,0,0
10,0,0
11,0,0
12,0,0
13,56.6,94.4
14,0,0
15,0,0
16,0,0
9999,9999,9999

Hollywood/Hallandale R101-R128 .dat Input File

```
R101-R128 broward Segment 3
2001,   50
-4
0       4       8       12      16
20      24      28      32      36
40      44      48      52      56
60      64      68      72      76
80      84      88      92      96
100     104     108     112     116
120     124     128     132     136
140     144     148     152     156
160     164     168     172     176
180     184     188     192     196
8
0       177
0.01    160.5
0.02    129
0.05    90
0.1     80
0.2     71
0.5     58.5
1       33
16
'CSP-SMALL CAPPED       '       625     71      1       1.00    1
'CSP-MEDIUM CAPPED      '       750     75.5    1       1.00    2
'CSP-LARGE CAPPED       '       850     80      1       1.00    3
'CSP-SMALL CAPPED W/TOE '       0       0       1       1.00    4
'CSP-MEDIUM CAPPED W/TOE'       0       0       1       1.00    5
'CSP-LARGE CAPPED W/TOE '       0       0       1       1.00    6
'ROCK REVETMENT-SMALL   '       0       0       1       1.00    7
'ROCK REVETMENT-LARGE   '       0       0       1       1.00    8
'DUMMY                  '       0       0       0       0.00    9
'DUMMY                  '       0       0       0       0.00    10
'DUMMY                  '       0       0       0       0.00    11
'DUMMY                  '       0       0       0       0.00    12
'RUBBLE - SMALL         '       200     75.5    0       0.65    13
'RUBBLE - LARGE         '       0       0       0       1.00    14

'DO NOTHING             '       0       0       0       0.00    15

'ROCK REVETMENT-MEDIUM  '       0       0       0       0.00    16

1.33
'Vacant Lot',0,40,1,15,15,-20,20,120,'VC',-1,0,'100',1
```

'MF-Destroyed 514201027510',0,90,1,15,15,120,140,175,'VC',-1,0,'101',1
'MF 514201027480',59724,70,1,1,1,40,140,175,'VC',-1,1,'101',1
'MF 514201027470',52236,70,1,15,15,115,135,150,'VC',-1,1,'101',1
'Beach Access',0,30,1,15,1,-20,30,125,'PC',-1,0,'101',1
'HOUSE 514201027280',92484,80,1,15,1,150,170,210,'VC',-1,0,'101',1
'MF 514201027250',206460,80,1,15,1,130,150,175,'VC',-1,0,'101',1
'Vacant Lot',0,240,1,15,15,-20,30,130,'VC',-1,0,'101',1
'SF 514201026860',74860,80,2,15,1,130,150,175,'VC',-1,0,'101',1
'HOTEL 51420102670',97620,80,2,1,1,45,55,80,'VC',-1,0,'101',1
'Vacant Lot',0,120,1,15,15,-20,45,120,'VC',-1,0,'102',1
'SF 514201026660',174456,80,2,1,1,44,50,113,'VC',-1,0,'102',1
'Beach Access',0,30,1,15,1,-20,40,130,'PC',-1,0,'102',1
'CONDO 514201AA',370500,50,2,1,1,23,41,126,'VC',-1,1,'102',1
'BUILD. 514201029999',200000,50,2,15,1,130,150,240,'VC',-1,1,'102',1
'SF 51401026440',8424,40,1,1,1,42,50,84,'VC',-1,0,'102',1
'SF 51401026430',198492,60,3,1,1,45,60,90,'VC',-1,1,'102',1
'CONDO 514201AC',431472,60,2,15,1,155,175,200,'VC',-1,1,'102',1
'Vacant Lot',0,2695,1,15,15,-20,50,180,'VC',-1,0,'104',1
'MF 514201024600',277392,50,2,15,1,92,112,28,'VC',-1,0,'105',1
'MF 514201024590',268284,100,2,15,1,116,136,165,'VC',-1,0,'105',1
'Vacant Lot',0,385,1,15,15,-20,50,230,'VC',-1,0,'105',1
'DUPLEX 514201024250',288700,150,2,1,1,42,115,175,'VC',-1,0,'105',1
'SF 514201024320',99684,100,2,1,1,41,130,180,'VC',-1,0,'105',1
'Vacant Lot',0,485,1,15,15,-20,50,240,'VC',-1,0,'106',1
'HOUSEREST 514201024241',362700,1530,2,15,1,95,115,175,'VC',-1,1,'106',1
'Roadway',48195,1530,1,15,1,72,92,106,'PC',-1,1,'106',1
'Beach Access',0,45,1,15,1,-20,120,200,'PC',-1,1,'106',1
'Roadway',1418,45,1,15,1,60,80,94,'PC',-1,1,'106',1
'MF 514212021350',154000,75,2,15,1,90,110,150,'VC',-1,1,'107',1
'Roadway',2363,75,1,15,1,60,80,94,'PC',-1,1,'107',1
'MF 214212021360',264156,80,2,15,1,90,110,145,'VC',-1,1,'108',1
'Roadway',2520,80,1,15,1,56,76,90,'PC',-1,1,'108',1
'Beach Access',0,45,1,15,1,-20,110,200,'PC',-1,1,'108',1
'Roadway',1418,45,1,15,1,56,76,90,'PC',-1,1,'108',1
'MF 514212021270',74352,40,2,15,1,90,110,145,'VC',-1,1,'108',1
'Roadway',1260,40,1,15,1,56,76,90,'PC',-1,1,'108',1
'MF 514212021280',177624,37,2,15,1,90,110,140,'VC',-1,1,'108',1
'Roadway',1166,37,1,15,1,55,75,89,'PC',-1,1,'108',1
'MF 514212021290',183100,95,2,15,1,95,115,145,'VC',-1,1,'108',1
'Roadway',2993,95,1,15,1,55,75,89,'PC',-1,1,'108',1
'Beach Access',0,35,1,15,1,-20,105,200,'PC',-1,1,'108',1
'Roadway',1103,35,1,15,1,55,75,89,'PC',-1,1,'108',1
'CONDO 514212CG',3067027,165,2,15,1,88,108,153,'VC',-1,1,'108',1
'Roadway',5198,165,1,15,1,55,75,89,'PC',-1,1,'108',1
'Beach Access',0,40,1,15,1,-20,110,200,'PC',-1,1,'108',1
'Roadway',1260,40,1,15,1,55,75,89,'PC',-1,1,'108',1

