VOLUME I

WALTON COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION

GENERAL INVESTIGATIONS STUDY
DRAFT REPORT

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Mobile District

WALTON COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION

GENERAL INVESTIGATIONS STUDY

TABLE OF CONTENTS

TITLE	PAGE NUMBER
1.0 INTRODUCTION	**1**
1.1 GENERAL	1
1.2 STUDY AUTHORITY	1
1.3 NON-FEDERAL SPONSOR	2
1.4 PURPOSE AND SCOPE OF STUDY	2
1.5 DESCRIPTION OF STUDY AREA	2
1.6 BACKGROUND	4
1.7 PREVIOUS STUDIES AND REPORTS	4
1.8 EXISTING WATER RESOURCES PROJECTS	4
1.9 PLANNING PROCESS	5
2.0 PROBLEMS AND OPPORTUNITIES	**6**
2.1 PROBLEMS	6
2.2 OPPORTUNITIES	7
2.3 PLANNING GOALS AND OBJECTIVES	7
2.4 ASSUMPTIONS	8
2.5 CONSTRAINTS	9
3.0 INVENTORYING AND FORECASTING RESOURCES	**10**
3.1 STUDY METHODOLOGY	10
3.1.1 Evaluation Framework	10
3.1.2 Beach-fx The Hurricane and Storm Damage Simulation Model	10
3.1.3 Engineering	11
3.1.3.1 Representative Profiles	11
3.1.4 Storm Set	12
3.1.4.1 Storm-Induced Beach Change Model (SBEACH)	13
3.1.4.2 Generalized Model For Simulating Shoreline Change (GENESIS)	13
3.1.5 Shoreline Response Database (SRD)	13
3.2 EXISTING CONDITIONS	14
3.2.1 Demographics	14
3.2.2 Population	14
3.2.3 Employment	14
3.2.4 Households	15
3.2.5 Study Reaches	15
3.2.6 Study Reaches and Hierarchy and Naming	17

WALTON COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION

GENERAL INVESTIGATIONS STUDY

TABLE OF CONTENTS (CONTINUED)

TITLE	PAGE NUMBER
3.2.7 Public Access and Parking	21
3.2.8 Land Use	28
3.2.8.1 State Parks	28
3.2.9 Future Development	29
3.2.10 Property Inventory	29
3.2.11 Value of Coastal Inventory	30
3.2.11.1 Structure Value	30
3.2.11.2 Content Value – Structure-Content Ratio	31
3.3 ECONOMIC BENEFIT EVALUATION	32
3.3.1 Assumptions	32
3.3.2 Storm Damage Reduction	32
3.3.3 Damage Functions	32
3.3.4 Damage Element	33
3.3.5 Damage Estimation	34
3.3.6 Structure and Content Damages	34
3.3.7 Inundation Damages	34
3.3.8 Lost Land Reduction	34
3.3.9 Loss of Land Benefit	34
3.3.10 Emergency Nourishment Cost	35
3.3.11 Storm Induced and Long-Term Erosion Damages	36
3.3.12 Wave Attack Damages	36
3.3.13 Emergency Nourishment	36
3.3.14 Rebuilding	37
3.3.15 Combining Damages – Composite Damage Function	37
3.3.16 Recreation Benefits	38
3.4 ENVIRONMENTAL	38
3.4.1 Environmental Considerations	38
3.4.1.1 Coastal and Marine Resources	41
3.4.1.2 Threatened and Endangered Species	43
3.4.1.3 Critical Habitats	44
3.4.1.4 Essential Fish Habitat (EFH)	44
3.4.1.5 Cultural Resources	44
3.4.1.6 Hazardous Materials	45
3.4.1.7 Sediment Compatibility	45
3.4.1.8 Environmental Mitigation	46
3.4.1.9 Borrow Area Environmental Impacts	46

WALTON COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION

GENERAL INVESTIGATIONS STUDY

TABLE OF CONTENTS (CONTINUED)

TITLE	PAGE NUMBER
3.4.1.10 Environmental Compliance, Coordination, and Agency Views	46
3.4.2 Status of Environmental Compliance Actions, Coordination, and Documentation	47
3.4.2.1 Water Quality Certification (WQC) Coordination	48
3.4.2.2 Endangered and Threatened Species	48
3.4.2.3 Fish and Wildlife Coordination Act (FWCA)	50
3.4.2.4 Essential Fish Habitat (EFH)	50
3.4.2.5 Coastal Barrier Resources Act (CBRA)	50
3.4.2.6 Cultural Resources	51
3.4.2.7 National Environmental Policy Act (NEPA) Documentation	52
3.5 FUTURE WITHOUT PROJECT CONDITION	54
3.5.1 General	54
3.5.2 Damages	54
4.0 FORMULATING ALTERNATIVE PLANS	**56**
4.1 DEVELOPING MEASURES	56
4.2 EVALUATING MEASURES	56
4.3 SCREENING MEASURES	57
4.3.1 Screening Criteria	57
4.3.2 Measures Screened	59
4.3.2.1 Non-Structural Measures	59
4.3.2.2 Structural Measures	59
4.4 DEVELOPING ALTERNATIVE PLANS	60
4.4.1 Acquisition Alternative	60
4.4.2 Beach Fill Alternatives	61
4.4.2.1 Berm Width Optimization Alternatives	61
4.4.3 Reformulating Beach Fill Alternatives	62
4.4.3.1 Refining Berm Width Optimization	62
4.4.3.2 Formulation of Construction Reaches	63
4.4.3.3 Berm Width Optimization by Construction Reach	63
4.4.3.4 The Optimized Berm Width Alternative	64
4.4.4 Evaluating Beach Fill Alternatives	65
4.4.4.1 Optimized Dune Width Alternatives	65
4.4.4.2 Constructible Dune Width Alternative	69

WALTON COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION

GENERAL INVESTIGATIONS STUDY

TABLE OF CONTENTS (CONTINUED)

TITLE	PAGE NUMBER
5.0 COMPARING ALTERNATIVE PLANS	**70**
5.1 NO ACTION PLAN	70
5.2 NON-STRUCTURAL ACQUISITION	70
5.3 NATIONAL ECONOMIC DEVELOPMENT (NED) PLAN	71
5.3.1 General	71
5.3.2 Periodic Nourishment – NED Plan	71
5.3.2.1 Comparison With Other Renourishment Projects	72
5.3.3 Benefit Analysis – NED Plan	73
5.3.4 NED Plan Costs and Benefits	78
5.4 LOCALLY PREFERRED PLAN (LPP)	79
5.4.1 General	79
5.4.2 Periodic Nourishment – Locally Preferred Plan	83
5.4.3 Summary Benefit Analysis – Locally Preferred Plan	85
5.4.4 Locally Preferred Plan Costs and Benefits	88
5.5 SYSTEM OF ACCOUNTS	89
6.0 SELECTING A PLAN	**95**
6.1 PLAN DETAILS	95
6.1.1 NED and TSP Plan For Construction With Renourishments	95
6.2 COST SHARE	95
6.3 RESIDUAL DAMAGES	118
6.4 RISK AND UNCERTAINTY	120
6.4.1 Residual Risks	121
6.4.2 Risk and Uncertainly in Relative Sea Level Rise Assumptions	121
6.4.3 Risk and Uncertainly in the Storm Climate Assumptions	121
6.4.4 Risk and Uncertainly in Project Reliability	123
6.4.5 Risk to Life and Safety	123
6.5 VALUE ENGINEERING	124
7.0 TENTATIVE RECOMMENDATION	125

LIST OF TABLES

TABLE NO.	DESCRIPTION	
1	Initial Major Study Reaches	16
2	Revised Major Study Reaches	16
3	Walton County Study Area – Reaches, Sub-Reaches, and Representative Profiles	19
4	Walton County Access and Parking	22

WALTON COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION

GENERAL INVESTIGATIONS STUDY

TABLE OF CONTENTS (CONTINUED)

LIST OF TABLES (CONTINUED)

TABLE NO.	DESCRIPTION	PAGE NUMBER
5	Structure Inventory Count By Reach By Type	30
6	Value of Walton County Structure and Content Value By Reach (Dollars in Millions)	32
6A	Status of Agency Coordinations and Consultations	53
7	Without Project Damages Average Values – Per 53- Year Iteration (Except Average Annual Values)	55
7A	Average Annual Without Project Structure and Content Damages By Type	55
8	Initial Screening Matrix	58
8A	Objective-Measures Success Assessment Matrix	58
9	Berm Width Optimization Alternatives and Specifications	62
10	Walton County Construction Reaches	63
11	Zero, MiniMin and Minimum Design Alternatives	64
12	Walton County Construction Reaches Berm Width Optimization	64
13	MiniMin and Minimum and Optimized Berm Width Alternatives	65
14	Dune Width Optimization	66
15	Optimum Added Dune Width – Representative Profile	71
16	NED Plan Periodic Nourishment Summary Statistics (Volumes in Cubic Yards)	73
17	NED Plan Periodic Nourishment Confidence Intervals (Volumes in Cubic Yards)	73
18	Nourishment Frequency Distribution 100 Possible Future Realizations	73
19	Walton County – National Economic Development Plan HSDR Benefits	74
20	Summary Benefits NED Plan Walton County, Florida - Feasibility	79
21	Locally Preferred Plan Added Reaches R1-1 To R1-10 and R1-17 To R1-24	80
22	Locally Preferred Plan Periodic Nourishment Summary Statistics (Volumes in Cubic Yards)	84
23	Locally Preferred Plan Periodic Nourishment Confidence Intervals (Volumes in Cubic Yards)	84

WALTON COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION

GENERAL INVESTIGATIONS STUDY

TABLE OF CONTENTS (CONTINUED)

LIST OF TABLES (CONTINUED)

TABLE NO.	DESCRIPTION	PAGE NUMBER
24	Renourishment Frequency Distribution 100 Possible Future Realizations	84
25	Walton County – Locally Preferred Plan Benefits	85
26	Summary Benefits LPP Plan Walton County, Florida - Feasibility	89
27	System of Accounts	90
28	Cost Share Federal and Non-Federal	98
29	Tentatively Selected Plan Cost Share Federal and Non-Federal	103
30	NED and TSP – Costs and Cost Share	108
30A	Ned And TSP Average Annual Equivalent Costs And Cost Share	108
31	Parking – Access – Cost Sharing Qualifying	109
32	Average Annual Residual Damages – By Reach Tentatively Selected Plan	118
33	Summary Benefits – TSP Walton County, Florida – Feasibility	125

LIST OF FIGURES

FIGURE NO.	DESCRIPTION	
1	Walton County Location Map	3
2A	High Bluffs Western Walton County	3
2B	Coastal Dune Lake	3
3	Beach-*fx* Simplified Beach Profile	11
4	Characterization of a Representative Profile With Damage Elements in Beach-*fx*	12
5	Counties of Interest	15
6	Revised Study Reaches	17
7A	Aerial Showing Parking and Access Points	25
7B	Aerial Showing Parking and Access Points	26
7C	Aerial Showing Parking and Access Points	27
8	Approximate Locations Coastal Dune Lakes Throughout Walton County	42
9	Beach Profile Showing Varying Width of Berm	62
10	Typical Project Sections to be Constructed	97
11A	Construction and Study Reaches	126
11B	Construction and Study Reaches	127
11C	Construction and Study Reaches	128

WALTON COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION

GENERAL INVESTIGATIONS STUDY

TABLE OF CONTENTS (CONTINUED)

LIST OF PLATES

PLATES 1 - 11 PHOTOS OF PRE-IVAN, POST-IVAN, AND POST DENNIS

LIST OF APPENDIXES

APPENDIX A ENGINEERING DESIGN
APPENDIX B ECONOMIC INVESTIGATIONS
APPENDIX C REAL ESTATE PLAN

WALTON COUNTY, FLORIDA
HURRICANE AND STORM DAMAGE REDUCTION

GENERAL INVESTIGATIONS STUDY

1.0 INTRODUCTION

1.1 GENERAL

This report presents the results of an investigation that has been conducted to analyze and formulate a hurricane and storm damage reduction project for Walton County, Florida. Since 1990, several coastal storms have eroded the coastline of Walton County resulting in recession of the protective beach and dune system.

1.2 STUDY AUTHORITY

This study was authorized both within the United States Senate and the U.S. House of Representatives. In the Senate, the Committee on Environment and Public Works adopted a committee resolution (unnumbered) on July 25, 2002, which reads as follows:

> *"Resolved by the Committee on Environment and Public Works of the United States Senate, That in accordance with Section 110 of the Rivers and Harbors Act of 1962, the Secretary of the Army is requested to review the feasibility of providing beach nourishment, shore protection and related improvements in Walton County, Florida, in the interest of protecting and restoring the environmental resources on and behind the beach, including the feasibility of providing shoreline and erosion protection and related improvements consistent with the unique characteristics of the existing beach sand, and with consideration of the need to develop a comprehensive body of knowledge, information, and data on coastal area changes and processes as well as impacts from Federally constructed projects in the vicinity of Walton County, Florida.*

In the House, the Committee on Transportation and Infrastructure adopted a resolution, Docket 2690, dated July 24, 2002, which reads as follows:

"Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, That in accordance with Section 110 of the Rivers and Harbors Act of 1962, the Secretary of the Army is requested to review the feasibility of providing beach nourishment, shore protection and environmental restoration and protection in the vicinity of Walton County, Florida.

1.3 NON-FEDERAL SPONSOR

The non-Federal sponsor is the Walton County Board of Commissioners. Their central point of contact is the Director of Beach Management for the Walton County Tourist Development Council (TDC). A Feasibility Cost Sharing Agreement was executed between the U.S. Army Corps of Engineers (Corps) and Walton County in December 2003, that defined the cost share responsibilities for conducting the feasibility study. The agreement provided that the feasibility costs would be shared 50/50 between the Corps and Walton County and that 50 percent of Walton County's share would be provided in cash with the remainder provided as in-kind services.

1.4 PURPOSE AND SCOPE OF STUDY

The purpose of this study is to assess the needs for hurricane and storm damage reduction and opportunities for environmental restoration and protection along the Gulf Coast of Walton County, Florida. The purpose of this report is to document the economic investigations, engineering analyses, and environmental considerations conducted to formulate a shore protection project for Walton County, Florida, which will reduce the damaging effects of hurricanes and severe storms to properties along the coast. The project will be constructible, acceptable to the public, environmentally sustainable and justified by an economic evaluation.

1.5 DESCRIPTION OF STUDY AREA

Walton County is located approximately 103 miles east of Pensacola, Florida and 98 miles west of Tallahassee, Florida, Figure 1. The beaches of Walton County encompass approximately 26 miles of shoreline extending from the City of Destin in Okaloosa County, Florida (about six miles to the east of East Pass) to the Walton/Bay County line near Phillips Inlet. The western two-thirds of Walton County are comprised of a coastal peninsula extending from the mainland, and the eastern third is comprised of mainland beaches. Choctawhatchee Bay lies north of the peninsula. Walton County includes 11.9 miles of state-designated critically eroding areas and three State of Florida park areas that cover approximately six miles of the 26-mile shoreline.

The Walton County shoreline is characterized by high dune elevations partly due to the presence of Pleistocene bluffs formed as a result of an exposed submarine berm formed during inundation of the Florida Peninsula during that geologic period. Primary dune elevations in Walton County range from 11.5 to 44.5 feet North American Vertical Datum, 1988 (NAVD88) and average 25.5 feet. Along the mid-section of Walton County, Bluff elevations exceed 60 feet in height, Figure 2A. Bluff erosion and undercutting occur in this area due to the interface of relatively low flat beaches and the bluff toe. An unusual attribute of the Walton County shoreline is the presence of coastal dune lakes. These lakes are rare worldwide and are almost exclusive to the Gulf Coast within the United States. The lakes are about five feet deep and intermittently breach the dune system and discharge directly into the Gulf of Mexico, Figure 2B.

Mild winters and warm hot summers characterize the project area, with an average in excess of 280 days a year of sunshine. The average daily temperature is 67 degrees

Fahrenheit and the average water temperature is about 70 degrees Fahrenheit. The months from June through November constitute the hurricane storm season, and this area is subject to tropical storm and strong hurricane conditions. The highest period of rainfall occurs during the storm season, with an average annual rainfall of 64 inches.

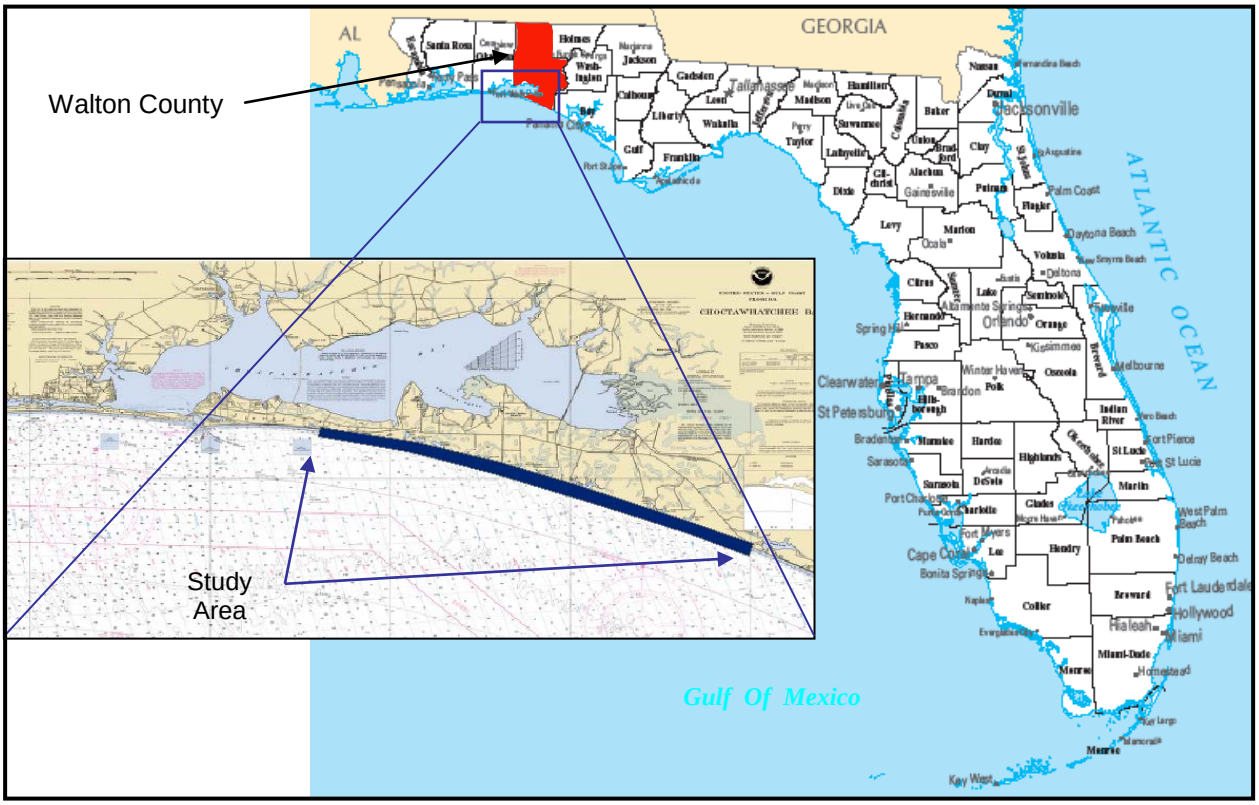


FIGURE 1. WALTON COUNTY LOCATION MAP

FIGURE 2A. HIGH BLUFFS WESTERN WALTON COUNTY

FIGURE 2B. COASTAL DUNE LAKE

1.6 BACKGROUND

Walton County's shoreline is receding and its protective dunes and high bluffs are being adversely impacted by hurricane and coastal storm forces. The impacts of these storms to property and infrastructure are considerable and can possibly be reduced through a beach restoration and stabilization project. Behind the dune system, upland drainage feeds several freshwater lakes that intermittently breach the dune system and discharge directly into the Gulf. Primary dune elevations range from 11.5 to 44.5 feet NAVD88 and average 25.5 feet National Geodetic Vertical Datum (NGVD).

During the late 1990s, the area endured several strong hurricanes resulting in extensive shoreline erosion (Taylor Engineering, 2003). In 2004 the area was affected severely by Hurricane Ivan (Sep 04) and early into the 2005 hurricane season it was impacted by Hurricanes Arlene (June 05) and Dennis (July 05). Photographs depicting the Walton County shoreline as well as structures are displayed in Plates 1 through 11 at the end of this report. Visual comparisons are shown for pre-Ivan, post-Ivan and Post Dennis.