'CONDO 514212CG-same-',766757,45,2,15,1,90,110,150,'VC',-1,1,'108',1
'Roadway',1418,45,1,15,1,55,75,89,'PC',-1,1,'108',1
'CONDO 514212AK',905544,100,2,15,1,112,132,152,'VC',-1,1,'108',1
'Roadway',3150,100,1,15,1,55,75,89,'PC',-1,1,'108',1
'Beach Access',0,60,1,15,1,-20,110,200,'PC',-1,1,'108',1
'Roadway',1890,60,1,15,1,55,75,89,'PC',-1,1,'108',1
'CONDO 514212AC',19484136,152,15,15,1,116,136,252,'VC',-1,1,'108',1
'Roadway',4788,152,1,15,1,55,75,89,'PC',-1,1,'108',1
'Beach Access',0,68,1,15,1,-20,110,190,'PC',-1,1,'108',1
'Roadway',2142,68,1,15,1,55,75,89,'PC',-1,1,'108',1
'PARKING LOT',14400,80,1,15,1,88,108,140,'VC',-1,1,'108',1
'MF 514212020940',75768,80,1,15,1,85,105,240,'VC',-1,1,'108',1
'Roadway',2520,80,1,15,1,55,75,89,'PC',-1,1,'108',1
'Parking Lot',16020,89,1,15,1,85,105,138,'VC',-1,1,'108',1
'Roadway',2804,89,1,15,1,55,75,89,'PC',-1,1,'108',1
'Beach Access',0,30,1,15,1,-20,105,190,'PC',-1,1,'108',1
'Roadway',945,30,1,15,1,50,70,84,'PC',-1,1,'108',1
'SF 514212020670',40488,78,2,15,1,85,105,140,'VC',-1,1,'109',1
'Roadway',2457,78,1,15,1,50,70,84,'PC',-1,1,'109',1
'MF 514212020680',210072,95,3,15,1,83,103,140,'VC',-1,1,'109',1
'Roadway',2993,95,1,15,1,50,70,84,'PC',-1,1,'109',1
'Beach Access',0,37,1,15,1,-20,105,190,'PC',-1,1,'109',1
'Roadway',1166,37,1,15,1,51,71,85,'PC',-1,1,'109',1
'HOTEL 514212020540',497232,180,3,15,1,88,108,149,'VC',-1,1,'109',1
'Roadway',5670,180,1,15,1,55,75,89,'PC',-1,1,'109',1
'Beach Access',0,35,1,15,1,-20,110,200,'PC',-1,1,'109',1
'Roadway',1103,35,1,15,1,60,80,94,'PC',-1,1,'109',1
'SF 514212020470',161376,40,1,15,1,90,110,145,'VC',-1,1,'109',1
'Roadway',1260,40,1,15,1,60,80,94,'PC',-1,1,'109',1
'SF 514212020472',80820,40,1,15,2,90,110,150,'VC',-1,1,'109',1
'Roadway',1260,40,1,15,1,65,85,99,'PC',-1,1,'109',1
'SF 514212020473',94296,40,1,15,2,90,110,150,'VC',-1,1,'109',1
'Roadway',1260,40,1,15,1,65,85,99,'PC',-1,1,'109',1
'MF 514212020474',37608,50,1,15,2,95,115,150,'VC',-1,1,'109',1
'Roadway',1575,50,1,15,1,65,85,99,'PC',-1,1,'109',1
'Beach Access',0,30,1,15,1,-20,120,200,'PC',-1,1,'109',1
'Roadway',945,30,1,15,1,66,86,100,'PC',-1,1,'109',1
'COOP 514212NP',1257648,89,4,15,2,98,118,161,'VC',-1,1,'109',1
'Roadway',2804,89,1,15,1,67,87,101,'PC',-1,1,'109',1
'MF 514212020380',574152,90,2,15,1,98,118,158,'VC',-1,1,'109',1
'Roadway',2835,90,1,15,1,69,89,103,'PC',-1,1,'109',1
'Beach Access',0,25,1,15,1,-20,120,200,'PC',-1,1,'109',1
'Roadway',788,25,1,15,1,70,90,104,'PC',-1,1,'109',1
'HOTEL 514212020360',6742728,180,11,15,1,120,140,290,'VC',-1,1,'109',1
'Roadway',5670,180,1,15,1,72,92,106,'PC',-1,1,'109',1
'Beach Access',0,30,1,15,1,-20,120,210,'PC',-1,1,'109',1