1.7 PREVIOUS STUDIES AND REPORTS

Previous investigations and reports have been completed for the area. The most recent studies pertinent to the erosion problems at Walton County are summarized below:

(1) "State of the Beaches" of Walton County, Florida 2001, 2002, 2003, 2004, and 2005 Walton County Tourism Development Council. These reports present data, analysis, and recommendation for managing the Florida coastline. Specific emphasis is placed on determining trends in beach width and explaining the physical and coastal processes that cause the changes.

(2) Beach Management Feasibility Study for Walton County and Destin Florida, Taylor Engineering, Inc., April 2003. The purpose of this study was to determine the most technically feasible and financially acceptable alternatives for protecting 9.2 miles of "critically eroding shoreline." The feasibility study is a six-part study funded by Walton County.

1.8 EXISTING WATER RESOURCES PROJECTS

There are four existing Federal projects in or adjacent to Walton County. In Walton County and its neighboring counties of Okaloosa and Bay, there is the Gulf Intracoastal Waterway. The existing project, authorized by the River and Harbor Acts of 1942, 1943, and 1966, provides for a through waterway with minimum dimensions of 12 by 125 feet from Apalachee Bay, Florida, to the Mexican Border via coastal bays, sounds and lands cuts. The existing project from Carrabelle (east of Walton County) to the Rigolets, Louisiana was completed in 1957. Maintenance on the waterway is sporadic across its length but on an annual basis. In Walton County the waterway transits through Choctawhatchee Bay and a land cut to St. Andrew Bay on the east.

In neighboring Bay County there are three other existing projects:

a. Panama City Harbor, Florida. The existing project provides for an entrance channel 38 feet deep and 450 feet wide in the Gulf of Mexico, thence 38 feet deep and 300 feet wide across Lands Ends Peninsula to deep water in St. Andrew Bay, with a branch channel 36 feet deep and 300 feet wide, leading from the inner end of the main entrance channel westward to the Port Authority Terminal at Dyers Point. The entrance channel is protected by east and west jetties extending 2,075 feet and 2,896 feet, respectively. The existing project was completed in 2003. Suitable sands dredged from the entrance channel are bypassed to down drift beaches on a 24 – 36 month cycle. Prior to the recently completed modifications, the project provided for a 32-foot deep project which was begun in 1933 and completed in 1949.

b. Panama City Beaches, Florida. A hurricane and storm damage reduction project for 18.5 miles of the Panama City Beaches was authorized by the Water Resources Development Act of 1986. This project extends from Phillips Inlet near the Walton County line eastward to the Panama City Harbor entrance channel. The authorized plan consisted of a 7-foot elevation berm landward of the erosion control line with a 50-foot top width over approximately 16.8 miles of shoreline. Approximately 6.4 million cubic yards (cy) of sand was dredged from six borrow sites approximately 2000 feet offshore and from the Panama City Harbor entrance channel. Renourishment was estimated to be required at five-year intervals. A slightly modified plan was constructed by the Bay County Tourist Development Council between 1998 and 2000 under the authority of Section 203 of the Water Resources Development Act of 1996. Bay County was approved for reimbursement of the Federal share for the authorized project.

c. East Pass Channel, Florida. The existing East Pass Channel from the Gulf of Mexico into Choctawhatchee Bay, Florida, located east of Walton County, was authorized by the River and Harbor Act Of 1965 and consists of a channel 12 feet deep, 180 feet wide, and 1.5 miles long from the Gulf into the bay via East Pass and a spur channel six feet deep and 100 feet wide from the main channel into Old Pass Lagoon to the harbor at Destin, a distance of about 0.2 miles. The main entrance channel from the Gulf is protected by two converging rock jetties, spaced 1,000 feet apart at the seaward end. This channel was completed in 1969. An extension of the 6 by 100-foot channel into Old Pass Lagoon was authorized by the Energy and Water Development Appropriation Act of 1981 and completed in 1983. Project maintenance is on an 18-month cycle with most of the dredged sands being passed down drift as part of the regional sediment management plan.

1.9 PLANNING PROCESS

The plan formulation process for this study applied the six step planning process described in the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G, 1983). This planning process is more fully specified in Corps of Engineers' Engineering Regulation ER 1105-2-100 (the

Planning Guidance Notebook, 22 April 2000). Steps in the plan formulation process include:

1. The specific problems and opportunities to be addressed in the study are identified, and the causes of the problems are discussed and documented. Planning goals are set, objectives are established, and constraints are identified.
2. Existing and future without-project conditions are identified, analyzed and forecast. The existing condition resources, problems, and opportunities critical to plan formulation, impact assessment, and evaluation are characterized and documented.
3. The study team, including Federal, State, County and local officials and interested individuals, formulates alternative plans that address the planning objectives. A range of alternative plans are identified at the beginning of the planning process and screened and refined in subsequent iterations throughout the planning process.
4. Alternative project plans are evaluated for effectiveness, efficiency, completeness, and acceptability. The impacts of alternative plans will be evaluated using the system of accounts framework (NED, EQ, RED, OSE) specified in the Principles and Guidelines and ER 1105-2-100.
5. Alternative plans will be compared. Contributions to National Economic Development (NED) will be used to prioritize and rank alternatives that are consistent with protecting the nation's environment and are publically acceptable. The public involvement program will be used to obtain public input to the alternative identification and evaluation process.
6. A plan will be selected for recommendation, and a justification for plan selection will be prepared.

2.0 PROBLEMS AND OPPORTUNITIES

2.1 PROBLEMS

Walton County's shoreline is receding and its protective dunes and high bluffs are being adversely impacted by hurricane and coastal storm forces. The impacts of these storms to property and infrastructure have been considerable. Erosion is also having an impact on the environment due to decreased beach area and elevation. Such impact directly affects the availability of suitable nesting habitat required for nesting sea turtles and the areas needed by shorebirds to forage and rest. Damage to the previously established dune system destroyed much of the existing vegetation that provides stabilization. The absence of the dunes and associated vegetation eliminates much of the suitable habitat required to sustain beach mice populations and other wildlife that relies on these types of habitats for their continued survival. These problems can be summarized by the following statements which will be used by the study team in developing the planning objectives:

- Damage to properties and infrastructure due to hurricane and storm induced erosion.
- Damage to beach and dune habitats due to hurricane and storm induced erosion.
- Reduced beach recreational opportunities due to hurricane and storm induced erosion.

2.2 OPPORTUNITIES

Because of the damaging effects of hurricanes and severe storms to properties and infrastructure along the coast, there is an opportunity for a hurricane and storm damage reduction project for Walton County, Florida. Such a project can reduce damage caused by wind-generated and tide-generated waves and currents by stabilizing or restoring the eroded shoreline. Stabilizing or restoring the shoreline provides environmental restoration opportunities within the proposed project area. Restoring a beach-dune system allows greater stability and sustainability of the coastal environment once it has become re-established. Restoring the beach and dune habitats that support a variety of associated flora and fauna can contribute to the success and continual survival of several threatened or endangered species. The restoration effort will also contribute to the well-being of various other flora and fauna that naturally occur in the immediate vicinity. Restoration opportunities include increasing both the beach berm and dune widths to reduce, stabilize and/or restore the shoreline to provide protection to properties and infrastructure, increase sea turtle nesting habitat, and provide numerous benefits to a variety of shore birds, beach mice, and natural vegetation as well as other inhabitants of the coastal environment. These opportunities can be summarized by the following statements which, in addition to the problem statements, will be used by the study team to develop the planning objectives:

- Reduce damages to properties and infrastructure along Walton County's coastline.
- Restore wildlife habitat along Walton County's coastline.
- Provide increased recreational opportunities along Walton County's coastline.

2.3 PLANNING GOALS AND OBJECTIVES

The primary goal of this study is to investigate, analyze and recommend solutions to provide for hurricane and storm damage reduction opportunities along the coastline of Walton County, Florida. Over the years coastal erosion in the project area has seriously reduced the ability of the shoreline to provide adequate protection from routine coastal storms. Planning objectives were identified based on the problems, needs, and opportunities as well as existing physical and environmental conditions present in the project area and consist of:

a. Reduce shoreline erosion along the shoreline of Walton County.

b. Reduce the potential for storm damages caused by hurricanes and storms along the shoreline of Walton County.

c. Restore beach and dune ecosystem habitats along the shoreline of Walton County.

d. Increase the recreational opportunities along the shoreline of Walton County.

In general, the primary Federal objective is to formulate alternatives and make recommendations for Federal participation in construction of a project that will offer the most significant contribution to the National Economic Development (NED) account and that is consistent with protecting the Nation's environment. Furthermore, the development of the alternative plans should be formulated in a systematic manner to ensure that all reasonable alternatives are evaluated.

2.4 Assumptions

The planning assumptions for this study are**:**

- The Federal discount rate of 4-1/8 percent is used in this evaluation. The period of analysis is 54 years, beginning in 2010 and ending after 2063. There are three pre-base years from 2010 to 2013. The base year is 2014.
- Benefits are stated in constant FY2011 dollars.
- The analysis will consider expected future beachfront development.
- Critically eroding beach will be protected to some level at one area by a local project to be constructed as a one-time fill funded by state and county jointly.
- Structure values will be based on depreciated replacement costs.
- Land use zoning and construction codes will not change during the period of analysis.
- Damaged or destroyed properties will be repaired to pre-storm conditions.
- Lost land will be valued at nearshore prices.
- Empirical storm frequencies based on historical records for the study area are assumed to be predictive of the probability of future events.
- Beach mice will continue to be a protected species and there will be no changes to existing environmental laws.
- Existing state and county owned public park limits would remain the same in the future.
- Emergency nourishment in the future without project condition, will take place following each serious storm event and will not be a project cost.

2.5 Constraints

Planning constraints are statements of things unique to a specific planning study that alternative plans should avoid. The constraints for this study are:

- This analysis considers applicable Federal and State laws.
- Sufficient parking must be available within a reasonable walking distance on free or reasonable terms. Reasonable public access must be furnished to comply with the planned recreational use of the area; however, public use is construed to be effectively limited to within one-quarter mile from available points of public access to any particular shore.
- There is a requirement for the benefit-to-cost ratio (BCR) to be greater than 1-to-1.
- The project will be formulated to avoid impacts to dune, lake and Gulf connections.
- Private beaches owned by beach clubs and hotels cannot be included in Federal shore protection activities if the beaches are limited to use by members or paying guests.
- Consideration should be given to public health, safety, and social well-being, including possible loss of life.
- Wherever possible, provide an aesthetically balanced and consistent appearance without changing the existing natural berm or dune height.
- Avoid detrimental environmental and social effects, specifically eliminating or minimizing the following where applicable:
    a. Air, noise and water pollution;
    b. Destruction or disruption of manmade and natural resources, aesthetic and cultural values, community cohesion, and the availability of public facilities and services;
    c. Adverse effects upon employment as well as the tax base and property values;
    d. Displacement of people, businesses, and livelihoods; and,
    e. Disruption of normal and anticipated community and regional growth.
- Maintain, preserve, and, where possible and applicable, enhance the following in the study area:
    a. Water quality;
    b. The beach and dune system together with its attendant fauna and flora;
    c. Wetlands and other emergent coastal habitats;
    d. Commercially important aquatic species and their habitats;
    e. Nesting sites for colonial nesting birds;
    f. Habitat for endangered and threatened species.

3.0 INVENTORYING AND FORECASTING RESOURCES

3.1 STUDY METHODOLOGY

3.1.1 Evaluation Framework

Shore protection projects are formulated to provide hurricane and storm damage reduction while recreation benefits are incidental. ER 1165-2-130 provides policies and guidelines for determining the extent of Federal participation in potential Federal projects for protection from shore erosion, hurricanes, and abnormal tidal and lake flooding that result in damages or losses to coastal resources and/or development. Federal participation in shore protection projects must produce economic justification from storm damage reduction benefits or a combination of damage reduction benefits and recreation benefits not to exceed 50 percent of the total benefits required for justification.

The specific methodologies that will be used for the benefit study are based on the general principles and guidelines contained in the Principles and Guidelines (P&G) and are documented in Engineering Regulation (ER) 1105-2-100, 22 April 2000, Planning – Planning Guidance Notebook, Section I – Hurricane and Storm Damage Reduction, Appendix D – Economic and Social Considerations, and Appendix E – Civil Works Missions and Evaluation Procedures.

The general economic principles and guidelines for assessing NED benefits are documented in the Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, Chapter II - National Economic Development Benefit Evaluation Procedures (March 10, 1983). This document is referred to as Principles and Guidelines, or P&G.

3.1.2 Beach-*Fx* The Hurricane And Storm Damage Simulation Model

The Beach-*fx* model is a Corps engineering-economic Monte Carlo simulation model that relates beach profile change to storms, coastal processes, and nourishment programs. It is an event-based, data-driven Monte Carlo simulation model. This structure has been used successfully in the past in a large number of Corps studies and Beach-fx has been certified for use on hurricane and storm damage reduction studies.

Beach-*fx* represents an improvement on previous models in this arena by being strongly based on representation of the coastal and engineering processes, incorporating the impact of multiple storms, and incorporating uncertainty in damage functions, physical characteristics of structures, and economic valuations. Expected structural damages generated through the simulations are expressed as losses due to flooding, erosion and waves.

3.1.3 Engineering

3.1.3.1 Representative Profiles

Coastal process models need to use a detailed distance vs. elevation (x, z) representation of the shoreline. The amount of data required for such a representation is not needed in an economic-engineering type model such as Beach-*fx* and so a simplified representation for the profile has been adopted. This simplified representation for the profile uses five key features, which are dune width, dune height, dune slope, berm width, and berm height.

Figure 3 is a depiction of the simplified Beach-*fx* profile. This representation is founded on three assumptions: 1) a single dune, 2) a single berm (no separate construction berm), and 3) an equilibrium submerged profile.

The beach variables that change with storms are dune width, dune height, berm width, and upland width. Beach variables that are unchanged and remain constant throughout the analysis are upland elevation, dune slope, berm height, foreslope, and shape of the submerged profile. Thus, in response to a given storm, the berm can be eroded or accreted (change in berm width), the dune can change height and/or width, and can translate landward or seaward (change in upland width).

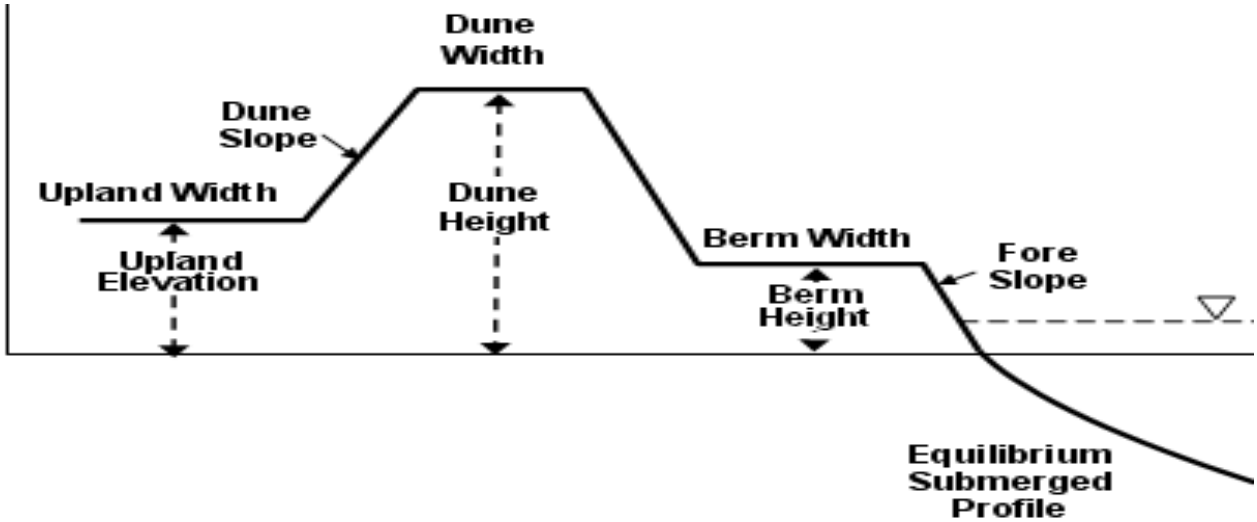


FIGURE 3. BEACH-*FX* SIMPLIFIED BEACH PROFILE

Figure 4 is a depiction of the simplified Beach-*fx* profile with damage elements viewed in Beach-*fx* model.

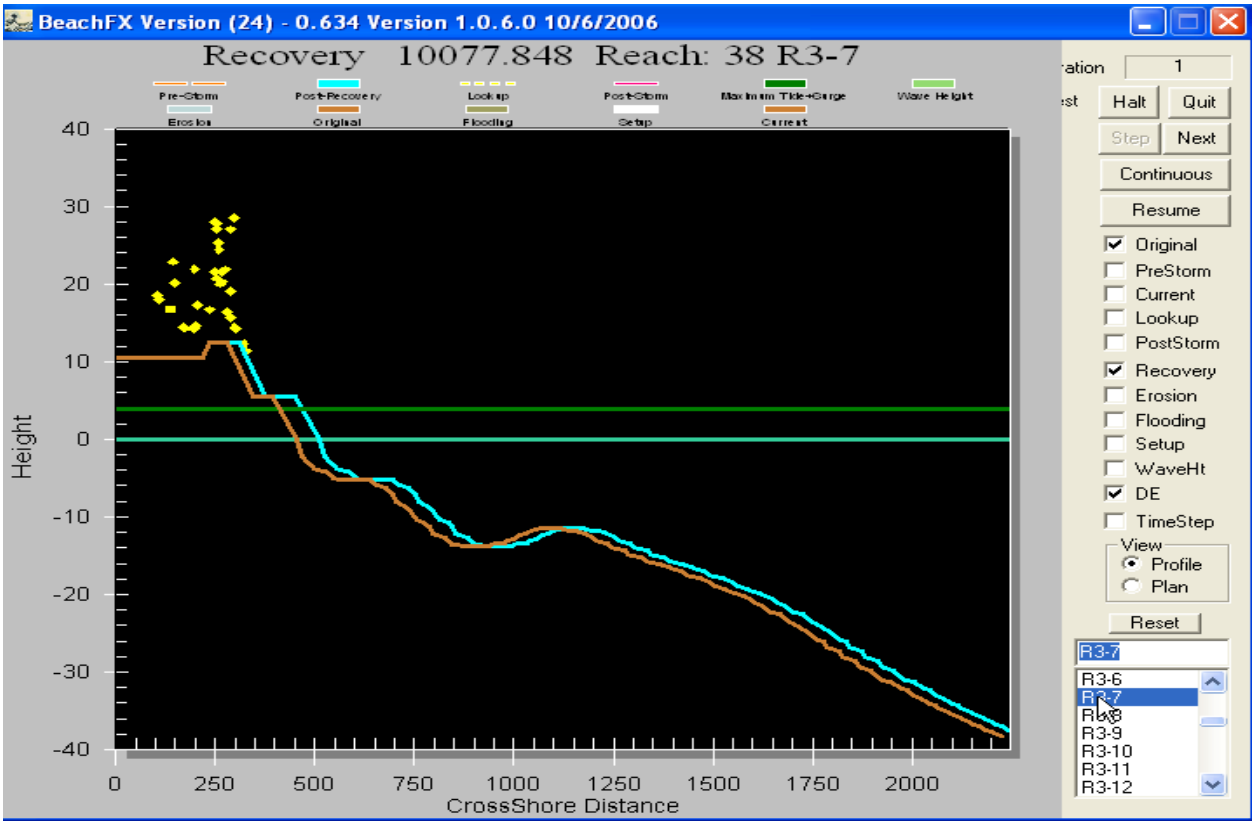


FIGURE 4. CHARACTERIZATION OF A REPRESENTATIVE PROFILE WITH DAMAGE ELEMENTS IN BEACH-*FX*

3.1.4 Storm Set

The set of plausible storms include all historical storms that have occurred in the Walton County area and have caused at least one foot of surge. The plausible storm set is detailed in Appendix A, Section 1, Attachment I-A.

The Monte Carlo simulation uses the same set of storms that were used to create the Shoreline Response Database (SRD). As a given storm event from the simulated sequence takes place, the current profile is used to look up the results that are associated with that storm in the SRD for the profile that is 'closest' to the pre-storm profile as tracked in the simulation. These results are then used to define the post-storm profile, to track volume changes, and to determine within-storm erosion, wave heights and water elevations due to the storm along the cross-shore profile.

3.1.4.1 Storm-Induced Beach Change Model (SBEACH)

A pre-computed database of beach profile responses to storms for a range of storms and profiles was generated utilizing the Storm-Induced BEAch CHange Model (SBEACH), (Larson and Kraus 1989).

SBEACH provided estimates of the short-term cross-shore response to a suite of plausible tropical storm events derived from the historical record of tropical storms impacting the Walton County area.