'Roadway',945,30,1,15,1,74,94,108,'PC',-1,1,'109',1
'MF 514212011870',904440,130,3,15,2,105,125,165,'VC',-1,1,'110',1
'Roadway',4095,130,1,15,1,75,95,109,'PC',-1,1,'110',1
'MF 514212011880',36240,58,2,15,1,105,125,155,'VC',-1,1,'110',1
'Roadway',1827,58,1,15,1,75,95,109,'PC',-1,1,'110',1
'Beach Access',0,20,1,15,1,-20,125,210,'PC',-1,1,'110',1
'Roadway',630,20,1,15,1,76,96,110,'PC',-1,1,'110',1
'COOP 514212NS',295944,85,2,15,1,105,125,158,'VC',-1,1,'110',1
'Roadway',2678,85,1,15,1,76,96,110,'PC',-1,1,'110',1
'MF 514212011730',114336,98,2,15,1,100,120,168,'VC',-1,1,'110',1
'Roadway',3087,98,1,15,1,75,95,109,'PC',-1,1,'110',1
'Beach Access',0,25,1,15,1,-20,120,210,'PC',-1,1,'110',1
'Roadway',788,25,1,15,1,76,96,110,'PC',-1,1,'110',1
'HOTEL 514212011570',234900,79,2,15,1,105,125,150,'VC',-1,1,'110',1
'Roadway',2489,79,1,15,1,76,96,110,'PC',-1,1,'110',1
'CONDO 514212AD',467460,101,3,15,1,105,125,161,'VC',-1,1,'110',1
'Roadway',3182,101,1,15,1,77,97,111,'PC',-1,1,'110',1
'Beach Access',0,20,1,15,1,-20,130,210,'PC',-1,1,'110',1
'Roadway',630,20,1,15,1,78,98,112,'PC',-1,1,'110',1
'MF 514212011420',200000,70,2,15,1,100,120,168,'VC',-1,1,'110',1
'Roadway',2205,70,1,15,1,79,99,113,'PC',-1,1,'110',1
'MF 514212011440',200000,81,2,15,1,130,150,170,'VC',-1,1,'110',1
'Roadway',2552,81,1,15,1,80,100,114,'PC',-1,1,'110',1
'Vacant Lot',0,32,1,15,1,-20,120,220,'VC',-1,1,'110',1
'Roadway',1008,32,1,15,1,82,102,116,'PC',-1,1,'110',1
'Beach Access',0,30,1,15,1,-20,120,220,'PC',-1,1,'110',1
'Roadway',945,30,1,15,1,85,105,119,'PC',-1,1,'110',1
'CONDO 514212AJ',2755884,175,2,15,2,115,135,175,'VC',-1,1,'110',1
'Roadway',5513,175,1,15,1,89,109,123,'PC',-1,1,'110',1
'Beach Access',0,35,1,15,1,-20,140,220,'PC',-1,1,'110',1
'Roadway',1103,35,1,15,1,95,115,129,'PC',-1,1,'110',1
'CONDO 514212AG',953388,79,2,15,1,125,145,175,'VC',-1,1,'111',1
'Roadway',2489,79,1,15,1,98,118,132,'PC',-1,1,'111',1
'MF 514212011220',283656,97,2,15,2,130,150,185,'VC',-1,1,'111',1
'Roadway',3056,97,1,15,1,100,120,134,'PC',-1,1,'111',1
'Beach Access',0,21,1,15,1,-20,150,240,'PC',-1,1,'111',1
'Roadway',662,21,1,15,1,102,122,136,'PC',-1,1,'111',1
'COOP 514212NN',2028744,105,7,15,2,130,150,190,'VC',-1,1,'111',1
'Roadway',3308,105,1,15,1,105,125,139,'PC',-1,1,'111',1
'MF 514212011050',162444,70,2,15,2,140,160,210,'VC',-1,1,'111',1
'Roadway',2205,70,1,15,1,110,130,144,'PC',-1,1,'111',1
'Beach Access',0,35,1,15,1,-20,160,240,'PC',-1,1,'111',1
'Roadway',1103,35,1,15,1,115,135,149,'PC',-1,1,'111',1
'CONDO 514212AM',1029264,120,4,15,2,145,165,205,'VC',-1,1,'111',1
'Roadway',3780,120,1,15,1,113,133,147,'PC',-1,1,'111',1
'SF 514212010950',15120,55,2,15,1,150,170,200,'VC',-1,1,'111',1

'Roadway',1733,55,1,15,1,120,140,154,'PC',-1,1,'111',1
'Beach Access',0,40,1,15,1,-20,160,250,'PC',-1,1,'111',1
'Roadway',1260,40,1,15,1,125,145,159,'PC',-1,1,'111',1
'CITY PARK 514212029999',20100,110,1,15,1,152,172,218,'PN',-1,1,'111',1
'Roadway',3465,110,1,15,1,128,148,162,'PC',-1,1,'111',1
'Beach Access',0,35,1,15,1,-20,175,260,'PC',-1,1,'111',1
'Roadway',1103,35,1,15,1,131,151,165,'PC',-1,1,'111',1
'REST 514212010780',61176,60,1,15,1,160,180,205,'VC',-1,1,'111',1
'Roadway',1890,60,1,15,1,132,152,166,'PC',-1,1,'111',1
'STORE/OFF 514212010781',94992,30,2,15,1,160,180,210,'VC',-1,1,'111',1
'Roadway',945,30,1,15,1,135,155,169,'PC',-1,1,'111',1
'STORE/OFF 514212010800',63336,38,2,15,1,160,180,210,'VC',-1,1,'111',1
'Roadway',1197,38,1,15,1,138,158,172,'PC',-1,1,'111',1
'MF 514212010810',72816,48,1,15,1,165,185,210,'VC',-1,1,'111',1
'Roadway',1512,48,1,15,1,140,160,174,'PC',-1,1,'111',1
'Beach Access',0,40,1,15,1,-20,180,260,'PC',-1,1,'111',1
'Roadway',1260,40,1,15,1,141,161,175,'PC',-1,1,'111',1
'REST 514212010600',53544,40,1,15,1,165,185,210,'VC',-1,1,'112',1
'Roadway',1260,40,1,15,1,141,161,175,'PC',-1,1,'112',1
'STORE/OFF 514212010610',207564,80,2,15,1,165,185,249,'VC',-1,1,'112',1
'Roadway',2520,80,1,15,1,143,163,177,'PC',-1,1,'112',1
'REST 514212010620',34044,45,1,15,1,165,185,215,'VC',-1,1,'112',1
'Roadway',1418,45,1,15,1,145,165,179,'PC',-1,1,'112',1
'Beach Access',0,40,1,15,1,-20,190,270,'PC',-1,1,'112',1
'Roadway',1260,40,1,15,1,146,166,180,'PC',-1,1,'112',1
'MF 514212010470',350712,165,2,15,2,170,190,225,'VC',-1,1,'112',1
'Roadway',5198,165,1,15,1,149,169,183,'PC',-1,1,'112',1
'Beach Access',0,35,1,15,1,-20,190,270,'PC',-1,1,'112',1
'Roadway',1103,35,1,15,1,150,170,184,'PC',-1,1,'112',1
'REST 514212010300',43944,52,1,15,1,170,190,212,'VC',-1,1,'112',1
'Roadway',1638,52,1,15,1,150,170,184,'PC',-1,1,'112',1
'STORE/OFF 514212101310',74016,45,3,15,1,170,190,219,'VC',-1,1,'112',1
'Roadway',1418,45,1,15,1,145,165,179,'PC',-1,1,'112',1
'STORES 514212010320',194832,85,1,15,1,170,190,220,'VC',-1,1,'112',1
'Roadway',2678,85,1,15,1,143,163,177,'PC',-1,1,'112',1
'Amphitheater',55000,80,1,15,1,110,130,200,'PC',-1,1,'112',1
'Roadway',2520,80,1,15,1,140,160,174,'PC',-1,1,'112',1
'Mini golf 514213010701',784206,380,1,15,2,180,200,310,'PC',-1,1,'113',1
'PARKING LOT',146250,380,1,15,1,162,182,340,'PC',-1,1,'113',1
'Roadway',11970,380,1,15,1,142,162,176,'PC',-1,1,'113',1
'Beach Access',0,30,1,15,1,-20,180,265,'PC',-1,1,'113',1
'Roadway',945,30,1,15,1,148,168,182,'PC',-1,1,'113',1
'HOTEL 514213010710',707340,170,4,15,1,156,176,215,'VC',-1,1,'113',1
'Roadway',5355,170,1,15,1,145,165,179,'PC',-1,1,'113',1
'Beach Access',0,40,1,15,1,-20,170,270,'PC',-1,1,'113',1
'Roadway',1260,40,1,15,1,143,163,177,'PC',-1,1,'113',1

'STORES 514213010880',247188,122,1,15,1,160,180,200,'VC',-1,1,'113',1
'Roadway',3843,122,1,15,1,130,150,164,'PC',-1,1,'113',1
'REST 514213010900',35892,40,2,15,1,175,195,218,'VC',-1,1,'113',1
'Roadway',1260,40,1,15,1,129,149,163,'PC',-1,1,'113',1
'Beach Access',0,38,1,15,1,-20,160,225,'PC',-1,1,'113',1
'Roadway',1197,38,1,15,1,128,148,162,'PC',-1,1,'113',1
'STORES 514213011020',62256,42,1,15,1,142,162,200,'VC',-1,1,'113',1
'Roadway',1323,42,1,15,1,125,145,159,'PC',-1,1,'113',1
'CONDOS 514213AJ',3260388,124,9,15,1,147,167,218,'VC',-1,1,'113',1
'Roadway',3906,124,1,15,1,122,142,156,'PC',-1,1,'113',1
'Beach Access',0,35,1,15,1,-20,170,250,'PC',-1,1,'113',1
'Roadway',1103,35,1,15,1,119,139,153,'PC',-1,1,'113',1
'CONDOS 514213AG',3440808,85,9,15,1,150,170,200,'VC',-1,1,'113',1
'Roadway',2678,85,1,15,1,119,139,153,'PC',-1,1,'113',1
'STORES/OFF 514213011220',359628,80,2,15,1,142,162,192,'VC',-1,1,'114',1
'Roadway',2520,80,1,15,1,113,133,147,'PC',-1,1,'114',1
'Beach Access',0,32,1,15,1,-20,170,240,'PC',-1,1,'114',1
'Roadway',1008,32,1,15,1,110,130,144,'PC',-1,1,'114',1
'STORES/OFF 514213011340',295104,165,2,15,1,145,165,195,'VC',-1,1,'114',1
'Roadway',5198,165,1,15,1,110,130,144,'PC',-1,1,'114',1
'Beach Access',0,42,1,15,1,-20,155,250,'VC',-1,1,'114',1
'Roadway',1323,42,1,15,1,110,130,144,'PC',-1,1,'114',1
'STORES 514213011490',443796,78,2,15,1,140,160,188,'VC',-1,1,'114',1
'Roadway',2457,78,1,15,1,109,129,143,'PC',-1,1,'114',1
'STORES 514213011510',104412,49,1,15,1,140,160,185,'VC',-1,1,'114',1
'Roadway',1544,49,1,15,1,108,128,142,'PC',-1,1,'114',1
'MF 514213011520',45036,39,1,15,2,140,160,182,'VC',-1,1,'114',1
'Roadway',1229,39,1,15,1,105,125,139,'PC',-1,1,'114',1
'Beach Access',0,50,1,15,1,-20,160,240,'PC',-1,1,'114',1
'Roadway',1575,50,1,15,1,105,125,139,'PC',-1,1,'114',1
'CONDO 514213AB',8373120,160,13,3,3,145,165,200,'VC',-1,1,'114',1
'Roadway',5040,160,1,15,1,102,122,136,'PC',-1,1,'114',1
'Beach Access',0,30,1,15,1,-20,160,240,'PC',-1,1,'114',1
'Roadway',945,30,1,15,1,100,120,134,'PC',-1,1,'114',1
'STORES/OFF 514213011870',84228,80,2,15,1,140,160,194,'VC',-1,1,'114',1
'Roadway',2520,80,1,15,1,100,120,134,'PC',-1,1,'114',1
'STORES 514213011890',251424,80,2,15,1,140,160,234,'VC',-1,1,'114',1
'Roadway',2520,80,1,15,1,100,120,134,'PC',-1,1,'114',1
'Beach Access',0,40,1,15,1,-20,155,240,'PC',-1,1,'114',1
'Roadway',1260,40,1,15,1,100,120,134,'PC',-1,1,'114',1
'STORE/REST 514213012070',1000000,158,1,15,1,138,158,230,'VC',-1,1,'114',1
'Roadway',4977,158,1,15,1,100,120,134,'PC',-1,1,'114',1
'Beach Access',0,30,1,15,1,-20,155,240,'PC',-1,1,'114',1
'Roadway',945,30,1,15,1,98,118,132,'PC',-1,1,'114',1
'CONDOS 514213BG',3772560,688,7,1,1,175,200,320,'VC',-1,0,'115',1
'CONDOS 514213BD',8721924,125,14,1,1,152,200,320,'VC',-1,0,'115',1