3.1.4.2 Generalized Model for Simulating Shoreline Change (GENESIS)

The Generalized Model for Simulating Shoreline Change (GENESIS) (Hanson and Kraus 1989) provided estimates of long-term shoreline response to existing and without project conditions.

The SBEACH and GENESIS models were developed by the Corps Research and Development Center (ERDC-CHL). Beach-*fx* is run for multiple period of analysis cycles and provides statistics on probable benefits and costs of the evaluated shore protection design alternatives, which is used to determine the economic justification of the project.

Beach-*fx* simulates beach response over time as storms, natural recovery, and management methods alter the beach profile. Events of interest (storms, beach nourishment) take place at calculated times. As each event takes place, the model simulates the physical and economic responses associated with that event. A set of simplified beach profiles, as defined by key data points, are tracked by the simulation model as the beach profile evolves over time.

3.1.5 Shoreline Response Database (SRD)

The Shoreline Response Database (SRD) is a relational database used to pre-store results of SBEACH runs for all plausible storms, and a range of pre-defined profiles, as expressed by ranges of berm width, dune width, and dune height. Two kinds of results are stored: changes in berm width, dune width, dune height, and upland width, and cross-shore profiles of erosion, wave height, and water depth. The SRD is site and study specific, that is, it is created for each shore protection study. The SRD, once generated, is used as a ‘lookup table’ by the Monte Carlo simulation. Within the Monte Carlo simulation, the shoreline modifications are tracked continuously by the simplified profile representation (primarily dune width and height and berm width). The driving force for profile change is the list of plausible storms. These plausible storms are then used to create SBEACH input, which is run against a range of profiles that is expected to cover the range of natural and managed profiles.

For each such pair (storm and profile), both simplified and detailed SBEACH results are stored in the SRD. The output of SBEACH for a given run is an ASCII file that describes the initial, final, maximum, and minimum cross-shore profiles, and the water and wave heights along the cross-shore. This file must be post-processed by software that extracts the values of changes in berm width, dune width, and dune height, and stores the information in the SRD.

3.2 EXISTING CONDITIONS

3.2.1 Demographics

Walton County is located in the State of Florida. The County is comprised of about 1,058 square miles of area. The 2009 estimated population is 55,105 persons which is a 35.7 percent increase over the base population estimate of 40,601 in 2000 making it one of the fastest growing counties in Florida. The population density is about 52 persons per square mile and the estimated number of housing units in 2008 was 41,859. The median household income was $43,779 with 14.9 percent of population estimated to be living below the poverty level. The median value of owner-occupied housing was $96,400. The racial makeup of the county in 2008 was estimated at 88.8 percent white, 7.6 percent African American, 3.8 percent of Hispanic or Latino origin, 1.1 percent American Indian and Alaska Native, and 0.7 percent Asian, with 1.8 percent of the population comprised of two or more races. The Gulf of Mexico borders Walton County to the south and, along with its four neighboring counties, its shoreline comprises part of 200 miles of Gulf beaches in the Florida panhandle. In Figure 3, from west to east, the Florida panhandle counties are as follows: Santa Rosa, Okaloosa, Walton, Bay, and Gulf.

3.2.2 Population

In the 29 years from 1980 to 2009, the population of the five counties, Santa Rosa, Walton, Bay, Okaloosa and Gulf increased by 171%, 159% ,69%, 62% and 48%, respectively. The State of Florida's population increase over the same period was 90%. Combined, the average population growth of the five counties was about 91 percent which is about equal to the growth rate of Florida for that same time frame. Out of the five counties, Okaloosa County has the greatest population at 178,473 persons and Gulf County has the least at 15,755 persons.

3.2.3 Employment

From 1990 to 2009 the number of persons in Florida's labor force increased by 48.1 percent. Four of the five counties in the study area exceeded the State's increase except for Gulf County which had only a 28.5 percent increase. The highest percentage labor force increase occurred in Walton County, a 140.8 percent increase, Santa Rosa County was the second highest gaining county with an 85.2 percentage increase. The State's unemployment rate for 2009 was a high 12 percent but all five counties in the study area had significantly lower rates. Gulf County's unemployment rate in 2009 was the highest at 9.6 percent and the lowest was 7.1 percent in Okaloosa County.

FIGURE 5. COUNTIES OF INTEREST

3.2.4 Households

All five counties experienced a significant increase in the number of households from 1990 to 2000. With increases of over 46 percent, Santa Rosa and Walton Counties had the greatest growth in the number of households. Of the five counties, Okaloosa led with 66,269 households in 2000. The median household income also increased from 1989 to 2007 for the five counties. Of the five counties, Okaloosa County had the highest median household income in 2008, but Walton County had the greatest percentage increase from 1989 to 2008, 105.6 percent. The median household income for Santa Rosa and Okaloosa Counties both were higher than that of the State of Florida in 2008.

3.2.5 Study Reaches

Walton County's 26 miles of coastline initially was subdivided into study reaches that very nearly coincided with the neighborhood divisions that already existed in the county's coastal community. That division resulted in 10 major study reaches initially formulated for economic delineation (see Table 1).

TABLE 1
INITIAL MAJOR STUDY REACHES

Reach	Reach Name
1	Miramar Beach to Sandestin
2	Sandestin and 4 Mile Village
3	Topsail Hill Preserve State Park
4	Beach Highlands and Dune Allen
5	Santa Rosa Beach
6	Blue Mountain Beach
7	Gulf Trace, Grayton Beach, Grayton Beach State Park and Watercolor
8	Seaside and Seagrove
9	Deer Lake State Park, Watersound and Seacrest West
10	Seacrest West, Rosemary beach and Inlet Beach

Damages to the Walton County coastal area wrought by Hurricane Ivan in 2004 prompted call for expediting the study process and getting the feasibility report complete ahead of the planned schedule outlined in the Project Management Plan (PMP). The Project Delivery Team (PDT) proposed a plan for expediting the study process. That plan included reducing the number of study reaches to five. This was made possible because significant erosion occurred due to Hurricane Ivan in September of 2004. Hurricane Ivan removed a significant portion of physiographic differences in the shoreline, thus reducing the number of representative profiles needed to account for variation between and among reaches.

Due to the effects of Hurricane Ivan on the beach the PDT decided that the project existing conditions had changed significantly. As a result new surveys of the beach were ordered and obtained. A new existing condition was established and named post-Ivan. That existing condition then became the initial point of beach condition (base condition) for the period of analysis.

Further, the PDT sought out, briefed and obtained from all the affected stakeholders approval of the expedited study plan which resulted in a revised PMP. Table 2 and Figure 6 lay out the revised major study reaches.

TABLE 2
REVISED MAJOR STUDY REACHES

Reach	Reach Name
1	Miramar Beach, Sandestin and Four Mile Village
2	Topsail Hill Preserve State Park
3	Beach Highlands, Dune Allen, Santa Rosa Beach, Blue Mountain and Gulf Trace
4	Grayton Beach State Park, Grayton Beach
5	Watercolor, Seaside, Seagrove, Watersound Seacrest Rosemary and Inlet Beach

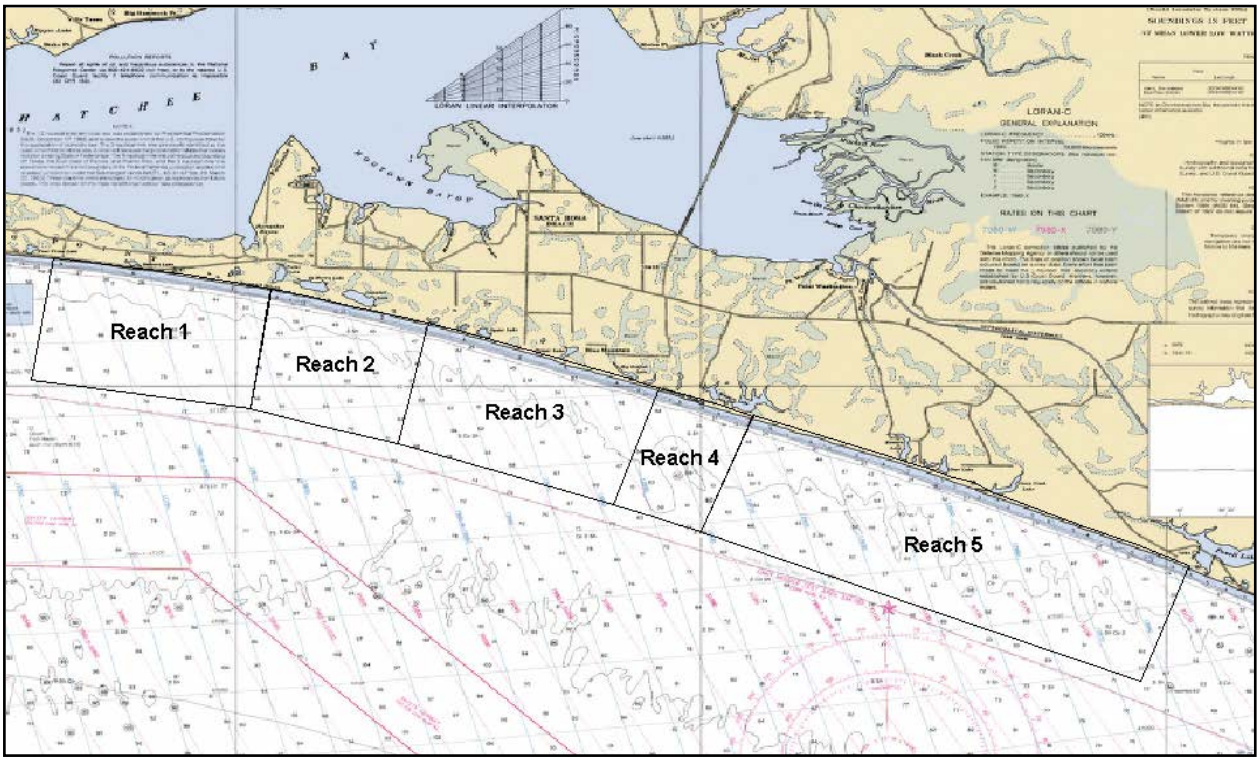


FIGURE 6. REVISED STUDY REACHES

3.2.6 Study Reaches Hierarchy and Naming

The study reach hierarchy begins with the five study reaches shown in Figure 6. Within these reaches there are 117 sub-reaches or Beach-*fx* model reaches, which are the same except for their naming convention.

The five study reaches were delineated for easy reference and visualization of the approximately 26-mile study area by grouping similar neighborhoods and subdivisions. These study reaches were numbered from Reach 1 to Reach 5 running west to east in the study area.

Early on in the study the PDT delineated the 26-mile study area into smaller increments named 'sub-reaches' which were about 1,000 feet in length, some longer, a few shorter but the majority averaged 1,000 feet. This was a very convenient way of defining the smallest reach unit since profiles were taken about every 1,000 feet and the Florida Department of Environmental Protection (FDEP) had set monuments about the same 1,000-foot spacing. This portioning created 117 sub-reaches which were numbered running from west to east, beginning with one and ending at 117.

The naming scheme for the 117 Beach-*fx* model reaches was symbolized by 'RX-Y; the R is Reach, the X is the study reach designator and the Y or YY is the numeric reach designator, whose value ranges from 1 to a maximum of 51, to represent the number of

approximate 1,000-foot sub-reaches in one of the five study reaches. Also, the Y or YY value was reset to begin at one within each of the five study reaches again with the numbering increasing from the west to the east.

The post-Ivan survey data was employed to produce revised representative profiles. The result of which reduced the number of representative profiles to 11. Reaches 1, 2, 3, and 4 could be represented by two profiles each while Reach 5 required three representative profiles. These representative profiles characterized the typical without project beach morphology for input into Beach-*fx*.

In the with-project condition these profiles are combined with alternative design templates to characterize that condition for various beach fill alternatives. Table 3 lists the various sub-reaches and associated profiles.

TABLE 3
WALTON COUNTY STUDY AREA – SUB-REACHES, MODEL REACHES, AND REPRESENTATIVE PROFILES

Sub-Reach	FDEP Monument	Beach-*fx* Model Reach	Representative Profile	Study Reach
1	R-1	R1-1	R1P1	**1**
2	R-2	R1-2	R1P1	**1**
3	R-3	R1-3	R1P1	**1**
4	R-3A	R1-4	R1P1	**1**
5	R-4	R1-5	R1P1	**1**
6	R-5	R1-6	R1P1	**1**
7	R-6	R1-7	R1P1	**1**
8	R-6A	R1-8	R1P1	**1**
9	R-7	R1-9	R1P1	**1**
10	R-8	R1-10	R1P1	**1**
11	R-9	R1-11	R1P1	**1**
12	R-10	R1-12	R1P1	**1**
13	R-11	R1-13	R1P1	**1**
14	R-12	R1-14	R1P1	**1**
15	R-13	R1-15	R1P2	**1**
16	R-14	R1-16	R1P2	**1**
17	R-15	R1-17	R1P2	**1**
18	R-16	R1-18	R1P2	**1**
19	R-17	R1-19	R1P2	**1**
20	R-18	R1-20	R1P2	**1**
21	R-19	R1-21	R1P1	**1**
22	R-20	R1-22	R1P1	**1**
23	R-21	R1-23	R1P1	**1**
24	R-22	R1-24	R1P1	**1**
25	R-23	R2-1	R2P1	**2**
26	R-24	R2-2	R2P1	**2**
27	R-25	R2-3	R2P2	**2**
28	R-27	R2-4	R2P1	**2**
29	R-29	R2-5	R2P2	**2**
30	R-30	R2-6	R2P1	**2**
31	R-40	R2-7	R2P1	**2**
32	R-41	R3-1	R3P1	**3**
33	R-42	R3-2	R3P1	**3**
34	R-43	R3-3	R3P1	**3**
35	R-44	R3-4	R3P2	**3**
36	R-45	R3-5	R3P2	**3**
37	R-46	R3-6	R3P2	**3**
38	R-47	R3-7	R3P2	**3**
39	R-48	R3-8	R3P1	**3**
40	R-49	R3-9	R3P1	**3**
41	R-50	R3-10	R3P1	**3**
42	R-51	R3-11	R3P1	**3**
43	R-52	R3-12	R3P1	**3**
44	R-53	R3-13	R3P1	**3**
45	R-54	R3-14	R3P1	**3**

TABLE 3
WALTON COUNTY STUDY AREA – SUB-REACHES, MODEL REACHES, AND REPRESENTATIVE PROFILES

Sub-Reach	FDEP Monument	Beach-*fx* Model Reach	Representative Profile	Study Reach
46	R-55	R3-15	R3P1	**3**
47	R-56	R3-16	R3P1	**3**
48	R-57	R3-17	R3P1	**3**
49	R-58	R3-18	R3P1	**3**
50	R-59	R3-19	R3P1	**3**
51	R-60	R3-20	R3P1	**3**
52	R-61	R3-21	R3P1	**3**
53	R-62	R3-22	R3P1	**3**
54	R-63	R3-23	R3P1	**3**
55	R-64	R3-24	R3P2	**3**
56	R-65	R3-25	R3P2	**3**
57	R-66	R3-26	R4P1	**4**
58	R-67	R4-1	R4P1	**4**
59	R-68	R4-2	R4P1	**4**
60	R-69	R4-3	R4P2	**4**
61	R-70	R4-4	R4P2	**4**
62	R-71	R4-5	R4P1	**4**
63	R-72	R4-6	R4P2	**4**
64	R-73	R4-7	R4P2	**4**
65	R-74	R4-8	R4P1	**4**
66	R-76	R4-9	R4P1	**4**
67	R-78	R5-1	R5P2	**5**
68	R-79	R5-2	R5P2	**5**
69	R-80	R5-3	R5P2	**5**
70	R-81	R5-4	R5P2	**5**
71	R-82	R5-5	R5P2	**5**
72	R-83	R5-6	R5P1	**5**
73	R-84	R5-7	R5P1	**5**
74	R-85	R5-8	R5P1	**5**
75	R-86	R5-9	R5P2	**5**
76	R-87	R5-10	R5P2	**5**
77	R-88	R5-11	R5P2	**5**
78	R-89	R5-12	R5P2	**5**
79	R-90	R5-13	R5P2	**5**
80	R-91	R5-14	R5P2	**5**
81	R-92	R5-15	R5P2	**5**
82	R-93	R5-16	R5P2	**5**
83	R-94	R5-17	R5P3	**5**
84	R-95	R5-18	R5P2	**5**
85	R-96	R5-19	R5P3	**5**
86	R-97	R5-20	R5P2	**5**
87	R-98	R5-21	R5P2	**5**
88	R-99	R5-22	R5P3	**5**
89	R-100	R5-23	R5P3	**5**
90	R-101	R5-24	R5P2	**5**

TABLE 3
WALTON COUNTY STUDY AREA – SUB-REACHES, MODEL REACHES, AND REPRESENTATIVE PROFILES

Sub-Reach	FDEP Monument	Beach-*fx* Model Reach	Representative Profile	Study Reach
91	R-102	R5-25	R5P2	**5**
92	R-103	R5-26	R5P1	**5**
93	R-103A	R5-27	R5P3	**5**
94	R-104	R5-28	R5P3	**5**
95	R-105	R5-29	R5P2	**5**
96	R-106	R5-30	R5P2	**5**
97	R-107	R5-31	R5P2	**5**
98	R-108	R5-32	R5P1	**5**
99	R-109	R5-33	R5P1	**5**
100	R-110	R5-34	R5P1	**5**
101	R-111	R5-35	R5P1	**5**
102	R-112	R5-36	R5P1	**5**
103	R-113	R5-37	R5P1	**5**
104	R-114	R5-38	R5P1	**5**
105	R-115	R5-39	R5P1	**5**
106	R-116	R5-40	R5P2	**5**
107	R-117	R5-41	R5P2	**5**
108	R-118	R5-42	R5P2	**5**
109	R-119	R5-43	R5P2	**5**
110	R-120	R5-44	R5P2	**5**
111	R-121	R5-45	R5P2	**5**
112	R-122	R5-46	R5P2	**5**
113	R-123	R5-47	R5P2	**5**
114	R-124	R5-48	R5P3	**5**
115	R-125	R5-49	R5P3	**5**
116	R-126	R5-50	R5P3	**5**
117	R-127	R5-51	R5P3	**5**

3.2.7 Public Access and Parking

Current shore protection guidance provides for Federal participation in restoring and protecting publicly owned shores available for use by the general public. Typically, beaches must be either public or private with public easements/access to allow Federal involvement in providing shoreline protection measures. Private property can be included, provided that the protection and restoration is incidental to protection of publicly owned shores or if such protection would result in public benefits. Table 4 lists the location of the access points and the parking availability along the shoreline of Walton County. Not all reaches contain access points. Figures 7A, 7B, and 7C are aerial depictions of the access points that are presented for the entire shoreline of Walton County. Each parking space assumes 4.5 persons per vehicle times 1.5 turnovers per day to yield visits parking will support.