'Beach Access',0,45,1,15,1,-20,150,230,'PC',-1,0,'115',1
'Sea Horse 514213CA',2374584,161,3,15,1,130,150,180,'VC',-1,1,'115',1
'Roadway',5072,161,1,15,1,106,126,140,'PC',-1,1,'115',1
'Beach Access',0,42,1,15,1,-20,155,240,'PC',-1,1,'115',1
'Roadway',1323,42,1,15,1,105,125,139,'PC',-1,1,'115',1
'MF 514213012460',392256,79,2,15,1,135,155,216,'VC',-1,1,'116',1
'Roadway',2489,79,1,15,1,107,127,141,'PC',-1,1,'116',1
'COOP 514213NP',744552,85,3,15,1,145,165,185,'VC',-1,1,'116',1
'Roadway',2678,85,1,15,1,108,128,142,'PC',-1,1,'116',1
'Beach Access',0,40,1,15,1,-20,155,235,'PC',-1,1,'116',1
'Roadway',1260,40,1,15,1,109,129,143,'PC',-1,1,'116',1
'CONDOS 514213AK',1390728,159,3,15,1,135,155,185,'VC',-1,1,'116',1
'Roadway',5009,159,1,15,1,109,129,143,'PC',-1,1,'116',1
'Beach Access',0,40,1,15,1,-20,154,240,'PC',-1,1,'116',1
'Roadway',1260,40,1,15,1,109,129,143,'PC',-1,1,'116',1
'Vacant Lot',0,80,1,15,1,-20,155,240,'VC',-1,1,'116',1
'Roadway',2520,80,1,15,1,109,129,143,'PC',-1,1,'116',1
'SF 514213012880',28884,40,1,15,1,168,188,210,'VC',-1,1,'116',1
'Roadway',1260,40,1,15,1,109,129,143,'PC',-1,1,'116',1
'MF 514213012890',30636,35,2,15,1,145,165,188,'VC',-1,1,'116',1
'Roadway',1103,35,1,15,1,109,129,143,'PC',-1,1,'116',1
'Beach Access',0,50,1,15,1,-20,140,230,'PC',-1,1,'116',1
'Roadway',1575,50,1,15,1,100,120,134,'PC',-1,1,'116',1
'CONDOS 514213BH',4861560,158,7,15,1,130,150,234,'VC',-1,1,'116',1
'Roadway',4977,158,1,15,1,75,95,109,'PC',-1,1,'116',1
'Beach Access',0,35,1,15,1,-20,140,230,'PC',-1,1,'116',1
'Roadway',1103,35,1,15,1,75,95,109,'PC',-1,1,'116',1
'SF 514213013250',43272,35,1,15,1,120,140,170,'VC',-1,1,'117',1
'Roadway',1103,35,1,15,1,75,95,109,'PC',-1,1,'117',1
'SF 514213013260',23280,40,2,15,1,120,140,165,'VC',-1,1,'117',1
'Roadway',1260,40,1,15,1,75,95,109,'PC',-1,1,'117',1
'SF 514213013270',89088,25,2,15,1,135,155,175,'VC',-1,1,'117',1
'Roadway',788,25,1,15,1,75,95,109,'PC',-1,1,'117',1
'SF 514312013271',85932,40,2,15,1,132,152,175,'VC',-1,1,'117',1
'Roadway',1260,40,1,15,1,75,95,109,'PC',-1,1,'117',1
'SF 514213013280',82776,20,3,15,1,160,180,170,'VC',-1,1,'117',1
'Roadway',630,20,1,15,1,75,95,109,'PC',-1,1,'117',1
'Beach Access',0,38,1,15,1,-20,130,200,'PC',-1,1,'117',1
'Roadway',1197,38,1,15,1,75,95,109,'PC',-1,1,'117',1
'SF 514213013440',68616,38,2,15,1,112,132,161,'VC',-1,1,'117',1
'Roadway',1197,38,1,15,1,75,95,109,'PC',-1,1,'117',1
'Vacant Lot',0,40,1,15,1,-20,125,200,'VC',-1,1,'117',1
'Roadway',1260,40,1,15,1,75,95,109,'PC',-1,1,'117',1
'SF 514213013460',114232,78,2,15,1,102,122,168,'VC',-1,1,'117',1
'Roadway',2457,78,1,15,1,75,95,109,'PC',-1,1,'117',1
'Beach Access',0,28,1,15,1,-20,120,200,'PC',-1,1,'117',1

'Roadway',882,28,1,15,1,75,95,109,'PC',-1,1,'117',1
'COOP 514213NR',2846400,165,6,3,3,120,120,160,'VC',-1,1,'117',1
'Roadway',5198,165,1,15,1,75,95,109,'PC',-1,1,'117',1
'PARKING LOT',108000,1165,1,15,1,90,110,150,'VC',-1,0,'117',1
'CASA LA PLAYA 514224CR',716292,178,2,1,1,92,92,148,'VC',-1,0,'118',1
'Beach Access',0,30,1,15,1,-20,95,195,'PC',-1,0,'118',1
'COOP 514224NP',2333424,128,2,13,13,93,110,152,'VC',-1,0,'118',1
'Vacant Lot',0,45,1,15,1,-20,95,195,'VC',-1,0,'118',1
'Beach Access',0,38,1,15,1,-20,100,200,'PC',-1,0,'118',1
'CONDOS 514224CA',2754312,74,3,1,1,94,100,145,'VC',-1,0,'118',1
'MF 514224020190',161292,87,2,1,1,86,100,151,'VC',-1,0,'119',1
'Beach Access',0,25,1,15,1,-20,100,200,'PC',-1,0,'119',1
'PARKING LOT',1800,80,1,1,1,96,100,160,'VC',-1,0,'119',1
'SHORE VIEW 514224020230',369600,85,2,1,1,96,100,155,'VC',-1,0,'119',1
'Beach Access',0,30,1,15,1,-20,100,205,'PC',-1,0,'119',1
'COOP 514224NR',2406132,165,4,1,1,102,105,160,'VC',-1,0,'119',1
'Beach Access',0,40,1,15,1,-20,110,220,'PC',-1,0,'119',1
'MF 514224020360',310428,81,3,1,1,102,110,170,'VC',-1,0,'119',1
'MF 514224020350',163224,85,2,1,1,110,115,171,'VC',-1,0,'119',1
'Beach Access',0,28,1,15,1,-20,105,220,'PC',-1,0,'119',1
'CONDOS 514224BG',6789024,174,7,1,1,110,110,180,'VC',-1,0,'120',1
'Beach Access',0,21,1,15,1,-20,110,225,'PC',-1,0,'120',1
'MF 514224020460',226596,95,2,1,1,112,115,180,'VC',-1,0,'120',1
'MF 514224020450',169980,85,2,1,1,112,118,170,'VC',-1,0,'120',1
'Beach Access',0,35,1,15,1,-20,111,230,'PC',-1,0,'120',1
'FOX GLOVE 514224029999',29600,80,1,3,3,106,110,168,'VC',-1,1,'120',1
'514224BH',7149662,80,28,15,15,270,290,350,'VC',-1,1,'120',1
'CONDOS 514224BH',7399662,395,28,3,3,123,162,228,'VC',-1,1,'120',1
'SAME CONDOS BLDG #2',7149662,395,28,15,15,362,382,462,'VC',-1,1,'120',1
'RESTROOM 514224020640',25000,90,1,3,3,119,120,148,'PC',-1,0,'120',1
'Beach Access',0,45,1,15,1,-20,190,300,'PC',-1,0,'120',1
'PRESIDENTIAL 514224010400',20188188,352,16,3,3,68,68,290,'VC',-1,0,'120',1
'HOLIDAY INN 514224010401',8019804,245,5,3,3,39,55,260,'VC',-1,0,'120',1
'CONDOS BLDG #1 514224BB',16860902,250,18,1,1,25,45,170,'VC',-1,1,'121',1
'BUILDING #2',16610902,250,18,15,15,285,305,418,'VC',-1,1,'121',1
'PARKING LOT',79650,120,1,1,1,30,28,170,'VC',-1,0,'121',1
'AQUARIUS 514224010420',14732190,238,15,2,2,32,35,320,'VC',-1,0,'121',1
'OCEAN VIEW 514224010430',4382364,240,5,1,1,36,35,215,'VC',-1,0,'121',1
'ALEXANDER 514224010450',14287800,281,15,1,1,39,35,285,'VC',-1,0,'121',1
'NEW CON. 514224010480',22000000,925,18,2,2,45,82,441,'VC',-1,0,'122',1
'SEA AIR T 514226010010',22845200,210,16,3,3,63,85,285,'VC',-1,0,'123',1
'MF 514226000020',13914542,220,15,15,15,170,190,350,'VC',-1,1,'123',1
'PARKING LOT',79650,220,1,2,2,70,75,221,'VC',-1,1,'123',1
'POOL',250000,220,1,2,2,55,120,121,'VC',-1,0,'123',1
'PARKING LOT ABOVE',79650,105,1,2,2,50,60,195,'VC',-1,0,'123',1
'MF 514226000030',13706378,105,15,2,2,50,170,335,'VC',-1,0,'123',1

'POOL',250000,80,1,2,2,50,72,73,'VC',-1,0,'123',1
'Vacant Lot 514226010180',0,65,1,2,2,50,50,200,'VC',-1,0,'123',1
'INDIGO 514226010130',339564,150,2,15,15,52,72,135,'VC',-1,1,'124',1
'POOL',150000,150,1,1,1,71,78,79,'VC',-1,1,'124',1
'PUBLIC BEACH 514226010170',11880,504,1,15,1,20,40,150,'PN',-1,0,'124',1
'CITY BEACH',0,1077,1,15,15,-20,0,300,'PN',-1,0,'124',1
'LE MER 514226CB',18102672,188,22,1,1,0,55,130,'VC',-1,0,'125',1
'LE MER 514226BC',14473210,110,22,15,15,180,200,280,'VC',-1,1,'125',1
'POOL',250000,110,1,1,1,0,30,31,'VC',-1,1,'125',1
'PARKING LOT',29363,120,1,2,2,0,10,165,'VC',-1,0,'125',1
'TENNIS COURT 514226CJ',150000,78,1,2,2,0,5,70,'VC',-1,1,'125',1
'514224CJ',11363920,78,20,2,2,0,150,220,'VC',-1,1,'125',1
'POOL 514226CJ',250000,95,1,2,2,0,10,11,'VC',-1,1,'125',1
'MALAYA 514226CJ',11363920,95,20,15,15,133,153,400,'VC',-1,1,'125',1
'BILTMORE MANSION 514226HB',3842412,128,4,15,1,2,22,240,'VC',-1,0,'126',1
'TAROMINA 514226NV',4532264,95,4,1,1,0,70,262,'VC',-1,0,'126',1
'POOL',100000,55,1,1,1,0,5,6,'VC',-1,0,'126',1
'PARKING LOT',43312,65,1,1,1,0,15,270,'VC',-1,0,'126',1
'THE HEMISPHERES #1 514226BH',30717289,92,23,1,1,11,65,205,'VC',-1,0,'126',1
'POOL',250000,139,1,2,2,0,5,6,'VC',-1,0,'126',1
'BLDG',5000000,168,1,2,2,0,5,95,'VC',-1,0,'126',1
'PARKING LOT',85950,175,1,2,2,0,55,140,'VC',-1,1,'126',1
'THE HEMISPHERES #2 514226BH',30717289,175,23,15,15,220,240,400,'VC',-
1,1,'127',1
'REGENCY 514226GH',2130480,111,3,1,1,0,20,130,'VC',-1,0,'127',1
'CONDOS 514226BE',49398695,299,22,15,15,170,190,315,'VC',-1,1,'127',1
'PLOT & POOL',279925,299,1,2,2,2,5,6,'VC',-1,1,'127',1
'HOTEL 514226020220',581796,95,2,3,3,44,68,512,'VC',-1,0,'127',1
'HOTEL 514226020350',567156,175,2,15,15,95,115,520,'VC',-1,1,'127',1
'POOL',250000,175,1,1,1,35,35,36,'VC',-1,1,'127',1
'COOP 514226NW',4382264,140,8,15,15,42,62,260,'VC',-1,1,'127',1
'POOL',250000,140,1,2,2,0,0,1,'VC',-1,1,'127',1
'PARKING LOT 514226DC',22950,175,1,2,2,0,15,115,'VC',-1,1,'127',1
'CONDO 514226DC',21275594,175,25,15,15,150,170,275,'VC',-1,1,'127',1
'POOL ',250000,175,1,2,2,0,35,36,'VC',-1,1,'127',1
'CONDO 514226DA',27371471,225,16,15,15,80,100,225,'VC',-1,1,'128',1
'PARKING LOT',113125,225,1,2,2,0,0,120,'VC',-1,1,'128',1
'POOL',250000,125,1,2,2,0,90,91,'VC',-1,0,'128',1

SUB-APPENDIX D-2

Example of Segment III
Storm Damage Model Input Files

John U. Lloyd Reach Evaluation
(South Jetty to R-94)