TABLE 4
WALTON COUNTY ACCESS AND PARKING

Construction Reach	Model Reach	Access Points	Parking Spaces	Visits Parking Will Support
1	R1-3	Miramar Beach Regional Access West	85	574
1	R1-4	Miramar Beach Regional Access East	85	574
1	R1-10	Scenic Gulf Drive	100	675
1	R1-12	735 Scenic Gulf Drive	0	0
1	R1-14	132 Norwood Drive	0	0
1	R1-15	Open Gulf Street	0	0
1	R1-16	~ 90 Beach Drive	6	41
1	R1-17	253 Sand Trap Road	3	20
1	R1-18	End of Tango De Mer	0	0
1	R1-22	San Destin Day Use Area	110	743
1	R2-1	719 Top Sail Hill Road	0	0
2	R3-4	363 Highland Avenue	5	34
2	R3-4	127 Highland Avenue	0	0
2	R3-5	Dune Allen 5753 W. Co Hwy 30A	75	506
2	R3-9	5605 Co Hwy 30A	0	0
2	R3-9	5173 Co Hwy 30A	15	101
2	R3-9	4991 W. Co Hwy 30A	0	0
2	R3-10	4850 W. Co Hwy 30A	5	34
2	R3-11	Gulf Place West Access Point	13	88
2	R3-12	Gulf Place Middle Access Point	13	88
2	R3-13	Gulf Place East Access Point	14	95
2	R3-11	4447 W Co Hwy 30A	42	284
2	R3-13	92 South Spooky Lane	0	0
2	R3-14	4201 Co. Hwy 30A	0	0
2	R3-14	186 Gulf View Heights Street	30	203
2	R3-21	2365 S. Co Hwy 83	22	149
2	R3-21	446 Blue Mountain Road	5	34
2	R3-21	590 Blue Mountain Road	5	34
2	R3-21	726 Blue Mountain Road	5	34
3	R4-5	125 Sandy Lane	12	81
3	R4-6	288 Garfield St.	41	277
3	R4-6	199 Banfill Street	41	277
3	R4-6	208 Holtz Avenue	0	0
3	R4-7	91 Boat Ramp Road	0	0

TABLE 4 (CONTINUED)
WALTON COUNTY ACCESS AND PARKING

Sub- Reach	Model Reach	Access Points	Parking Spaces	Visits Parking Will Support
3	R4-6	913 Main Park Road	0	0
4	R5-2	Van Ness Butler Jr. Beach Access and parking and Watercolor Parking Garage and access	100	675
4	R5-4	Seaside (Access & Parking)	60	405
4	R5-5	2560 Co Hwy 30A	0	0
4	R5-6	2624 Co Hwy 30A	2	14
4	R5-6	2680 Co Hwy 30A	0	0
4	R5-6	~ 2750 Co Hwy 30A	0	0
4	R5-6	2790 Co Hwy 30A	32	203
4	R5-7	2845 Co Hwy 30A	0	0
4	R5-7	2920 Co Hwy 30A	0	0
4	R5-8	3020 Co Hwy 30A	4	27
4	R5-9	118 Montgomery Street	0	0
4	R5-9	52 S Andalusia St	0	0
4	R5-9	South end of Dothan Avenue on Montgomery Street	0	0
4	R5-10	3458 E. Co Hwy 30A - San Juan Neighborhood B A	20	135
4	R5-10	3512 E. Co. Hwy 30A	0	0
4	R5-10	3576 E. Co Hwy 30A - Pelaya Neighborhood B A	0	0
4	R5-12	3694 E. Co Hwy 30 A - Campbell Street Neighborhood	75	506
4	R5-12	3874 E. Co Hwy 30A	20	135
4	R5-13	57 Seagrove Place	9	61
4	R5-18	679 Eastern Lake Road	6	41
4	R5-18	491 Eastern Lake Road #33 - Eastern Lake N B A	0	0
4	R5-18	188 San Roy Road - neighborhood come out to helio	0	0
4	R5-19	11 Beachside Dune - Sugar Dune	16	108
4	R5-20	258 Beachfront Trail - Walton Dune	10	68
4	R5-22	308 Beachfront Trail	10	68
4	R5-22	Beachside Drive	16	108
5	R5-22	Deer Lake State Park	1	7
5	R5-32	8040 E. Co Hwy 30A - Gulf Lakes Neighborhood B A	0	0

TABLE 4 (CONTINUED)
WALTON COUNTY ACCESS AND PARKING

Sub- Reach	Model Reach	Access Points	Parking Spaces	Visits Parking Will Support
5	R5-34	8286 E. Co. Hwy 30A - Seabreeze Neighborhood B A	10	68
5	R5-35	Saint Lucia Lane	100	675
5	R5-35	Rosemary Avenue	0	0
5	R5-35	8520 E. Co Hwy 30A - Seacrest Drive Neighborhood B A	0	0
5	R5-46	East Water Street	50	338
5	R5-46	East Water Street	50	338
5	R5-46	188 Winston Lane Beach Access	5	34
5	R5-47	264 South Wall Street - Wall Street Neighborhood	9	61
5	R5-47	435 West Park Place Ave.	67	452
5	R5-48	139 South Orange Street	67	452
5	R5-49	118 West Park Place Avenue FL #20	67	452
5	R5-50	202 South Walton Lakeshore Drive Phillips Inlet Access	15	101
TOTALS		73 Access Points	1,553	10,478

FIGURE 7A
AERIAL SHOWING PARKING AND ACCESS POINTS

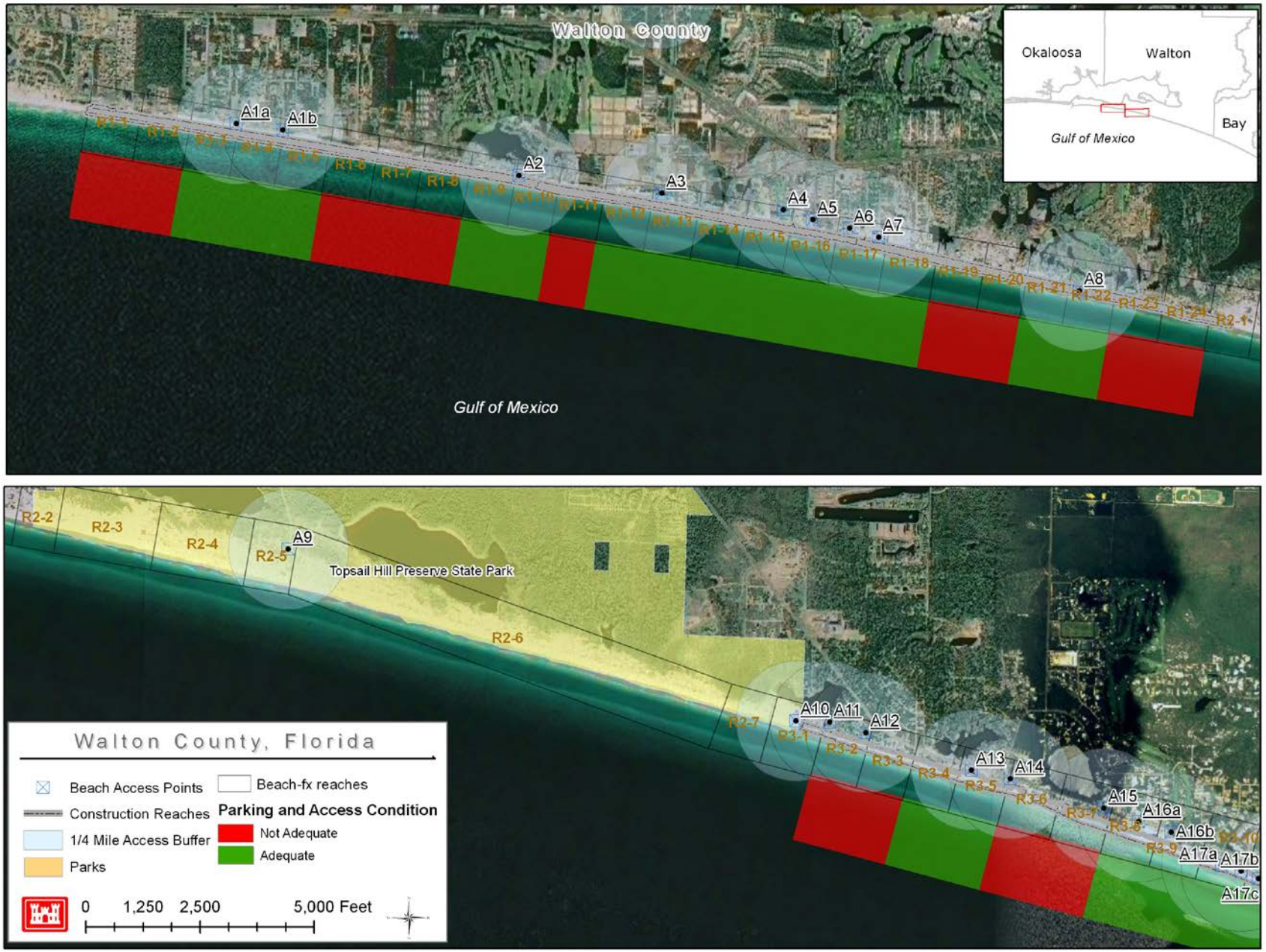


FIGURE 7B
AERIAL SHOWING PARKING AND ACCESS POINTS

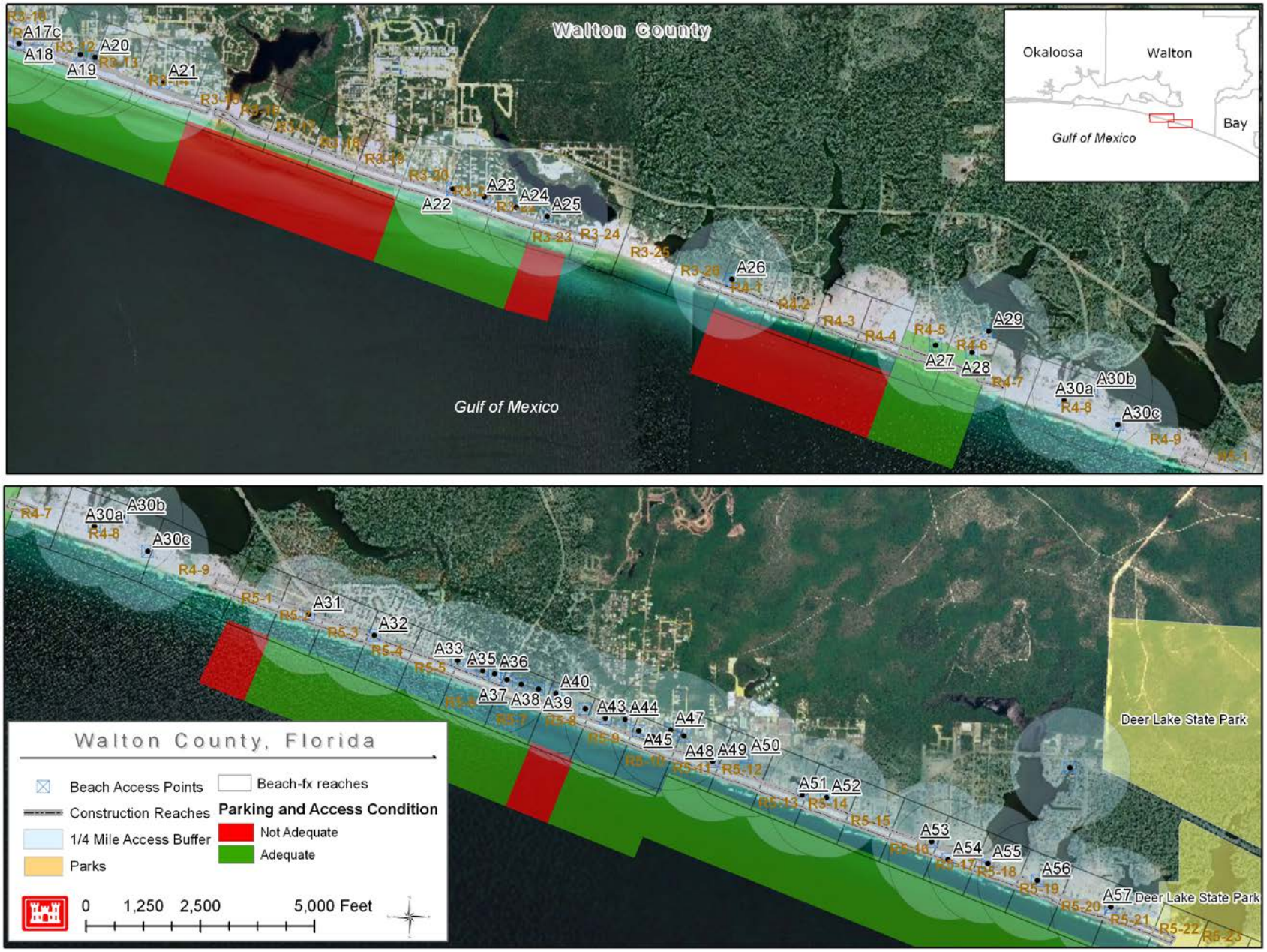
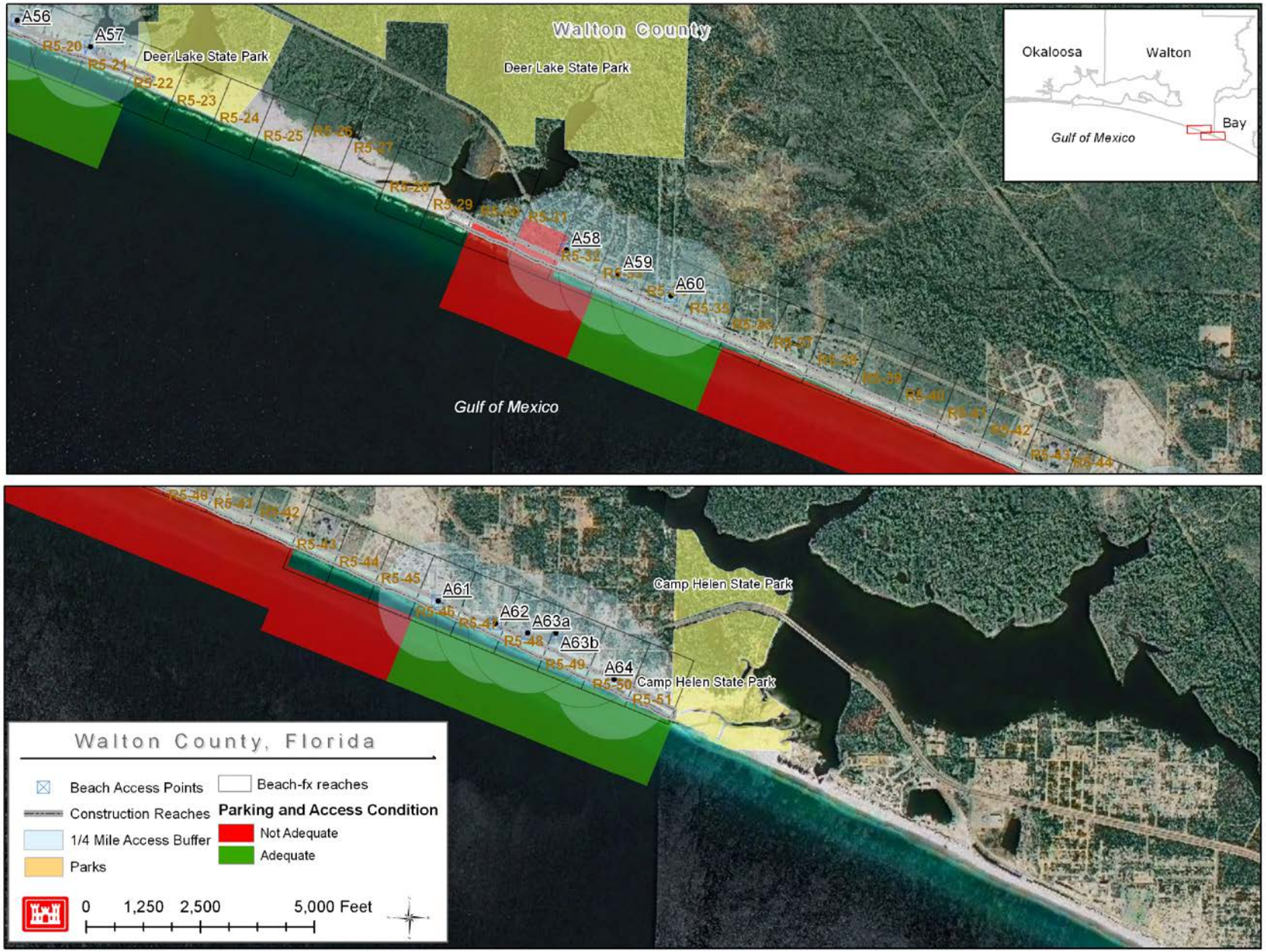


FIGURE 7C
AERIAL SHOWING PARKING AND ACCESS POINTS



3.2.8 Land Use

The coastal beach community layout is somewhat typical of other beach and shoreline development along the Gulf Coast; a checkerboard pattern of single and multi-family residential areas intermixed with a few commercial areas. Walton County's beach shoreside development has less commercial trade on the front row shoreline probably due to the high cost of the land and real estate taxes which affects profitability. Instead most commercial trade establishments prefer to locate on the north side of the beach road.

The current trend in land use on the shoreline continues to be principally single and multi-family development, with little commercial trade development.

3.2.8.1 State Parks

There are three State Parks in the Walton County Study area. They feature great diversity and natural beauty.

Grayton Beach State Park

Grayton Beach State Park is located south of U.S. Hwy 98 approximately halfway between Panama City Beach and Destin. Grayton Beach State Park offers a wide variety of activities for the visitor. Along with the beaches, there are two trails in the 2,228-acre coastal park. There are also 35 campsites with camping and cabin rentals with an additional 22 campsites to be provided in a renovation project that also includes a new ranger station and enhanced ADA accessibility and boardwalks.

Topsail Hill Preserve State Park

Topsail Hill Preserve State Park features one of the most diverse natural eco-systems in the state, with wet prairies, scrub, pine flatwoods, marshes and cypress domes. The park has more than three miles of beaches and five dune lakes. The lakes total more than 170 acres within the 1,637 acre park. In addition to the beaches, this recreation area provides opportunities for bicycling, camping, fishing, nature trails, picnicking, scuba, and swimming. The park has a 2.5 mile long maritime nature trail which traverses ancient dunes and scrub communities. The park has RV accommodations, with 156 sites and 16 rental cabins. Topsail Hill Preserve State Park is located in Santa Rosa Beach about 10 miles east of Destin, FL. .

Deer Lake State Park

The Deer Lake State Park on County Hwy 30A, just west of Watersound, offers park goers a look at intact ancient sand dunes and vast ecosystems. The park has an area of approximately 2,000 acres, the majority of which lies on the north side of the park across County Hwy 30A. A walking trail approximately one mile long is located in the wooded area in the northern portion of the park. The park has recently completed a remodeling project on the walkway to the beach providing ADA accessibility.

3.2.9 Future Development

Development is both ongoing and continuous at Walton County, as it is likely to continue into the immediate and the near future until the small amount of remaining beachfront, save the state and county properties, is completely developed. The characteristic of the existing beachfront is composed of single and multi-family housing. The multi-family housing includes 29 multi-floored condominiums and resort complexes consisting of four floors or more.

3.2.10 Property Inventory

Recent beachfront development in Walton County has predominately been high-rise condominiums, residential resorts and residential communities. Currently, there is a height restriction of four stories or 50 feet for coastal structures in Walton County; however, there are a number of structures in excess of this height restriction that were either constructed prior to or have been granted waivers subsequent to the height restriction. Most of the coastal area that is not state or county property is highly developed. Construction of new single and multifamily residential structures is ongoing at a brisk pace. The few remaining undeveloped large private holdings are showing signs of infrastructure preparations for development.

In the spring of 2004 a complete property inventory of existing structures that may benefit from a storm damage reduction project was undertaken. In 2010 a windshield survey of the study area was undertaken. That survey revealed no significant changes had occurred since the last inventory was completed. Some structures that were under construction are now fully constructed. They were already entered in the initial property inventory along with their values. The purpose of this inventory is to gather data required for the Beach-*fx* data inputs and to obtain a database that would facilitate the gathering of critical metrics that locate the structure spatially in relation to the shoreline and the beach profile as well as its elevation. Routinely, recreational facilities that are damaged or destroyed by storm events are repaired or rebuilt.

Beach-*fx* considers the inventory of structures (damage elements) as items that are containerized in ‘lots’. Lots form boundaries that contain damage elements. Lots are defined as quadrilaterals that approximate lot parcels as delineated in the tax assessor’s files, databases and Geographic Interface Systems (GIS). An aggregation of lots that are for the most part contiguous composes a reach. All reaches taken in aggregate compose the study area.

Photos of structures along with pertinent statistics of construction and foundation type, number of floors, and accompanying detached structures that may benefit from a project were also collected.

The result of that inventory is displayed in Table 5.

TABLE 5
STRUCTURE INVENTORY COUNT BY REACH BY TYPE

Damage Element	Major Study Reach				
	1	2	3	4	5
Commercial	10		1	7	13
Single-Family	99		268	118	348
Multi-Family	62		37	21	99
Walkovers	151		189	20	263
Pool	36		12	9	84
Gazebo	4		7		7
Jacuzzi	4				
Total	366		514	175	814
Grand Total	1869				

3.2.11 Value Of Coastal Inventory

3.2.11.1 Structure Value

The value of structures in the study area required for economic analysis to determine NED benefits, need to be expressed in terms of depreciated replacement costs.

The Mobile District Real Estate Division conducted investigations to determine the depreciated replacement cost for single family residential structures. Tax Assessor's records were examined and studied on the current inventory. Variables of interest relating to assessed value, date of construction, type of construction, number of floors, square footage, recent sales and selling prices, along with other information was analyzed. Sampling techniques, professional judgment, professional guidelines, and consultations with the tax assessor's office and field visits composed of methods used to complete the investigations.

Some of the findings from that analysis were that there were two significantly different classes of valuations between the types of development in Walton County: pre-1990 construction and post-1990 construction. The handful of pre-1990 typical construction was generally less than 1,800 square foot, one-story structures. Many were on grade and most were of masonry or brick construction and only a few made of wood. Assessed values for these structures were very low when compared to calculated depreciated replacement costs. The value of the land has outgrown the value of the structure. When these structures are sold they are usually torn down for larger and more expensive ones. On average they were assessed about one-half of their depreciated replacement cost. The Walton inventory for these structures saw their assessed value increased by 200 percent to arrive at their true depreciated replacement cost.