John U. Lloyd Jetty to R-94 .rsk File

"Uncertainties Broward County Segment III - JUL reach"
8.0,"Shorelien position sd"
.100,"Armor cost uncertainty at 95% confidence limit"
.100,"structure value cost uncertainty"
1.0,"sd of setback distance"
.22,"sd of backfill cost per ft^3"
8,"# return periods"
16
14.9
13.4
10.7
9.9
9.9
10
2
1,39,65
2,43.9,73.1
3,48.8,81.3
4,0,0
5,0,0
6,0,0
7,0,0
8,0,0
9,5000,5000
10,5000,5000
11,0,0
12,0,0
13,43.9,73.1
14,0,0
15,0,0
16,0,0
9999,9999,9999

Broward Segment 3, JUL Reach 86-88 - Without Project Condition
2002,25
-10.00
56 66 76 86 96
96 106 116 126 136
136 146 156 166 176
176 186 196 206 216
216 226 236 246 256
8
.00,187
.01,171
.02,148
.05,103
.10,65
.20,52
.50,41
1.0,26.5
16
'CSP-SMALL CAPPED ' 625 52 1 1.00 1
'CSP-MEDIUM CAPPED ' 750 58.5 1 1.00 2
'CSP-LARGE CAPPED ' 850 65 1 1.00 3
'CSP-SMALL CAPPED W/TOE ' 0 0 1 1.00 4
'CSP-MEDIUM CAPPED W/TOE '0 0 1 1.00 5
'CSP-LARGE CAPPED W/TOE ' 0 0 1 1.00 6
'ROCK REVETMENT-SMALL ' 0 0 1 1.00 7
'ROCK REVETMENT-LARGE ' 0 0 1 1.00 8
'Navy facility w/ Project ' 0 5000 1 1.00 9
'DUMMY ' 0 0 0 0.00 10
'DUMMY ' 0 0 0 0.00 11
'DUMMY ' 0 0 0 0.00 12
'RUBBLE - SMALL ' 200 58.5 0 0.65 13
'RUBBLE - LARGE ' 0 0 0 1.00 14

'DO NOTHING ' 0 0 0 0.00 15

'ROCK REVETMENT-MEDIUM ' 0 0 0 0.00 16
1.33
'Radar Station ',2125000,350,1,1,1,29,30,60,'PN',-1,0,'86',1
'Boardwalk',212000,190,1,15,15,130,150,155,'PN',-1,0,'86',1
'B-room',24000,90,1,15,15,160,180,210,'PN',-1,0,'86',1
'Vacant Lot',0,670,1,15,15,-20,130,250,'PN',-1,0,'86',1
'Parking Lot',83025,282,1,15,15,175,195,305,'PN',-1,0,'87',1
'B-room',24000,113,1,15,15,170,190,230,'PN',-1,1,'87',1
'Parking Lot',45765,113,1,15,15,290,310,400,'PN',-1,1,'87',1
'Parking Lot',153900,380,1,15,15,215,235,340,'PN',-1,0,'88',1
'Vacant Lot',0,355,1,15,15,-20,100,200,'PN',-1,0,'88',1

'B-room',24000,95,1,15,15,160,180,215,'PN',-1,0,'88',1
'Vacant Lot',0,340,1,15,15,-20,100,200,'PN',-1,0,'88',1

R86-R94 Broward Segment 3 - 86-88 with project condition
2002,25
-10.00
56 66 76 86 96
96 106 116 126 136
136 146 156 166 176
176 186 196 206 216
216 226 236 246 256
8
.00,187
.01,171
.02,148
.05,103
.10,65
.20,52
.50,41
1.0,26.5
16
'CSP-SMALL CAPPED ' 625 52 1 1.00 1
'CSP-MEDIUM CAPPED ' 750 58.5 1 1.00 2
'CSP-LARGE CAPPED ' 850 65 1 1.00 3
'CSP-SMALL CAPPED W/TOE ' 0 0 1 1.00 4
'CSP-MEDIUM CAPPED W/TOE '0 0 1 1.00 5
'CSP-LARGE CAPPED W/TOE ' 0 0 1 1.00 6
'ROCK REVETMENT-SMALL ' 0 0 1 1.00 7
'ROCK REVETMENT-LARGE ' 0 0 1 1.00 8
'Navy facility w/ Project ' 0 5000 1 1.00 9
'DUMMY ' 0 0 0 0.00 10
'DUMMY ' 0 0 0 0.00 11
'DUMMY ' 0 0 0 0.00 12
'RUBBLE - SMALL ' 200 58.5 0 0.65 13
'RUBBLE - LARGE ' 0 0 0 1.00 14

'DO NOTHING ' 0 0 0 0.00 15

'ROCK REVETMENT-MEDIUM ' 0 0 0 0.00 16
1.33
'Radar Station ',2125000,350,1,9,9,29,30,60,'PN',-1,0,'86',1
'Boardwalk',212000,190,1,15,15,130,150,155,'PN',-1,0,'86',1
'B-room',24000,90,1,15,15,160,180,210,'PN',-1,0,'86',1
'Vacant Lot',0,670,1,15,15,-20,130,250,'PN',-1,0,'86',1
'Parking Lot',83025,282,1,15,15,175,195,305,'PN',-1,0,'87',1
'B-room',24000,113,1,15,15,170,190,230,'PN',-1,1,'87',1
'Parking Lot',45765,113,1,15,15,290,310,400,'PN',-1,1,'87',1
'Parking Lot',153900,380,1,15,15,215,235,340,'PN',-1,0,'88',1
'Vacant Lot',0,355,1,15,15,-20,100,200,'PN',-1,0,'88',1

'B-room',24000,95,1,15,15,160,180,215,'PN',-1,0,'88',1
'Vacant Lot',0,340,1,15,15,-20,100,200,'PN',-1,0,'88',1