Post-1990 construction was much larger than 1,800 square feet and most are multi-storied structures. The division between masonry, and wood was about equal for the majority of structure while the remaining minority was brick or wood. Selling prices over the last 5-10 years have been much above what would normally be expected in the market place. Turnovers are occurring in as little as two years and there are large increases in the selling price when compared to purchased prices. Most of the increasing value was carried in the land. The agreed upon methodology for determining depreciated replacement cost was to estimate replacement cost as 125 percent of assessed value.

A relationship between assessed values and depreciated replacement cost for multi-family structures was found to be highly variable and not reliable. The methodology that would render the best estimate of depreciated replacement cost for these structures was to begin with current per square foot construction costs and depreciates that value by two percent each year of age. Current construction costs developed from activity in the last five years was estimated to be $160.00 a square foot for construction less than 20,000 square feet and $175.00 per square foot for construction greater than 20,000 square feet.

Walkovers were valued at an average $200.00 per linear foot for wood structures and $275.00 per linear foot for structures constructed from a commercially produced composite called 'Trex' that was used for public access provided by the TDC's public accesses. Pool values were based on an average updated composite value obtained by interviews and sampling for an earlier study in neighboring Bay County. The few Jacuzzis and tennis court values were based on typical sized units at current costs.

3.2.11.2 Content Value – Structure-Content Ratio

The National Flood Insurance Agency (NFIA) claims database was searched for paid claim history in Walton and the neighboring counties of Bay, Okaloosa and Fort Walton. These records show the date of the loss and what was paid for building and content loss for each claim. No claims were found for any of these counties. The NFIA is now under Homeland Security. They have been contacted for updated claim data. As of the date of this report no updated data has been provided.

A web search of trade associations of homeowner casualty underwriters revealed that insurers generally use a content to structure ratio between 50 and 75 percent of replacement cost. The Walton county inventory is valued at depreciated replacement cost not full replacement cost. The average insurers' content to structure ratio of 62.5% was used to estimate the value of contents for Walton County based on depreciated structure replacement cost.

Table 6 presents the structure and content value of damageable property based on depreciated replacement cost. Damageable property value is used here to reflect that only the lower two (2) floors of multi-storied structures were valued in the property inventory as they alone were susceptible to modeling damages.

TABLE 6
VALUE OF WALTON COUNTY
STRUCTURE AND CONTENT VALUE BY REACH
(DOLLARS IN MILLIONS)

	Reach				
	1	2	3	4	5
Damage Elements	366		514	175	814
Structure Value	$317.3		$164.9	$33.7	$276.9
Content Value	$156.1		$78.9	$16.2	$133.5
Total	$473.4		$243.8	$49.9	$410.4
Grand Total	$1,177.5				

3.3 ECONOMIC BENEFIT EVALUATION

3.3.1 Assumptions

The economic benefits are from four categories: storm damage reduction, lost land reduction, elimination of emergency nourishment costs and increased recreation. The primary benefit category is the storm damage reduction as mandated in Engineering Regulation ER 1105-2-100, shore protection projects are to be formulated to provide for storm damage reduction.

Benefits are stated in constant Fiscal Year (FY) 2011 dollars. The period of analysis is 50 years from January, 2014 through and including all of the year 2063, there are four pre-project base years, 2010 through 2013, making the period of study 54 years. The base year is 2014. The structure inventory is valued at FY 2011 dollars.

3.3.2 Storm Damage Reduction

Beach-*fx* calculates the storm damage reduction from inundation, storm-induced erosion, long-term erosion and wave attack on a damage element-by-damage element basis for each storm event for the study period for a large number of iterations.

3.3.3 Damage Functions

The damage functions used in Beach-*fx* are those developed for the Institute for Water Resources (IWR). A Coastal Storm Damage Workshop (CSDW) was held in Alexandria, Virginia to solicit expert-opinion for economic consequence assessment of coastal storm damage. The workshop is part of longer-term research effort whose objective is to develop a peer-reviewed, step-by-step methodology for estimating coastal storm damages.

The objective of that workshop was to discuss and recommend damage relationships needed to predict structural damage from coastal storms as functions of hazard intensity levels, with associated uncertainties, resulting from erosion, waves, inundation, and their combined effects. Because information on the relationship between residential structural damage and storm parameters is limited, this workshop used expert-opinion as a means of gaining information on these relationships (see Ayyub 2001). A report describing the results of the workshop both in terms of damage relationships and future information needs identified by the experts at the workshop is included in Attachment II of Appendix B – Economic Investigations.

The CSDW developed a set of lookup curves, defined for various damage types and foundation types, to calculate percentage loss associated with structure and contents. For each damage type the input to these curves, or the "damage driving parameter", has been defined by the CSDW. The appropriate damage-driving parameters for each damage type are:

Flooding:
- Depth of water over walking surface of lowest walking floor

Waves:
- Difference between the top of wave (crest) and the bottom of the lowest horizontal member

Erosion:
- Percent of footprint compromised

Damage functions for each damage type (erosion, inundation, and wave) are currently associated with damage element type (single family residential, multi-family residential, walkway, etc.) foundation type (shallow piles, deep piles, slab, etc.) and construction type (wood frame concrete, masonry, etc.) and armor type (no armor, sheet pile, etc.) are used to select the appropriate damage function.

Damages are calculated at the damage element level, following each storm. For each damage type, a damage driving parameter is calculated for each damage element, and used as a lookup into stored damage functions.

3.3.4 Damage Element

Damages are estimated based on the concept of a "damage element". Damage elements are structures, walkways, etc., anything that can incur economic losses. In Beach-*fx's* system hierarchy reaches contain lots, and lots contain damage elements. For each storm, damages are estimated by examining the reach, lots, and damage elements within the lots. Thus, the basic unit on which damages are calculated at present is the damage element. Damage elements have attributes relating to type, geographic location, and value. Each damage element has information relating to structure and content value (treated as a three-parameter distribution for purposes of incorporating uncertainty). For location information, a structure's center point is referenced, as well as its width and length. A single value of ground elevation is

specified, which also includes a three-parameter distribution for describing the first floor elevation and uncertainty.

3.3.5 Damage Estimation

Damages are estimated, based on calculation of the value of a “damage-driving parameter” for the damage element, which is then used as the independent variable to use for lookup into the stored damage functions. These damage functions provide the percentage loss for structure and contents.

3.3.6 Structure and Content Damages

The determination of structure and content damage was calculated using the IWR damage functions. These damage functions generally give the percent damage as related to a water level for inundation damages, and the percent of structure footprint compromised to calculate storm induced and long-term erosion damages.

3.3.7 Inundation Damages

Inundation damages occur when storm surge elevations exceed the elevation of the dune line, or when waves break over the dunes. Inundation damages were assumed to begin for existing conditions when the maximum water level exceeded the first floor elevation of structure, since there is not always a continuous dune system.

3.3.8 Lost Land Reduction

P&G states that erosion protection benefits include loss of land, structural damage prevention, reduced emergency costs, and reduced maintenance of existing structures and incidental benefits. The loss of land benefit is measured as the value of nearshore upland. Nearshore upland is sufficiently removed from the shore to lose its significant increment of value because of its proximity to the shore, when compared to adjacent parcels that are more distant (inland) from the shore.

3.3.9 Loss of Land Benefit

With a project in place land that would be lost in the without project future condition would be preserved by a project. The design template that represents the project that provides full benefits to protected properties would be in place for the period of analysis preserved through the process of periodic renourishment. This benefit is based upon the value of near shore lands. Normally determinations of the market value for the land losses are based on the value of near shore upland. Near shore upland is sufficiently removed from the shore to lose its significant increment of value because of its proximity to the shore, when compared to adjacent parcels that are more distant (inland) from the shore.

For this project, near shore values were estimated by Mobile District's Real Estate Division. The criterion used was, near shore lands are those parcels that are sufficiently removed from the shore to lose any direct water frontage value. These parcels have; no Gulf frontage, no view of the water, no access point to the Gulf as part of any deeded subdivision rights. The methodology used was to track 2005 and 2006 sales of near shore parcels in Walton County. Since property values varied according to location and sale prices also varied broadly due to the pause in the market caused by the storm activity on the Gulf in 2004 and 2005, a range of values, a low and a high, price per square foot was calculated. Then the average of the high and low was used to estimate the value of land lost. The value used represents a long-term value suitable for the period of evaluation. The value of land lost ranges from a low of $35 per square foot to $112.50 per square foot. In each eroding reach the average yearly erosion rate multiplied by the length of the reach multiplied by the price per square yard gave the average annual value of land lost.

3.3.10 Emergency Nourishment Cost

Emergency nourishment is performed at the reach level. At each time step of the model, the need for emergency nourishment is tested for each reach. The test consists of an examination of the current model-simulated reach dune height, dune width, and berm width, which are compared to user input "triggers", that is, limits below which emergency nourishment takes place. For example, if the input berm width trigger is 100.0 feet, then if the current berm width is below 100', emergency nourishment takes place. Each trigger acts independently, such that if either the berm width, or the dune, or the dune height trigger is activated, emergency nourishment takes place.

Once emergency nourishment is triggered for the reach, the emergency nourishment will start after a user-entered mobilization time. (There is also a user-entered mobilization cost which can be associated with the reach-level mobilization). Thus, if the trigger for emergency nourishment takes place on day 255 of the simulation, and the mobilization time is 30 days, then emergency nourishment will start on day 285.

The volume of emergency nourishment is determined based on the user input emergency template, defined by dune height, dune width, and berm width. This information is used to calculate a needed volume for the reach. Three parameters are then used to determine how long it will take to place the volume and how much it will cost: the production volume (cubic yards (cu/yd) per day), the borrow to placement ratio (cu yds) of borrow per cu yd placed), and the unit cost ($/cu yd). Based on the needed volume, production rate, and borrow to placement ratio, the time for restoration of the emergency template is determined and at that time increment after start of nourishment, the dune template is set to the emergency template, subject to rules that preclude diminishing the existing berm height, dune width, or dune height if they are currently greater than the corresponding template values.

Model output includes the cost of emergency nourishment for the complete future without project condition and for each alternative plan. The cost avoidance benefit of a

project feature is defined as the difference between the with and without project emergency costs.

3.3.11 Storm Induced and Long-Term Erosion Damages

Storm induced erosion is defined as the horizontal distance from 0 NGVD on the pre-storm profile to the landward most position where vertical erosion during the storm exceeds 0.5 feet. Recession is calculated, averaged and a standard deviation computed for each sub-reach over the simulation period.

A project-induced planform change rate, which accounts for the longshore dispersion of the beach nourishment material, is specified for each Beach-*fx* reach. GENESIS Model was used to estimate the long-term planform change rate for the future without and future with project conditions. GENESIS simulates changes in shoreline position due to the presence and combinations of beach fills and nearshore structures such as groins, jetties, seawalls, and breakwaters. GENESIS was used to predict and optimize the performance of the NED Plan and renourishment requirements given various design transitions.

3.3.12 Wave Attack Damages

Wave conditions, which drive the model, consist of wave height, period, and direction and can originate from multiple sources. Predictive simulations estimate the performance of any proposed beach fill or structural modifications.

Damage elements along the shoreline can be damaged from wave run-up or from waves breaking directly on the damage element when storm surge elevations are high. These damages are determined using the IWR expert elicitation damage functions.

3.3.13 Emergency Nourishment

In the without-project condition it is assumed that emergency nourishment will be performed as needed, over the 54-year period of study. The non-Federal sponsor indicated that, in the absence of a Federal project, they will, acquire funding to pursue a renourishing action after each significant storm. When a disaster is declared for a particular county, the Federal Emergency Management Agency (FEMA) will provide up to six cubic yards per linear foot to mitigate for loss. There is a cost sharing provision requirement by FEMA that can be as low as zero percent.

The non-Federal sponsor has just completed a dune restoration project to partially replace the erosion losses due to Hurricane Ivan to provide storm protection for existing infrastructure, mainly Scenic Highway 98 and Gulf-front development. The current most threatened areas are the beneficiaries of this effort; Miramar Beach, Dune Allen and the Inlet Beach areas. The funding was provided by FEMA.

Temporarily, the non-Federal sponsor has deferred emergency work in anticipation of a Federal project. This deferral should be viewed as an anomaly and such work will be performed if project implementation is delayed for some reason.

Beach-*fx* executes a nourishing action after each hurricane event, which averages about 125,000 cy of material on the beach. This material is trucked in for placement on the beach and has a cost of about $30 per cy. Reach 2, which is all State Recreation Area Lands and Reach 4 which is primarily State Recreation Area Lands do not receive emergency nourishment.

3.3.14 Rebuilding

The model allows the user to define a distribution (triangular, you provide minimum, most likely, and maximum) of the number of days required for rebuilding, at the damage element (DE) level, that is, the distribution can be changed for each damage element. Thus, the user might enter 350, 365, or 380 to get a distribution around one year. At the start of each iteration, a value is drawn for the sample, setting the rebuilding time for the damage element for that iteration. The Walton County existing condition rebuilding parameters for single and multi-family construction was 365, 730 and 1,825 days. Walkovers, pools, jacuzzis, were assigned 365, 548 and 730 days. The number of times rebuilding could occur was unlimited if sufficient room on the lot permitted rebuilding.

If a DE is damaged to any degree, and has not been "rebuilt" more times than the maximum allowable, then a "rebuilding event" is set at a time in the future corresponding to the random rebuilding time. When the simulation reaches that time, the lot on which the DE exists is checked to see if it is buildable. The model makes a simple check based on whether or not the landward toe of the dune has retreated past the center point of the lot. If so, the lot is not buildable, and rebuilding does not take place.

If the lot is rebuildable at the time of rebuilding, then structure and contents values are restored to their initial values at the start of the simulation, such that they are able to be taken as damages again at the next storm event, and the number of times the damage element is rebuilt is incremented by one.

3.3.15 Combining Damages – Composite Damage Function

Total damage element damages are calculated using a composite damage function that takes into account damages for all damage mechanisms present while avoiding double counting. Because a structure may be damaged by more than one storm damage hazard a methodology was needed to be developed for combining the damages. This methodology was defined during the IWR workshop and is included in Attachment II of Appendix B – Economic Investigations.

3.3.16 Recreation Benefits

In order to determine the recreation benefits for a tentatively selected plan an economic value must be placed on the recreation experience at the Walton County Beaches. This value can then be applied to the increase in visitation which results from the project to determine the NED recreation benefits. For this report, unit day values (UDV's) are used to determine the economic value of recreation at Walton County Beaches. UDV's are administratively determined values which represent the National Economic Development (NED) recreation values for typical types of recreation. Guidance for their use is provided by Engineering Regulation 1105-2-100.

UDV's are determined using a point system that takes into account the following factors: recreation experience, availability of opportunity, carrying capacity, accessibility, and environmental (esthetics) quality. A good deal of judgment is required in the assessment of point values. A group of planning professionals with knowledge of the study area made independent judgments of the UDV values which were averaged. The UDV point totals convert to a recreation value of $5.07 for the without project condition and $5.16 for the with project condition. These values were applied to the increase in visitation over the study period. The difference between the without and with project value of recreation determines the recreation benefits. The complete recreation analysis can be found in Attachment I of Appendix B. The source of the value of recreation is obtained from Economic Guidance Memorandum, 10-03, Unit Day Values for Recreation, Fiscal Year 2010.

3.4 ENVIRONMENTAL

3.4.1 Environmental Considerations

The study area is located in Walton County, Florida as illustrated in Figure 1. During the late 1990s, this region endured several strong hurricanes, most notably Hurricanes Opal in 1995 and Hurricane Georges in 1998. More recently, the entire coast of Walton County sustained major beach and dune erosion from Hurricane Ivan in 2004 and Hurricane Dennis in 2005. Erosion occurred both in terms of beach profile lowering and dune erosion. Major dune recession occurred throughout the County, including a number of locations where high dune-bluff escarpments replace the once established dune systems. These areas have become particularly vulnerable to further storm erosion.

Environmental Impacts associated with Hurricane Ivan have resulted in decreased beach area and elevation. Such impacts directly affect availability for suitable nesting habitat required for nesting sea turtles. If nesting does occur, the lower elevations allow the nests to be more vulnerable to water inundation from lesser magnitude storms. Narrower beaches decrease the areas for shorebirds to forage and rest. Damage to the previously established dunes system destroyed much of the existing vegetation that provides stabilization. The absence of the dunes and associated vegetation eliminates

much of the suitable habitat required to sustain beach mice populations and other wildlife that relies on these types of habitats for their continued survival.

These impacts provide environmental restoration opportunities within the proposed project area. Restoring a beach-dune system allows greater stability and sustainability of the coastal environment once it has become re-established. Restoring the beach and dune habitats that support a variety of associated flora and fauna contribute to the success and continual survival of several threatened or endangered species. The restoration effort will also contribute to the well-being of various other flora and fauna that naturally occur in the immediate vicinity. Restoration opportunities include increasing both the beach berm and dune widths to increase sea turtle nesting habitat and provide numerous benefits to a variety of shore birds, beach mice, and natural vegetation as well as other inhabitants of the coastal environment. The dune vegetation will be restored with naturally occurring dune vegetation designed to create a dune that matches the surrounding natural dune patterns in the area.

The general environmental criteria for projects of this nature are identified in Federal environmental statutes, executive orders, planning guidelines, and the USACE Environmental Operating Principles (EOP). It is the national policy that ecosystem restoration, particularly that which results in the conservation of fish and wildlife resources be given equal consideration with other study purposes in the formulation and evaluation of alternative plans. The basic guidance during planning studies is to assure that care is taken to preserve and protect significant ecological and cultural resources, and to conserve natural resources. These efforts also should provide the means to maintain and restore, as applicable, the desirable qualities of the human and natural environment. Formulation of alternative plans should avoid damaging the environment to the extent practicable and contain measures to minimize or mitigate unavoidable environmental damages. Consistent with laws and policy, alternative plans formulated should avoid damaging the environment to the extent practicable and contain measures to minimize or mitigate unavoidable environmental impacts.

EOP's have been established for evaluation of water resource projects throughout the study process to ensure conservation, environmental preservation, and restoration is considered at the same level as economic issues. These principles are: 1) Strive to achieve environmental sustainability, 2) Consider environmental consequences, 3) Seek balance and synergy, 4) Accept responsibility, 5) Mitigate impacts, 6) Understand the environment, and 7) Respect other views. The following criteria were used to address environmental impacts during the evaluation of alternatives.

- Protection, preservation, and improvement of the existing fish and wildlife resources along with the protection and preservation of coastal and offshore habitat and water quality;

- Consideration in the project design of the least disruptive construction techniques and methods;

- Protection and preservation of endangered and/or threatened species, Critical Habitat, and Essential Fish Habitat (EFH); and
- Preservation of significant historical and archeological resources through avoidance, if possible, or data recordation if destruction of the resources is necessary.

Of primary concern is compliance with the Clean Water Act. Potential water quality impacts associated with the borrowing and placement of fill material associated with beach nourishment operations must be considered. Such activities will include evaluation of sediment from identified borrow sources for placement within the littoral zone throughout the study area. Sediment characteristics of concern are sediment grain size and color. Borrow sediments identified as suitable must match, as closely as possible, the sediment characteristics at the nourishment site. This information has been utilized in the preparation of the Section 404(b)(1) evaluation and also in developing the management requirements to minimize impacts to threatened and/or endangered species under Section 7 of the Endangered Species Act.

Additional issues that have been addressed include coordination with the U.S. Fish and Wildlife Service (USFWS) on six Coastal Barrier Resource System Units. The Coastal Barrier Resources Act (CBRA) limits the expenditure of Federal funds in designated system units so that expenditure would not enhance future/further development of the area. It was initially determined by the Corps that the activities would protect or enhance fish and wildlife resources and habitats within these units which are exempt under CBRA. The CBRA Units that are within the project limits are illustrated in Figure 8 of the Environmental Assessment (EA). Coordination with the USFWS concerning the consistency of proposed actions with the requirements of CBRA has been conducted for the tentatively selected plan and the USFWS does not agree with the Corps' determination for the CBRA exemptions. By letter dated February 22, 2010 the USFWS issued their determination that this project is not consistent with the purpose of CBRA. It should be recognized that CBRA units P31A, FL-96, and FL-94 are the only units that have been determined to fall within the Federal cost-shared project reaches as discussed in Section 4.9. These reaches are for the most part at the tapered ends of those reaches. The decision has been made that funding of these reaches will be 100% locally funded.