Broward Segment 3, JUL Reach - 89-94 Without&without Project Condition
2002,25
-10.00
0 10 20 30 40
50 60 70 80 90
100 110 120 130 140
150 160 170 180 190
200 210 220 230 240
8
.00,187
.01,171
.02,148
.05,103
.10,65
.20,52
.50,41
1.0,26.5
16
'CSP-SMALL CAPPED ' 625 52 1 1.00 1
'CSP-MEDIUM CAPPED ' 750 58.5 1 1.00 2
'CSP-LARGE CAPPED ' 850 65 1 1.00 3
'CSP-SMALL CAPPED W/TOE ' 0 0 1 1.00 4
'CSP-MEDIUM CAPPED W/TOE '0 0 1 1.00 5
'CSP-LARGE CAPPED W/TOE ' 0 0 1 1.00 6
'ROCK REVETMENT-SMALL ' 0 0 1 1.00 7
'ROCK REVETMENT-LARGE ' 0 0 1 1.00 8
'Navy facility w/ Project ' 0 5000 1 1.00 9
'DUMMY ' 0 0 0 0.00 10
'DUMMY ' 0 0 0 0.00 11
'DUMMY ' 0 0 0 0.00 12
'RUBBLE - SMALL ' 200 58.5 0 0.65 13
'RUBBLE - LARGE ' 0 0 0 1.00 14

'DO NOTHING ' 0 0 0 0.00 15

'ROCK REVETMENT-MEDIUM ' 0 0 0 0.00 16
1.33
'B-room',24000,90,1,15,15,135,155,190,'PN',-1,0,'89',1
'Vacant Lot',0,450,1,15,15,-20,0,200,'PN',-1,0,'89',1
'B-room',24000,150,1,15,15,120,140,160,'PN',-1,0,'89',1
'Vacant Lot',0,3492,1,15,15,-20,0,150,'PN',-1,0,'92',1

SUB-APPENDIX D-3

Details of Recreation Benefit Analysis for
John U. Lloyd Reach Evaluation
(South Jetty to R-94)

JUL Avg. Annual Recreational Benefits

Interest Rate:	6.125%	
Project Life (yrs):	24	
Capital Recovery Factor		0.080601712

Year	Visits Attributable to Project	Benefit ($)	Present Valuation ($)
1	**0**	0	0
2	36,950	143,000	127,000
3	73,901	286,000	239,300
4	110,851	429,000	338,200
5	147,801	572,000	424,900
6	**184,752**	715,000	500,500
7	239,136	925,500	610,500
8	293,520	1,135,900	706,000
9	347,903	1,346,400	788,500
10	402,287	1,556,900	859,200
11	456,671	1,767,300	919,000
12	511,055	1,977,800	969,100
13	565,439	2,188,200	1,010,300
14	619,823	2,398,700	1,043,600
15	674,207	2,609,200	1,069,700
16	**728,591**	2,819,600	1,089,200
17	737,362	2,853,600	1,038,700
18	746,134	2,887,500	990,400
19	754,905	2,921,500	944,200
20	763,677	2,955,400	900,000
21	772,448	2,989,400	857,900
22	781,220	3,023,300	817,500
23	789,991	3,057,300	779,000
24	798,763	3,091,200	742,200
	TOTAL	24-yr	17,764,900
	Annual Equivalent Benefit		$ 1,431,900

SUB-APPENDIX D-4

Example of Segment III
Storm Damage Model Input Files
(Project Modification between R-94 and R-101)

Dania R-94 to R-101 .rsk File

"Uncertainties Broward COunty Segment III - Daina reach"
3.0,"Shorelien position sd"
.100,"Armor cost uncertainty at 95% confidence limit"
.100,"structure value cost uncertainty"
1.0,"sd of setback distance"
.22,"sd of backfill cost per ft^3"
8,"# of storm probablilties"
13
12.5
11.9
11.9
11.4
11.6
12.1
3
1,46.1,76.9
2,50.3,83.8
3,54.4,90.6
4,0,0
5,0,0
6,0,0
7,0,0
8,0,0
9,0,0
10,0,0
11,0,0
12,0,0
13,46.1,76.9
14,0,0
15,0,0
16,0,0
9999,9999,9999

Dania: Broward Segment 3 Input File
2001, 25
-4
0 4 8 12 16
20 24 28 32 36
40 44 48 52 56
60 64 68 72 76
80 84 88 92 96
8
0 182
0.01 165.7
0.02 138.5
0.05 96.5
0.1 72.5
0.2 61.5
0.5 49.8
1 29.8
16
'CSP-SMALL CAPPED ' 625 61.5 1 1.00 1
'CSP-MEDIUM CAPPED ' 750 67 1 1.00 2
'CSP-LARGE CAPPED ' 850 72.5 1 1.00 3
'CSP-SMALL CAPPED W/TOE ' 0 0 1 1.00 4
'CSP-MEDIUM CAPPED W/TOE ' 0 0 1 1.00 5
'CSP-LARGE CAPPED W/TOE ' 0 0 1 1.00 6
'ROCK REVETMENT-SMALL ' 0 0 1 1.00 7
'ROCK REVETMENT-LARGE ' 0 0 1 1.00 8
'DUMMY ' 0 0 0 0.00 9
'DUMMY ' 0 0 0 0.00 10
'DUMMY ' 0 0 0 0.00 11
'DUMMY ' 0 0 0 0.00 12
'RUBBLE - SMALL ' 200 61.5 0 0.65 13
'RUBBLE - LARGE ' 0 0 0 1.00 14

'DO NOTHING ' 0 0 0 0.00 15

'ROCK REVETMENT-MEDIUM ' 0 0 0 0.00 16

1.33
'Pier',0,150,1,15,15,20,40,55,'PN',-1,0,'98',1
'Parking Lot',135450,430,1,15,15,80,100,165,'PN',-1,0,'98',1
'Building',24000,50,1,15,15,50,70,85,'PN',-1,1,'98',1
'parking Lot',14063,50,1,15,15,90,110,175,'PN',-1,1,'98',1
'Parking Lot',146250,500,1,15,15,90,110,175,'PN',-1,0,'99',1
'Building',24000,65,1,15,15,30,50,65,'PN',-1,1,'99',1
'Parking Lot',19012,65,1,15,15,95,115,180,'PN',-1,1,'99',1
'Building',24000,80,1,15,15,65,85,110,'PN',-1,1,'99',1

'Parking Lot',11700,80,1,15,15,115,135,175,'PN',-1,1,'99',1
'Parking Lot',75938,760,1,15,15,65,85,130,'PN',-1,1,'100',1
'SeaTech',1300000,760,2,15,1,160,180,210,'VC',-1,1,'100',1
'New Construction',20000000,610,16,15,15,95,115,225,'VC',-1,0,'100',1