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) identified habitats within the marine and estuarine areas of the US that were essential to the management of certain specific fin and shellfish. Areas identified by the Gulf of Mexico Fishery Management Council as EFH include all the marine and estuarine areas of Walton County. Consultation with the National Marine Fisheries Service (NMFS), Habitat Conservation Division has been completed and focuses on minimizing impacts to EFH. Of particular concern is avoidance or minimization of impacts or the enhancement of EFH.

Coordination with the NMFS concerning potential impacts to listed species and critical habitats has been conducted for the selected Federal plan. The consultation and coordination includes efforts to minimize impacts and benefit the recovery of listed

species. Coordination with the USFWS has been conducted through the recent finalization of the Statewide Programmatic Biological Opinion (PBO) for Shore Protection Activities along the Coast of Florida dated August 2011. Due to issues regarding piping plover and beach mice that could not be resolved, the PBO does not address these two species. Coordination for the piping plover and the Choctawhatchee beach mouse will be conducted prior to the final report.

All Federal activities that will affect any land, water use, or natural resource of the coastal zone shall be carried out in a manner which is consistent, to the maximum extent practicable with the enforceable policies of the Florida Coastal Management Program. In addition, water quality certification from the State of Florida is required for all actions to be implemented. The feasibility study of the critically eroded shoreline has been conducted and determined to be consistent with State of Florida's beach management plan.

3.4.1.1 Coastal and Marine Resources

Coastal Walton County consists of approximately 26 miles of both developed and undeveloped beach and dune systems including six miles of state recreation areas and nine miles of state-designated critical eroding areas. The county's coastline also supports a number of coastal dune lakes considered rare worldwide and unique to the northern Gulf of Mexico and the United States. The existing coastal resources within the study area range from natural pristine systems found within state recreation areas to severely disturbed systems found within the more developed areas. The dune systems fronting developed areas range from little or no dune to larger relatively healthy dune systems. North of the county's coastal areas lies Choctawhatchee Bay. The ecosystem associated with Choctawhatchee Bay is typical of northern gulf coast estuaries including wetlands consistent with adjacent estuaries and submerged aquatic vegetation. It is not expected that the Bay will be affected by the proposed beach restoration and will not be considered in this study.

The area has been further characterized by a previous study conducted by Taylor Engineering, Inc. (2003) as a coastal peninsula extending west from the mainland defining the western two-thirds of the coastline and mainland beaches characterizing the eastern third. Behind the county dune system, upland drainage feeds the coastal dune lakes that intermittently breach the dune system and discharge directly into the Gulf of Mexico. The area supports a variety of coastal wildlife with natural communities consistent with the northern Gulf of Mexico. The proposed beach restoration effort may potentially affect three beach zones which define the natural communities within the placement and borrow areas. These zones, addressed in this evaluation, are classified as coastal beach and dune, intertidal swash, and nearshore. These zones are discussed in greater detail in the EA.

An unusual attribute of the Walton County's coastal beach and dune community is the presence of coastal dune lakes. There are a number of dune lakes throughout the Walton County coast as shown in Figure 8. Coastal dune lakes are relatively small

bodies of water that occur in coastal communities along the northern Gulf of Mexico. The lakes are typically separated from the Gulf by a barrier beach and dune system which may be intermittent with or without a meandering tidal outlet. The lakes contain and support valuable wetlands and a variety of coastal wildlife with natural communities unique to this region that may be impacted if the periodic breaching process is impacted by this project. Some of the coastal dune lakes have dune systems 500 feet wide and ridges extending 10-30 feet high and are important breeding areas for insects and crustaceans. Many birds and mammals also utilize coastal dune lakes for food and habitat. The intermittent connection to the Gulf is what distinguishes these lakes as rare. Prior to Ivan, most of the coastal dune lakes were not openly flowing into the Gulf of Mexico. Following Ivan, most all of them were flowing freely into the Gulf. The Florida Natural Areas Inventory designates the coastal dune lakes as “critically impaired in Florida because of extreme rarity.” A more detailed discussion of the coastal dunes lakes can be found in the EA.

The study conducted by Taylor Engineering (2003) also evaluated the native beach characteristics of Walton County and found that the sand in the beach system was fairly uniform throughout the study area. The beach system sediments consist of medium-grained sand with minor amounts of carbonate material. A color analysis determined the Munsell color classification of the native beach sand. Generally, the native sand is described as white with slight variations in localized areas. The geotechnical section of this document presents additional information pertaining to the native beach and borrow area characteristics. In general, the sediment contained in the borrow area is similar to that of the Walton County beaches and considered to be compatible.

FIGURE 8. APPROXIMATE LOCATIONS OF COASTAL DUNE LAKES THROUGHOUT WALTON COUNTY

3.4.1.2 Threatened and Endangered Species

There are several listed species know to exist within the Walton County project area and will require coordination with the appropriate agencies as specified by Section 7 of the Endangered Species Act. Of particular concern within the project areas are:

- Atlantic loggerhead sea turtle
- Green sea turtle
- Leatherback sea turtle
- Kemp's ridley sea turtle
- Hawksbill sea turtle
- Gulf sturgeon
- Choctawhatchee beach mouse
- Piping plover
- Various shorebirds
- Florida manatee
- Gulf coast lupine

A more detailed discussion of the listed species can be found in the EA. Formal consultation has been conducted with both the USFWS and NMFS in accordance with Section 7 of the ESA for species and critical habitats under their purview.

3.4.1.3 Critical Habitats

The proposed beach restoration area falls within the designated Gulf sturgeon Florida Nearshore Gulf of Mexico critical habitat (Unit 11). This area falls under the jurisdiction of the NMFS. Consultation with NMFS regarding the effects of the proposed action on Gulf sturgeon and subsequent potential modification to Gulf sturgeon critical habitat has been conducted. The direct berm and beach placement is adjacent to designated critical habitat for the Choctawhatchee beach mouse (CBM). Consultation with the USFWS regarding the effects of the proposed action on the CBM and subsequent potential modification to its critical habitat has been conducted.

3.4.1.4 Essential Fish Habitat (EFH)

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCA) require that Federal agencies assess potential impacts to EFH for NMFS managed commercial fisheries. In accordance with the MSFCA, any Federal action that has the potential to adversely affect EFH requires consultation with the NMFS. EFH is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity and include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include aquatic areas historically used by fish where appropriate. The near and offshore areas of the Walton County project reaches supports a variety of fish species, primarily small species and juveniles of larger fish species. EFH for many of these species occur within the project area and include such species managed under the purview of the NMFS, Habitat Conservation Division as identified in the EA. EFH consultation has been completed with NMFS, Habitat Conservation Division.

3.4.1.5 Cultural Resources

The Walton County shoreline has been the site of numerous cultural resources investigations since the 1940s. Over forty archaeological and historical sites are known to exist within one mile inland of the current beachfront with at least two of those sites considered potentially eligible or eligible for the National Register of Historic Places. Known archaeological sites suggest that humans have occupied the area as far back as 8500 BC, beginning with the Archaic period. The Walton County coast has been continually although sparsely inhabited up to the present.

In accordance with Section 106 of the National Historic Preservation Act and other relevant cultural resource laws, recommendations and actions have been coordinated with the Florida State Historic Preservation Officer (FLSHPO). Coordination with the appropriate Federally recognized American Indian tribes have been conducted as part

of the required public notice. Plans to avoid or conduct more intensive evaluations of any cultural resources identified during the surveys have been developed and coordinated.

Mobile District's cultural resources staff has provided the appropriate narratives for the National Environmental Policy Act (NEPA) documentation summarizing the results of the cultural resources investigations and coordination. No significant cultural resources have been identified. The Mobile District, as lead Federal agency, has determined that the project will have no effect on historic properties.

3.4.1.6 Hazardous Materials

The material contained in the selected nearshore borrow areas consists of medium-grained marine. These areas are far removed from any historically known sources of contaminants. Also, the material is primarily composed of unconsolidated quartz sand which is considered inert and in areas of high current and wave energy conditions, in which such material is considered to likely be free of contaminants. Typically, considering these conditions, based on 40 CFR 230.60, no testing for contaminants should be necessary. Because of recent events in the Gulf of Mexico, there is concern that there may offshore oil contamination. To date, there has been no evidence to confirm this presence but random sampling may be necessary during the Design and Implementation Phase if instances of offshore contamination are found elsewhere.

3.4.1.7 Sediment Compatibility

The State of Florida requires shoreline storm protection and restoration activities that artificially place sand on the beach from remote sources must use sand similar to the native beach sand in order preserve the beach's natural characteristics to the maximum extent practicable. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system.

The non-Federal sponsor has conducted offshore studies to include geological and geophysical interpretation of seismic records and vibracores, performed by Taylor Engineering, Inc. Subsequent investigations looked at the entire coastline to confirm locations with sufficient quantities for the initial beach placement and future renourishments. To satisfy the state's stringent sand suitability standards, an assessment has been conducted to compare and show that the selected borrow area sand is reasonably compatible with that of the native beach sand. This detailed assessment is included in the geotechnical section of this report.

A Sediment Quality Assurance Plan has been prepared that outlines the steps that must be taken to observe, sample, and test the placed sediments to assure compliance with the standards set by the state of Florida. The technical requirements addressed in this plan include the location of dredging, sediment quality monitoring on the beach, and remedial actions if necessary.

3.4.1.8 Environmental Mitigation

It is believed that the beach restoration efforts will provide numerous benefits towards improving the size and quality of habitats for shoreline wildlife that result from wider beaches and healthier dunes. Biological opinions have been issued by USFWS and NMFS to incorporate methods and measures to avoid and/or minimize environmental impacts to existing habitats and threatened or endangered species and associated critical habitats. These methods and conditions will be incorporated into the proposed action. Based on the identified borrow area and the various coordination conducted with the support agencies, no mitigation requirements have been identified.

3.4.1.9 Borrow Area Environmental Impacts

The non-Federal sponsor has conducted a biological resources survey along with a detailed sub-bottom seismic survey in June 2007. Offshore equipment employed for borrow area excavation typically consists of a hopper dredge and possibly pipelines, equipment barges, marker buoys, and small tugs. Dredging would temporarily affect water quality by increasing local turbidity levels around the dredging sites. Increased water column turbidity during sand excavation would be temporary and localized. The spatial extent of elevated turbidity is expected to be within 1,000 meters of the operation, with turbidity levels returning to ambient conditions within a few hours after completion of the dredging activities. Therefore, no significant long-term impacts to water quality are expected to occur. Elevated turbidity levels resulting from construction should not have a significant negative effect on organisms inhabiting the area.

Given the naturally dynamic waters of the Gulf of Mexico coast, organisms inhabiting the offshore areas adapt well to reasonable environmental changes such as moderate increases in turbidity. Fish and other mobile species may temporarily leave the dredging site if turbidity becomes too great. Dredging activities would result in significant mortality of non-motile benthic organisms. No significant impacts to managed species of finfish or shellfish populations have been identified from the borrow area excavation operations.

3.4.1.10 Environmental Compliance, Coordination, and Agency Views

On 29 June 2004, an interagency meeting was held at the Walton County, Tourist Development Council facility in Santa Rosa Beach, Florida. The purpose of the meeting was to initiate environmental coordination with the interagency team involved in the permitting and environmental compliance processes for the Walton County Shore Protection Feasibility Study. The meeting's primary objects were to identify and discuss environmental issues and opportunities, permitting issues, and environmental compliance requirements associated with the proposed Walton County project. In attendance were representatives from the Corps, Walton County, USFWS, Florida Department of Environmental Protection (DEP), and Florida Fish and Wildlife Conservation Commission (FWCC). It should be noted that representatives from the

NMFS were invited to participate. Communications with the Habitat Conservation Division expressed that the project did not raise issues that would require their representation. A Memorandum for Record (MFR) summarizing the meeting was prepared and distributed. A copy of the MFR is included in the EA.

An important topic of discussion at the interagency meeting dealt with the NEPA process that should be conducted for the Walton County project, specifically whether the project would require an EA or Environmental Impact Statement (EIS). The USFWS expressed that their agency is not viewing this project as one that would require an EIS. Although the project area encompasses some 26 miles of shoreline, the activities will be comprised of segmented beach nourishment and/or dune restoration. The group in attendance felt that given the project characteristics, low level of controversy, absence of contamination, and precedent set by other local beach projects that an EA would be the appropriate level of environmental documentation for the Walton County project. An EA must adequately address the cumulative impacts of the entire project and may be subject to future change into an EIS should any major issues and controversy arise. If the EA results in a finding that no significant resources would be impacted by the proposed actions, a FONSI would be prepared.

The Mobile District has reopened communications with the interagency team to reaffirm this determination. Reaffirmation has been received from the team that their position is that an EA would be the appropriate level of NEPA documentation. The USFWS, in an email dated December 9, 2009 concurs that with the information available an EA is the appropriate level of NEPA documentation. Also in an email dated December 9, 2009, Florida DEP has indicated that they feel the determination as to the appropriate level of NEPA documentation is the Corps' decision as long as it adequately addresses the information outlined in the Joint Coastal Permit (JCP) application package. A conference call was held on December 16, 2009 between Corps representatives and Ntale Kajumba and Paul Gagliano from EPA Region IV. After describing the project and answering several questions the EPA representatives felt that the Corps was justified in the determination to generate an EA. They also affirmed that this decision is the responsibility of the Corps; however, the information contained in the EA must support the FONSI. If the EA reveals significant impacts, then an EIS must be initiated.

The Mobile District maintains the position that based on project characteristics, low level of controversy, absence of chemical contamination, lack of any mitigation requirements, and precedent set by other local beach projects that an EA would be the appropriate level of environmental documentation for the Walton County project.

3.4.2 Status of Environmental Compliance Actions, Coordination, and Documentation

It should be recognized that the non-Federal sponsor proceeded with pursuing a beach restoration plan of their own. Their local project area lays the length of Walton County. The proposed local plan includes a berm design that exhibits a construction profile that has a 207-foot wide berm measured from the existing 9.5 feet NAVD contour with a10-

foot wide dune crest. The proposed plan view and profiles totally encompasses the tentatively selected plan and uses the same borrow site. Subsequently, the County has already completed the process of applying for the state WQC/CZC. They have also completed coordination for threatened and endangered species as required by the ESA, initiated coordination on essential fish habitat (EFH), completed cultural resources coordination, and prepared a draft EA for their local plan. Although their efforts are for a larger area, these same coordinations are required to be conducted for the tentatively selected plan, but have provided a level confidence that the same outcome will be achieved. Much of the information already generated by the sponsor for the local plan has been used in the various coordinations and consultations for the tentatively selected plan.

Although the non-Federal sponsor has conducted the coordination required by the ESA, the Fish and Wildlife Coordination Act (FWCA) requires that Federal agencies consult with the USFWS regarding fish and wildlife resources in the project area. This consultation has been conducted for the tentatively selected plan.

The Coastal Barrier Resources Act of 1982 must also be considered for the tentatively selected plan. The CBRA restricts Federal expenditures and financial assistance within designated CBRA zones in the Gulf and Atlantic Coasts. Several CBRA units are located within the project area. Coordination with the USFWS concerning the consistency of the tentatively selected plan in accordance with the requirements of CBRA for the six system units has been completed in efforts to ensure that the expenditure of Federal funds does not enhance the potential for development within these units.

Table 6A at the end of this section summarizes the coordination and consultations required for environmental compliance for the tentatively selected plan.

3.4.2.1 Water Quality Certification (WQC) Coordination

A Water Quality Certification/Coastal Zone Consistency application with the Florida Department of Environmental Protection (FDEP), Bureau of Beaches and Coastal Systems dated June 27, 2007 has been prepared by the sponsor for their local plan. Their application has been deemed complete but the final permit has not yet been issued. The state has indicated that since the application for the local plan totally encompasses the tentatively selected Federal plan that much of the information submitted in the local application will be accepted for the Federal plan. Most of the required information is already contained in the permit application and the only thing that would be necessary is to replace the project description with the selected Federal plan. The Corps is currently coordinating this effort with FDEP and the non-Federal sponsor.

3.4.2.2 Endangered and Threatened Species

An existing Regional Biological Opinion (RBO) issued by NMFS pertaining to hopper dredging in navigation channels and sand mining areas in the Gulf of Mexico concerning sea turtles and Gulf sturgeon will be useful during the coordination process.

The RBO that was issued in November 2003 directly pertains to dredging operations at the borrow area. A second RBO that will be useful during the coordination of this project is currently being developed by the USFWS with cooperation from the Corps for beach fill projects in the State of Florida. If available during the final coordination stages of this project it will be useful for the coordination of the threatened and endangered species under Section 7 of the Endangered Species Act, but does not address Gulf sturgeon critical habitat. A biological assessment was submitted to initiate formal consultation with NMFS regarding Gulf sturgeon critical habitat.

Although coordination efforts were conducted by the sponsor for the local plan, the Corps has, in addition, conducted formal Section 7 consultation with the USFWS and NMFS for the tentatively selected plan. Biological assessments (BA) were prepared and submitted initiating consultation with both agencies, which addressed the potential impacts to the listed species and/or critical habitats. Copies of these BA's are included in the EA. Based on the evaluation for species and critical habitats under the purview of the USFWS, it is the Corps' assessment that the actions may have an adverse affect on sea turtles, piping plovers, and CBM. Upon further consideration of the previous biological opinion (BO) issued for the local Walton County Project, it is the USFWS opinion that the effects of the proposed activities are not likely to jeopardize the continued existence of these species and not likely to destroy or adversely modify designated critical habitat for the CBM. Subsequently, based on the evaluation for species and critical habitats under the purview of the NMFS, it is the Corps' assessment that the actions may have an adverse affect on Gulf sturgeon but not likely to jeopardize their continued existence and not likely to adversely modify Gulf sturgeon critical habitat.

By email dated March 1, 2010, the NMFS indicated that the Walton County Federal project would not result in additional impacts already coordinated for the non-Federal sponsor (EA-APPENDIX B). In August, 2011, the USFWS finalized the Statewide Programmatic Biological Opinion (PBO) for Shore Protection Activities along the Coast of Florida. The draft PBO indicates that for sand placement actions such as this in the State of Florida, the USFWS has determined that the proposed action would not jeopardize the continued existence of nesting sea turtles. However, there is still a potential for incidental takes in the form of long-term and short-term impacts on sea turtles. The USFWS has therefore imposed terms and conditions to be implemented that would minimize the potential for incidental takes. The USFWS also agrees with the Corps' determination that the proposed action may adversely affect (MAA) non-breeding piping plover. Due to issues regarding piping plover and beach mice that could not be resolved, the PBO does not address these two species. Coordination for the piping plover and the Choctawhatchee beach mouse and will be providing this consultation in a separate document. A copy of the PBO is included in EA-APPENDIX B. Based on the formal consultations regarding threatened and endangered species and associated designated critical habitats, no mitigation requirements have been identified.

3.4.2.3 Fish and Wildlife Coordination Act (FWCA)

Although the non-Federal sponsor has conducted the coordination required by the ESA and formal consultation has been initiated for the tentatively selected plan, the Fish and Wildlife Coordination Act (FWCA) requires that federal agencies consult with the USFWS with regarding fish and wildlife resources in the project area. Such coordination will result in a Fish and Wildlife Coordination Act Report. This coordination has been conducted with the USFWS for the tentatively selected plan in accordance with the FWCA of 1958 regarding impacts to significant fish and wildlife resources and impacts to federally listed or proposed species or their designated or proposed critical habitat, which is in accordance with Section 7 of the Endangered Species Act of 1973. A copy of the coordination letter is included in the EA. A scope of work and transfer of funds to the USFWS has been completed for the preparation of this report. The USFWS has completed and submitted a draft FWCAR report to the Mobile District staff dated October 7, 2010. A copy of the draft FWCAR is included in EA-APPENDIX B.

3.4.2.4 Essential Fish Habitat (EFH)

Coordination with the NMFS, Habitat Conservation Division in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) has been completed involving the dredging and placement activities for tentatively selected plan. Activities have been undertaken to assure that plans identified for this study are not in conflict with existing Federal fishery management plans or do not result in unacceptable impacts to the habitats of managed species.

The Corps will be adhering to water quality requirements under the conditions specified by the Florida Department of Environmental Protection (DEP) to further reduce impacts to EFH. Consultation with the NMFS, Habitat Conservation Division concerning EFH has been completed for the tentatively selected plan pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (PL 94-265). A copy of the coordination documentation is included in the EA. The Corps' assessed the project in relation to impacts to fisheries resources and determined that the overall impact to identified species is considered negligible given the relatively small area and will not result in significant impacts to EFH.

By letter dated October 6, 2010, NOOA's National Marine Fisheries Service (NMFS), Habitat Conservation Division has stated that they have reviewed the Corps' EFH assessment and subsequent information for the proposed selected plan and determined that the NMFS does not have any EFH consultation recommendations to offer. A copy of this letter of determination in included in EA-APPENDIX B. Based on the formal consultations regarding EFH, no mitigation requirements have been identified.

3.4.2.5 Coastal Barrier Resources Act (CBRA)

The CBRA Units that are within the project limits include FL-94, FL-96, FL-95P, FL-93P, P32, and P31A as illustrated in Figure EA-8 of the EA. Coordination with the USFWS concerning the consistency of the tentatively selected plan in accordance with the

requirements of CBRA for the six system units has been initiated to ensure that the expenditure of Federal funds does not enhance the potential for development within these units. A copy of the coordination document in included in the EA.

CBRA units 95P and FL-93P are considered as otherwise protected areas (OPA) and only applies to Federal flood insurance which does not apply to this project. CBRA unit P32 falls within a segment of the project that cannot be justified for Federal funding and will be 100 percent locally funded, which is exempt from CBRA requirements. The Corps initially determined that the tentatively selected plan qualifies for an exemption under Section 6 Exemptions for CBRA units P31A, FL-96, and FL-94. 16 U.S.C. § 3505 (a)(6)(A) identifies projects relating to the study, management, protection, and enhancement of fish and wildlife resources and habitats, including acquisition of fish and wildlife habitats and related lands, stabilization projects for fish and wildlife habitats, and recreational projects. 16 U.S.C. § 3505 (a)(6)(G) also exempts nonstructural projects for shoreline stabilization that are designed to mimic, enhance, or restore natural stabilization systems.

Upon completion of the CBRA consultation, the USFWS does not agree with the Corps' determination for the CBRA exemptions. In their response letter dated February 22, 2010, the USFWS issued their determination that this project is not consistent with the purpose of CBRA. It should be recognized that CBRA units P31A, FL-96, and FL-94 are the only units that have been determined to fall within the Federal cost-shared project reaches as discussed in Section 4.9 of the EA. These reaches are, for the most part, at the tapered ends of those reaches. The non-Federal sponsor is aware of this situation and has agreed to locally fund these segments. Therefore, no Federal funds will be used towards the development of these segments will be 100 percent non-federally funded. Since no Federal funding will be used in the construction of these segments of the project, the CBRA will no longer be applicable.

3.4.2.6 Cultural Resources

Archival research and field work has been initiated by the non-Federal sponsor. Sonographics, Inc conducted a cultural resource survey and detail phase sub-bottom seismic survey in June 2007. Potential identified cultural resources were investigated using qualitative visual observations. It was determined that none of the anomalies detected appeared to represent any type of cultural resources and a determination was made that the activities associated with this project are unlikely to affect any historic or cultural resources. The county subsequently initiated coordination with the Florida Division of Historic Resources presenting this determination. In a letter dated December 11, 2008, concurrence was issued by the Florida Division of Historic Resources for the project. This determination covers the same areas as the tentatively selected plan. Section 106 consultation has been initiated for the Federal plan using this existing information.

In accordance with Section 106 of the National Historic Preservation Act and other relevant cultural resource laws, recommendations and actions have been coordinated with the FLSHPO. The Mobile District's cultural resources staff has composed a letter indicating that the Mobile District has reviewed the aforementioned cultural resources survey and review by the FLSHPO. Based on this information, and the nature of the project, the Mobile District, as lead Federal agency, has determined that the tentatively selected plan will have no effect on historic properties as per 36 CFR 800.4(d)(1). A copy of this coordination is included in the EA. By letter dated March 11, 2010 the FLSHPO provided their concurrence that the Federal action will have no effect on historic properties. A copy of this coordination is included in EA-APPENDIX B. Based on the consultation regarding cultural resources, no mitigation requirements have been identified.

3.4.2.7 National Environmental Policy Act (NEPA) Documentation

During an interagency meeting held in June 2004, it was determined that given the project characteristics, low level of controversy, absence of chemical contamination, and precedent set by other local beach projects that an EA would be the appropriate level of environmental documentation for the Walton County project. The EA must adequately address the cumulative impacts of the entire project. It is recognized that if the findings of the EA is that the major Federal undertaking will not significantly affect the environment then a Finding of No Significant Impact (FONSI) will be prepared.

An EA, based on the tentatively selected plan, has been prepared and included with this report. Also, a 404(b)(1) Evaluation Report has also been prepared based on the final geotechnical assessments conducted on both the borrow and native beach characteristics. The 404(b)(1) confirms that the borrow material closely matches that of the native beach. Any adverse impacts would come from increased turbidity, which is expected to be short term in nature. No mitigation requirements have been identified associated increased turbidity levels resulting from placement of the borrow material on the beaches. This report is included as part of the EA.

As required by NEPA, a public notice for this project has been issued on April 27, 2010, in accordance with rules and regulations published in the Federal Register on 26 April 1988. These laws are applied whenever dredged or fill materials may enter waters of the United States, or for the transportation of dredged material for the purpose of placement into ocean waters. The only comment received in response to the public notice was from the Seminole Tribe of Florida. By letter dated May 27, 2010, they indicated that they have no objection to the project. A copy of their letter is included in the EA.

It should also be considered that all of the required formal consultations have been completed and no mitigation requirements have been identified for the proposed selected project.

TABLE 6A
STATUS OF AGENCY COORDINATIONS AND CONSULTATIONS

APPLICABLE LAW/REGUALTION	AGENCY	COORDINATION/CONSULTATION	
		INITIATED	STATUS
National Environmental Policy Act (NEPA)		Public Notice Issued April 27,2010	1 no objection comment received.
Endangered Species Act (ESA)	U.S. Fish and Wildlife Service	Consulted initiated January 15, 2010	In August, 2011, the USFWS finalized the Statewide Programmatic Biological Opinion (PBO) for Shore Protection Activities along the coast of Florida. The PBO indicates that for actions such as this in Florida, the USFWS has determined that the proposed action would not jeopardize the continued existence of nesting sea turtles. The final PBO will require separate coordination for the piping plover and beach mouse.
	NOAA-National Marine Fisheries Service, Office of Protected Resources	Consultation initiated January 15, 2010	Email dated March1, 2010, concurring that project would not result in additional impacts already coordinated for the non-Federal sponsor
Fish and Wildlife Coordination Act (FWCA)	U.S. Fish and Wildlife Service	Request for Fish and Wildlife Coordination Act Report (FWCAR) initiated January 8, 2010	Draft report received October 7, 2010.
Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) – Essential Fish Habitat (EFH)	NOAA-National Marine Fisheries Service, Habitat Conservation Division	EFH consultation initiated January 8, 2010	Letter received October 6, 2010, NMFS, Habitat Conservation Division determined that they do not have any EFH additional consultation recommendations to offer.
Coastal Barrier Resources Act (CBRA)	U.S. Fish and Wildlife Service	CBRA consultation initiated January 13, 2010	Letter received February 22, 20210 indicating USFWS's determination that project is not consistent with the purpose of CBRA.
National Historic Preservation Act (NHPA)	Florida Division of Historic Resources	Cultural resources consultation initiated January 8, 2010	Letter received March 11, 2010 that FLSHPO concurred the action will have no effect on historic properties.
Clean Water Act (CWA)	Florida Department and Environmental Protection (FDEP)	No water quality certification application at this time	Draft 404(b)(1) Evaluation Report prepared. Currently coordinating with the FDEP and non-Federal sponsor
Coastal Zone Management Act	Florida Department and	No application at this time	Currently coordinating with

3.5 FUTURE WITHOUT PROJECT CONDITION

3.5.1 General

Most of the existing shoreline is developed with the exception of state and county lands. Those properties not currently developed will likely be developed in the future. The development will likely be single and multi-family with little commercial trade development. The undeveloped areas are zoned by the County to insure that future development is compatible to neighboring property. Commercial development that may occur will be located on the north side of the beach inland from the shoreline. This development will be limited if the beach system continues to degrade and current development will ultimately be impacted, perhaps irreparably, as additional beach and dune area is lost.

Without restoration, there will be continued degradation of a valuable beach ecosystem and loss of associated habitats and benefits. The habitats will remain particularly vulnerable to wave and storm activity that continually threaten and will prevent the re-establishment of valuable natural resources. Degradation of valuable dune and beach habitat including sea turtle nesting habitat, shorebird foraging and roosting areas, dune habitat that supports various flora and fauna, and general beach ecosystem functions will persist as the area continues to be vulnerable to even minor storm activity.

Continued degradation of the beach system will have a negative effect on the value of the properties located along the beach because of cost to the property owners of increased insurance costs. As the properties experience damage there will be the loss of ability to utilize ones property as well as the loss of rental income from rental property. These losses will have a negative effect on not just the immediate area of the beach but on the general economy of the southern portion of Walton County as tourism in this area will diminish along with the value that it adds to the local economy.

3.5.2 Damages

The Beach-*fx* hurricane and storm damage model was executed to simulate the future without project condition over the study period of analysis for 100 iterations (realizations). The model process is event driven, that is, it processes storm events as they happen. In the first year if there are three storm events, then the model calculates the change in beach morphology from the start year to the time for the first storm. Beach losses and any damages are calculated and triggers are checked to ascertain if any action may be warranted, for example, an emergency nourishment action. If not then the revised beach morphology is adapted for each reach as it responds to the passage of time. It then moves to the next event, a storm, and the process repeats itself until the end of the iteration and the model is reset and another possible future storm event is run. When 100 iterations are complete, summary variables are computed and read into output files to protect them. Table 7 displays the future without project condition by study reach. Table 7A shows average annual damages by type for the future without project condition to illustrate what is being damaged comparatively.

TABLE 7
WITHOUT PROJECT DAMAGES
AVERAGE VALUES – PER 53-YEAR ITERATION (EXCEPT AVERAGE ANNUAL VALUES)

Study Reach	Model Reach	Average Structure Damage	Average Content Damage	Average Total Damage	Average Annual Damages	Average Emergency Nourishment	Average Annual Emergency Nourishment
1	R1-1 to R1-24	$14,138,949	$6,011,169	$20,150,119	$1,082,511	$5,033,773	$270,425
2	R2-1 to R2-6	$9,908	$0	$9,908	$532	$181,819	$9,768
3	R3-1 to R3-26	$19,554,284	$5,266,372	$24,820,659	$1,333,421	$16,633,442	$893,586
4	R4-1 to R4-9	$3,863,133	$1,554,697	$5,417,829	$291,058	$2,942,889	$158,099
5	R5-1 to R5-51	$16,501,429	$4,481,685	$20,983,115	$1,127,259	$18,206,371	$978,091
	All Reaches	$54,067,703	$17,313,923	$71,381,630	$3,834,781	$42,998,294	$2,309,969

TABLE 7A
AVERAGE ANNUAL WITHOUT PROJECT STRUCTURE AND CONTENT DAMAGES BY TYPE

Type	Average Annual Structure Damage	Average Annual Content Damage
Private Access	$6,976	$0
Public Access	$18,796	$0
Commercial	$13,161	$6,191
Gazebo	$48,243	$4,189
Jacuzzi	$682	$0
Small Multi-Family	$49,485	$19,637
Medium Multi-Family	$329,994	$162,168
Large Multi-Family	$305	$14,859
Pool	$74,320	$2,594
Single Family Residential	$1,343,119	$629,710
Walkovers	$689,815	$0
Average Annual Damages	$2,574,895	$839,346

4.0 FORMULATING ALTERNATIVE PLANS

4.1 DEVELOPING MEASURES

Projects are formulated in accordance with policies, principles and procedures contained in Engineering Regulation (ER) 1105-2-100 and related regulations (e.g., ER 200-2-2) describing the planning process developed to implement the Water Resources Council's Principles and Guidelines, and the National Environmental Policy Act. Consideration should be given to structural and nonstructural solutions. Plan formulation should be accomplished systematically to arrive at the best solution, considering all factors, including engineering, economic, environmental, and social. ER 1105-2-100 requires that the effects of alternatives are to be determined and evaluated in terms of four accounts: national economic development (NED); environmental quality (EQ); regional economic development (RED) and other social effects (OSE).

The initial list of measures developed by the study team to address the planning objectives included the following:

- No Action
- Seawalls
- Bulkheads
- Revetments
- Breakwaters
- Groins
- Beach and dune fill
- Land use regulations
- Acquisition (buyouts)
- Relocation

4.2 EVALUATING MEASURES

Coastal protection alternatives can be classified into two groups: Non-structural and structural. Non-structural alternatives can consist of those measures that: control or regulate the use of land and buildings such that damages to property are reduced or eliminated; acquire threatened or damageable property; or, retreat which is relocation of threatened property.

Structural alternatives are composed of those measures that block or otherwise retard erosive coastal processes, or restore or nourish beaches to compensate for erosion. Typically, the hardened structural alternatives consist of seawalls, bulkheads, revetments, breakwaters, or groins. Beach and dune fill is considered a soft structural alternative. In general, seawalls, bulkheads and revetments are shore parallel structures used to retain fill and/or reduce direct wave attack on the backshore. Typical construction materials are timber and steel sheet piles, rock and/or concrete. Breakwaters are also shore parallel structures, typically constructed of rock or concrete, and placed offshore to reduce incoming wave energy. Groins, on the other hand, are

typically shore perpendicular structures used to interrupt the long shore sediment transport to build a protective beach, retard erosion of an existing beach or prevent alongshore transport of sand to some downdrift point. Groins can be constructed of a wide variety of materials. The placement of sand on the beach to provide a larger berm and/or dune and to offset erosion is known as beach or dune fills. Of the structural alternatives, seawalls, bulkheads, revetments, breakwaters and groins are typically expensive to construct. The beach/dune fill option; however, is usually less expensive and more environmentally favorable since it responds to the natural beach environment.

4.3 SCREENING MEASURES

4.3.1 Initial Screening

A matrix was developed to compare and screen the various measures against the initial screening criteria to determine which measures could be carried forward and formulated as alternative solutions to the study needs. The measures were initially screened for:

- Engineering Feasibility
- Economic Feasibility
- Environmental Feasibility

Table 8 displays this matrix and shows what measures demonstrate promise for continued consideration.

Also of concern is assuring that the proposed measures fulfill the stated objectives for the study. A matrix was also developed to compare the success of the various measures against the objectives:

- Reduce shoreline erosion
- Reduce potential for storm damages
- Protect fish and wildlife resources
- Restore beach and dune ecosystem habitats
- Increase recreational opportunities

Table 8A displays the results of the comparison of the measures against the objections.

TABLE 8
INITIAL SCREENING MATRIX

		Non-Structural Measures			Structural Measures					
Screening Criteria	No Action	Regulations	Acquisition	Retreat	Seawall	Bulkhead	Revetment	Breakwater	Groin	Beach Fill
Engineering Feasibility	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Economic Feasibility	No	No	No	No	No	No	No	No	No	Yes
Environmental Feasibility	No	No	Short Term	Short Term	No	No	No	No	No	Yes

TABLE 8A
OBJECTIVES-MEASURES SUCCESS ASSESSMENT MATRIX

		Non-Structural Measures			Structural Measures					
Objectives	No Action	Regulations	Acquisition	Retreat	Seawall	Bulkhead	Revetment	Breakwater	Groin	Beach Fill
Reduce shoreline erosion	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Reduce potential for storm damages	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Protect fish and wildlife resources	No	Yes	Short Term	Yes	No	No	No	No	No	Yes
Restore beach and dune ecosystem habitats	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Increase recreational opportunities	No	Yes	Yes	Yes	No	No	No	No	No	Yes

4.3.2 Measures Screened

4.3.2.1 Non-Structural Measures

While non-structural alternatives serve to reduce damages to the development or structures that have developed along the beach, they do not reduce land loss or damage to the shoreline and dunes. Regulation of land use may establish oceanfront setback limits or restrict building below a certain elevation; however, the study area is nearly fully developed and implementation of additional land use regulations will not serve to reduce the threat of damage to the existing structures. Additionally, there are already regulations in place for building and development along the shoreline of Walton County to minimize the threat of damage to shoreline structures. The County, along with the State, has established evacuation zones and evacuation routes and has in place procedures to alert affected residents and visitors regarding potential storm threats that could impact the coastal shoreline.

Retreat of the affected structure on the existing property is not practicable. Because of the small size of the existing lots, the structures could not be relocated further from the shoreline nor is there available property to relocate the structures upon. Retreat was therefore not considered a viable option and dropped from further consideration.

Property acquisition was also considered as a storm damage reduction measure. Property acquisition would involve the purchase of the damageable property that is threatened by extra-tropical and tropical storms, and relocating the residents. While the implementation of this non-structural measure will likely exceed the cost of any structural measure it will be analyzed further to determine its relative cost.

4.3.2.2 Structural Measures

Structural alternatives serve to reduce land loss or damage to the shoreline and dunes and as a consequence also reduce damages to the development or structures along the beach. These alternatives include the construction of hard structures and/or beach fill.

In the initial consideration of using hard structures it was determined that there were both engineering and environmental factors that would preclude their use. As there were no concentrated locations of erosion the usage of groins was not appropriate. Other hard structures would also disrupt the normal natural dispersal of material down drift. Additionally, Chapter 62B-33 of the State of Florida's Bureau of Beaches and Coastal Systems - Rules and Procedures for Coastal Construction and Excavation, provides guidance on criteria that must be met for use of coastal structures within the state. Specifically, 62b-33.0051 details coastal armoring and related structures and what constitutes an eligible permitable structure and under what condition structures could be authorized. The use of coastal structures in this case would not be consistent with state policy for a shore-wide solution for Walton County.

Additionally, it is believed that the use of hard structures would have a negative impact on listed species inhabiting the area. It has been demonstrated that a loss of nesting habitat related to placement of coastal structures has had an impact on nesting sea turtles in Florida. Structures not only cause the loss of suitable nesting habitat, but can result in the disruption of coastal processes accelerating erosion and interrupting the natural shoreline migration. Because of the effects on sea turtle nesting habitat believed to be caused by coastal structures, the continued vulnerability of remaining nesting habitat to frequent or successive severe weather events, may impact ability of sea turtle populations to survive and recover. In response to periodic storms, the beach itself moves landward, construction or persistence of structures at their pre-storm locations can result in a major loss of nesting habitat. In addition, the presence of hard coastal structures may interfere with nesting turtle access to the beach, result in a change in beach profile and width (downdrift erosion, loss of sandy berms, and escarpment formation), trap hatchlings, and concentrate predatory fishes, resulting in higher probabilities of hatchling predation. The combination of habitat loss and nesting opportunities resulting from beachfront development and subsequent use of coastal structures such as seawalls, bulkheads, and groins is believed to be a threat to sea turtle survival and recovery and should be avoided were possible.

Coastal structures are known to have a similar affect on beach mouse habitat and various shorebirds known to exist along the project area. The use of seawalls, bulkheads, and groins disrupt the natural dune and beach building processes that are critical to the survival of endangered beach mouse populations and shorebirds. Because of the limited remaining habitat such structures could compromise the ability of certain populations to survive and recover. As with sea turtles, the combination of habitat loss to beachfront development and subsequent use of persistent coastal structures to stabilize the shorelines at their pre-storm locations has resulted in an increased threat to species survival and recovery. In order to preserve the survival and recovery of these species, the use of such coastal structures be avoided.

Based on these considerations, beach fill is the only structural measure that can be implemented and also satisfy the study objectives.

4.4 DEVELOPING ALTERNATIVE PLANS

Of the measures that were screened, those remaining that could be considered for implementation can be used to develop alternatives. After these alternatives are developed, they will be evaluated as to how well they satisfy the planning objectives and avoid the planning constraints, and then compared against each other to determine which provides the greatest benefit for the least cost. The measures remaining after the initial screening are acquisition and beach fill.

4.4.1 Acquisition Alternative

The acquisition alternative would remove damageable property off of the beach and dune area. This would consist of acquiring those damage elements and the front lots in the study area. This alternative would remove all damageable structures from the front

lots and would eliminate storm damage to approximately 81 percent of the approximately 814 damage elements in the study area. This results in about a $57,819,000 reduction of the total average damages and about a $3,106,000 reduction of the average annual damages. The cost of this alternative is significant. For this study area, the typical 50-foot front row lot averages one million dollars each, appraised value. There are approximately 20 lots per sub-reach, multiplied by 117 sub-reaches equals about 2,340 lots. At one million dollars each lot, multiplied by 2,340 lots yields about $2.34 billion dollars in land value. When this land value is added to $1.18 billion in damageable structure value (Note: only the value of the first two floors for multi-storied structures was counted in the damageable structure inventory) the resulting approximate cost is about $3.42 billion dollars. The annual cost of this acquisition alternative would be about $193,303,000.

4.4.2 Beach Fill Alternatives

The study team recognized that the dunes along the Walton County shoreline provide the principal protection for the damageable structures. Likewise, the dunes are protected by the shoreline berm. Berm alternatives were formulated for each reach that would likely to provide a robust berm feature in front of the dune. After the optimized berm alternative was developed for each reach, several dune alternatives were analyzed to optimize the dune width needed to provide significant reduction to hurricane and storm damages. Thus the resulting beach fill alternative is a combination of the optimized berm width and the optimized dune width.

The evaluation of erosion control and storm damage reduction alternatives for evaluation took into account some heuristics and prior experience from similar constructed projects. The PDT decided to follow the process that was successfully implemented in the neighboring and adjacent Bay County, Florida, the Panama City Beaches storm damage and beach erosion protection project. The PDT decided that any alternative plans would not change the existing natural berm or dune height. A range of beach fill alternative plans were formulated by the PDT to evaluate both berm width and dune width alternatives. The evaluation approach adopted was a two-phase process with the first phase of the evaluation optimizing the proposed berm width. The second phase would build on the results of the first phase by optimizing the dune width.

4.4.2.1 Berm Width Optimization Alternatives

Four berm width optimization alternatives were formulated for evaluation. These berm width alternatives were specified as minimum, small, medium and maximum beach fill alternatives. These four alternatives berm widths of 50, 75, 100 and 125 feet were held for all profiles except in reach one profile one (R1P1) whose alternative berm width was 25 feet smaller. For reference purposes, the shoreline template depicting the location of the varying width is shown on Figure 9. The specifications of the four alternatives are shown in Table 9.

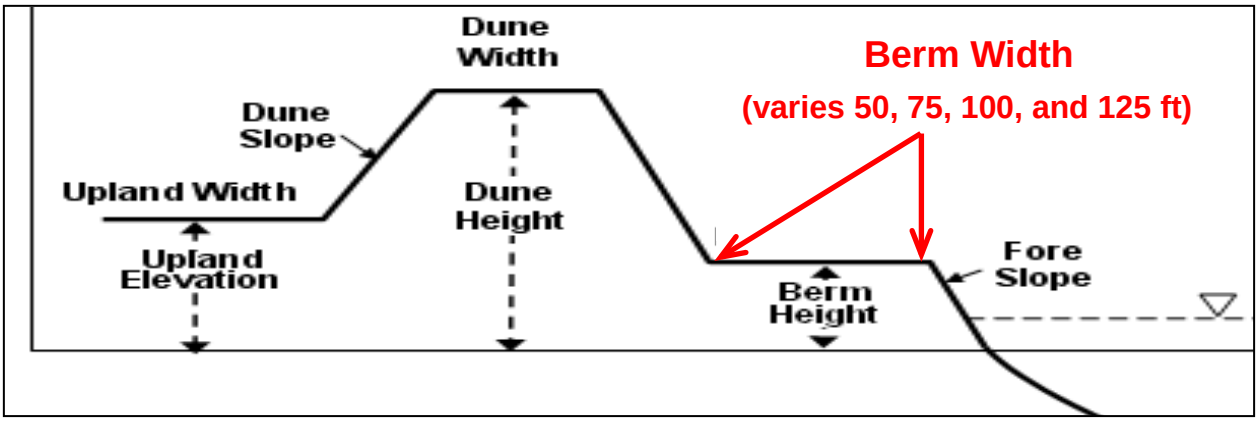


FIGURE 9 – BEACH PROFILE SHOWING VARYING WIDTH OF BERM

TABLE 9
BERM WIDTH OPTIMIZATION
ALTERNATIVES AND SPECIFICATIONS

Reach	Representative Profile	Existing Dune Height (Feet)	Existing Dune Width (Feet)	Alternative Dune Width (Feet)	Alternative Berm Width (Feet)			
					Minimum	Small	Medium	Maximum
1	R1P1	22.2	55	75	25	50	75	100
	R1P2	13.6	100	120	50	75	100	125
3	R3P1	23	75	95	50	75	100	125
	R3P2	12.5	45	65	50	75	100	125
4	R4P1	23	50	70	50	75	100	125
	R4P2	10	82	10	50	75	100	125
5	R5P1	32	185	205	50	75	100	125
	R5P2	24	65	85	50	75	100	125
	R5P3	15.5	50	70	50	75	100	125

4.4.3 Reformulating Beach Fill Alternatives

4.4.3.1 Refining Berm Width Optimization

The berm width optimization runs, that kept the existing dune width constant for the four berm width optimization alternatives, resulted in justified economic reaches that were not very combinable to yield robust beach-fill features. As a result, the PDT reformulated the six alternatives to include additional dune width to test the assumption that protecting the toe of the dune would be of great benefit. These four alternatives were re-run in Beach-*fx* with 20 feet of additional dune width. The results of these runs indicated that the minimum berm template was the alternative with the greatest net

benefits. Another determination from the Beach-*fx* runs of the berm width optimizations was that not all sub-reaches were going to be cost justified or they may not be robust enough for coastal hydrodynamic forces. These short sections cannot be effectively protected or left out when sandwiched between larger justified reaches. When the cost of construction per unit of benefited shore length is not reasonably uniform for the entire project area, the project should be subdivided into elements (construction reaches) within which this condition is met.

4.4.3.2 Formulation of Construction Reaches

Five possible construction reaches were formed as candidates for economic justification. Those five construction reaches were identified, numbered one through five from the west to east formed the basis for subsequent alternative analyses. Table 10 depicts the study model reaches contained within the construction reaches.

TABLE 10
WALTON COUNTY CONSTRUCTION REACHES

Construction Reach	Beginning Model Reach	Ending Model Reach	Model Reach Length (ft)	Model Reach Length (miles)
1	R1-11	R1-16	6,191	1.2
2	R3-2	R3-23	22,980	4.4
3	R4-1	R4-6	6,101	1.2
4	R5-1	R5-21	21,688	4.1
5	R5-30	R5-51	22,319	4.2

4.4.3.3 Berm Width Optimization by Construction Reach

The PDT noted that the Minimum Berm width alternative maximized net benefits but there was not an identified alternative plan that was smaller and, as a consequence, the minimum may not be the optimized berm width. The team formulated a smaller berm width plan called the MiniMin alternative to try and bracket an optimized berm width. In addition the alternative of zero added berm width needed to be analyzed. The MiniMin Alternative features a 10-foot berm width in Profile R1-P1 and a 25-foot berm width in the remaining profiles with a +20 foot dune width. Tables 11, 12 and 13 show the design and results of the Zero, MiniMin and the Minimum alternatives and net benefits by construction reach.

TABLE 11
ZERO, MINIMIN AND MINIMUM DESIGN ALTERNATIVES

Representative Profile	Zero Berm Width	MiniMin Berm Width	Minimum Berm Width
R1P1	0	10	25
R1P2	0	25	50
R2P1	0	25	50
R2P2	0	25	50
R3P1	0	25	50
R3P2	0	25	50
R4P1	0	25	50
R4P2	0	25	50
R5P1	0	25	50
R5P2	0	25	50
R5P3	0	25	50

4.4.3.4 The Optimized Berm Width Alternative

A comparison of the net benefits, Table 12, between the MiniMin and the Minimum Alternative reveals that in construction reach 1 the Minimum alternative maximizes net benefits and the MiniMin alternative maximizes net benefits in Construction reaches 2, 3, 4 and 5. Construction reach 1 is composed of profiles R1P1 and R1P2. R1P1 in the Minimum alternative has a berm width of 25 feet whereas profile R1P1 in the MiniMin alternative has a berm width of 10 feet.

TABLE 12
WALTON COUNTY CONSTRUCTION REACHES BERM WIDTH OPTIMIZATION

Construction Reach	Beginning Model Reach	Ending Model Reach	Net Benefits Zero Berm	Net Benefits MiniMin Berm	Net Benefits Minimum Berm	Net Benefits Small Berm	Net Benefits Medium Berm	Net Benefits Maximum Berm
1	R1-11	R1-16	$435,924	$414,516	$440,993	$311,341	$159,172	$13,458
2	R3-2	R3-23	$904,813	$1,742,843	$1,676,708	$1,287,383	$815,509	$26
3	R4-1	R4-6	$97,911	$166,356	$103,342	$22,924	-$117,384	-$76,562
4	R5-1	R5-21	$710,743	$868,767	$600,593	$176,833	-$208,993	-$611,285
5	R5-30	R5-51	$636,087	$932,571	$645,701	$177,435	-$313,043	-$788,554
Total NED			**$2,785,478**	**$4,125,053**	**$3,467,337**	**$1,975,916**	**$335,261**	**-$1,462,917**

Table 12 shows the Optimized Berm Width Alternative is the Minimum beach fill in construction reach one and the MiniMin beachfill in construction reaches 2 through 5. The optimized berm width alternative, then, is the one with berm widths of 25 feet in all profiles and construction reaches as illustrated in Table 13. The resulting widths and the reaches in which the work can be justified are used in the next phase of analysis.

TABLE 13
MINIMIN AND MINIMUM AND OPTIMIZED BERM WIDTH ALTERNATIVES

Representative Profile	MiniMin Berm Width	Minimum Berm Width	Optimized Berm Width
R1P1	10	25	25
R1P2	25	50	25
R2P1	25	50	25
R2P2	25	50	25
R3P1	25	50	25
R3P2	25	50	25
R4P1	25	50	25
R4P2	25	50	25
R5P1	25	50	25
R5P2	25	50	25
R5P3	25	50	25

Denotes optimized berm width

4.4.4 Evaluating Beach Fill Alternative Plans

4.4.4.1 Optimized Dune Width Alternatives

Having determined the optimal berm width for construction, the next phase of analysis optimizes on added dune width. Added dune width alternatives of 0, 10, 20, 30 and 40 feet were run in Beach-*fx* with the optimized berm width alternative of 25 feet (Optimized berm template of 50 feet, 25 berm width plus 25 feet of advanced nourishment). Table 14 lays out the results of the five dune width optimization alternatives. The maximized net benefit by model reach column identifies the added dune width alternative optimized by Beach-*fx* for each model reach (the constructible dune width column on this table will be discussed in the following section).

TABLE 14
DUNE WIDTH OPTIMIZATION

Model Reach	Summed Net Benefits No added Dune Width	Summed Net Benefits 10-ft added Dune Width	Summed Net Benefits 20-ft added Dune Width	Summed Net Benefits 30-ft added Dune Width	Summed Net Benefits 40-ft added Dune Width	Maximized Added Dune Width by Model Reach	Constructible Added Dune Width
R1-1	-$21,973	-$24,268	-$29,633	-$32,663	-$70,656	+00	
R1-2	-$20,560	-$23,275	-$28,261	-$31,277	-$64,626	+00	
R1-3	-$19,452	-$22,450	-$26,062	-$28,842	-$59,847	+00	
R1-4	-$20,515	-$21,875	-$26,597	-$29,331	-$59,152	+00	
R1-5	-$22,644	-$24,528	-$27,754	-$30,620	-$62,686	+00	
R1-6	-$26,738	-$25,173	-$31,575	-$34,387	-$66,491	+10	
R1-7	-$25,776	-$24,932	-$30,447	-$33,119	-$64,351	+10	
R1-8	-$27,070	-$26,652	-$31,812	-$34,591	-$67,592	+10	
R1-9	-$23,183	-$23,071	-$27,636	-$30,195	-$60,899	+10	
R1-10	-$19,414	-$20,251	-$22,745	-$25,250	-$53,615	+00	
R1-11	$30,826	$56,895	$68,085	$66,491	$34,057	+20	+10
R1-12	-$24,859	-$21,595	-$29,833	-$32,618	-$64,658	+10	+10
R1-13	$163,848	$164,890	$159,465	$156,755	$120,973	+10	+10
R1-14	$74,404	$76,523	$72,382	$69,860	$34,592	+10	+10
R1-15	$108,037	$131,552	$189,573	$212,157	$204,933	+30	+30
R1-16	$108,817	$119,998	$151,449	$162,735	$137,214	+30	+30
R1-17	-$10,947	-$8,672	-$12,337	-$13,249	-$44,213	+10	
R1-18	-$6,686	-$4,787	-$8,185	-$10,136	$12,779	+10	
R1-19	-$16,464	-$11,762	-$16,353	-$16,455	-$44,967	+10	
R1-20	-$18,102	-$14,543	-$17,092	-$16,619	-$41,608	+10	
R1-21	-$23,864	-$24,628	-$28,267	-$30,742	-$60,704	+00	
R1-22	-$22,459	-$22,298	-$26,891	-$29,509	-$59,756	+10	
R1-23	-$22,482	-$24,929	-$28,360	-$31,250	-$65,072	+00	
R1-24	-$18,535	-$19,329	-$25,302	-$28,140	-$58,971	+00	
R3-1	-$6,480	-$1,676	-$523	-$1,133	-$48,529	+20	
R3-2	$60,918	$88,440	$99,635	$105,914	$67,319	+30	+10
R3-3	-$3,637	$2,903	$495	-$467	-$39,895	+10	+10
R3-4	-$8,604	-$8,046	-$11,455	-$12,306	-$36,443	+10	+10
R3-5	-$10,952	-$7,497	-$13,443	-$14,081	-$40,631	+10	+10
R3-6	-$13,879	-$9,546	-$16,724	-$17,106	-$44,795	+10	+10
R3-7	-$12,437	-$9,368	-$15,972	-$16,624	-$44,681	+10	+10
R3-8	$6,269	$10,978	$10,427	$10,154	-$33,177	+10	+10
R3-9	$21,777	$33,172	$32,887	$33,918	-$7,904	+30	+30
R3-10	$54,721	$115,738	$157,575	$194,603	$178,292	+30	+30
R3-11	$29,313	$44,573	$49,252	$53,628	$13,442	+30	+30
R3-12	$46,295	$80,649	$104,132	$127,568	$103,900	+30	+30

TABLE 14 (CONTINUED)
DUNE WIDTH OPTIMIZATION

Model Reach	Summed Net Benefits No added Dune Width	Summed Net Benefits 10-ft added Dune Width	Summed Net Benefits 20-ft added Dune Width	Summed Net Benefits 30-ft added Dune Width	Summed Net Benefits 40-ft added Dune Width	Maximized Added Dune Width by Model-Reach	Constructible Added Dune Width
R3-13	$37,990	$42,943	$42,354	$41,955	$656	+10	+30
R3-14	$107,187	$125,032	$125,659	$128,119	$74,087	+30	+30
R3-15	$53,578	$57,577	$56,864	$56,257	$11,006	+10	+30
R3-16	$42,516	$44,866	$45,067	$44,743	$13,220	+20	+30
R3-17	$70,535	$75,378	$76,840	$77,139	$32,760	+30	+30
R3-18	$76,242	$84,878	$86,728	$88,165	$42,842	+30	+30
R3-19	$77,587	$81,617	$83,045	$82,970	$38,210	+20	+30
R3-20	$239,534	$274,140	$287,533	$294,440	$252,339	+30	+30
R3-21	$90,529	$112,124	$118,304	$123,926	$80,356	+30	+30
R3-22	$60,602	$71,894	$70,982	$72,274	$30,460	+30	+30
R3-23	$45,841	$55,004	$53,541	$54,111	$17,947	+10	+30
R4-1	$57,579	$60,774	$59,376	$59,220	-$1,796	+10	+10
R4-2	$56,114	$69,534	$65,479	$66,614	-$9,366	+10	+10
R4-3	-$5,402	-$1,372	-$6,935	-$7,651	$1,532	+40	+10
R4-4	-$1,736	-$1,313	-$3,208	-$3,895	$1,471	+40	+10
R4-5	$22,248	$25,615	$23,096	$22,401	-$848	+10	+10
R4-6	-$405	$3,772	$3,267	$2,791	-$3,672	+10	+10
R5-1	$101,205	$98,415	$95,873	$95,109	$5,332	+00	+10
R5-2	$70,355	$68,018	$64,932	$63,312	$5,423	+00	+10
R5-3	$37,513	$37,398	$33,074	$31,024	$4,439	+00	+10
R5-4	$11,335	$10,860	$6,833	$3,971	$4,502	+00	+10
R5-5	$1	$3,602	-$1,157	-$3,562	$1,157	+10	+10
R5-6	$140,226	$157,419	$154,409	$151,764	-$14,183	+10	+10
R5-7	$200,024	$214,153	$209,752	$206,797	-$9,729	+10	+10
R5-8	$86,384	$100,229	$95,839	$93,221	-$9,455	+10	+10
R5-9	$12,641	$15,448	$8,646	$6,694	$3,995	+10	+10
R5-10	$16,735	$17,865	$12,965	$11,068	$3,770	+10	+10
R5-11	$22,492	$25,100	$18,724	$16,681	$3,768	+10	+10
R5-12	$19,276	$19,473	$16,094	$14,321	$3,182	+10	+10
R5-13	$17,898	$23,227	$15,965	$13,943	$1,934	+10	+10
R5-14	$15,842	$18,371	$12,358	$10,452	$3,484	+10	+10
R5-15	$22,419	$23,919	$18,097	$15,770	$4,322	+10	+10
R5-16	$25,421	$31,720	$27,972	$26,043	-$2,551	+10	+10
R5-17	$6,949	$10,436	$4,477	$3,815	$2,472	+10	+10
R5-18	$24,250	$25,944	$22,209	$20,851	$2,041	+10	+10
R5-19	$462	$4,253	$70	$647	$392	+10	+10

TABLE 14 (CONTINUED)
DUNE WIDTH OPTIMIZATION

Model Reach	Summed Net Benefits No added Dune Width	Summed Net Benefits 10-ft added Dune Width	Summed Net Benefits 20-ft added Dune Width	Summed Net Benefits 30-ft added Dune Width	Summed Net Benefits 40-ft added Dune Width	Maximized Added Dune Width by Model-Reach	Constructible Added Dune Width
R5-20	-$563	$825	-$3,538	-$5,666	$2,975	+40	+10
R5-21	$135	$985	-$3,266	-$5,468	$3,401	+40	+10
R5-30	$31,359	$32,542	$27,446	$25,763	-$4,716	+10	+10
R5-31	$39,204	$40,628	$34,506	$32,596	$2,163	+10	+10
R5-32	$93,797	$116,901	$120,434	$119,260	$77,242	+20	+10
R5-33	$70,338	$76,230	$72,162	$69,274	$25,221	+10	+10
R5-34	$47,939	$51,558	$46,369	$43,212	-$235	+10	+10
R5-35	$52,939	$56,658	$52,726	$49,924	$8,037	+10	+10
R5-36	$97,937	$124,305	$126,632	$126,125	$83,916	+20	+10
R5-37	$76,094	$79,651	$74,974	$71,484	$28,353	+10	+10
R5-38	$97,013	$107,768	$99,436	$95,873	$48,203	+10	+10
R5-39	$90,626	$91,422	$88,855	$86,031	$41,575	+10	+10
R5-40	$49,424	$47,040	$44,289	$42,296	$11,247	+00	+10
R5-41	$44,150	$42,989	$39,376	$37,311	$6,701	+00	+10
R5-42	$28,280	$28,539	$23,859	$21,635	-$8,858	+10	+10
R5-43	$17,851	$17,377	$13,587	$11,494	-$17,881	+00	+10
R5-44	$3,985	$4,253	-$3	-$2,204	-$26,622	+10	+10
R5-45	-$1,618	-$1,157	-$5,345	-$7,562	-$15,038	+10	+10
R5-46	$621	$6,642	$2,709	$408	-$27,913	+10	+10
R5-47	$2,923	$17,635	$15,037	$13,057	-$1,926	+10	+10
R5-48	-$4,635	-$3,737	-$7,661	-$8,418	-$31,424	+10	+10
R5-49	$5,033	$4,860	$3,240	$2,480	-$20,329	+00	+10
R5-50	$9,987	$9,714	$7,843	$7,514	-$20,651	+00	+10
R5-51	$21,836	$23,141	$19,461	$18,844	-$6,300	+10	+10

LEGEND

CONSTRUCTION TEMPLATE 10 FEET OF ADDED DUNE WIDTH	+10
CONSTRUCTION TEMPLATE 30 FEET OF ADDED DUNE WIDTH	+30
ECONOMICALLY JUSTIFIED MODEL REACHES	

4.4.4.2 Constructible Dune Width Alternative

The best beach fill alternative plan based solely on an economic criterion is based on net excess benefits. The optimization by sub-reach shown in Table 14 describes an alternative with jagged added dune widths within those reaches that have positive net benefits and is shown in the Maximized Added Dune Width by Sub-Reach column; however, a project must also be constructible and coastal engineering and constructability issues would point to a uniform smoothed and connected robust beach fill.

One question that arose while evaluating the results of the dune width optimization results was what would be the smallest segment of beach fill that could be constructed and yet perform adequately. Coastal engineering experience suggests that a beach fill as small as 2,000 feet would perform very poorly due to its small size.

If material is placed irregularly alongshore, i.e. gaps along the placement, then the nearshore contours will be altered by the presence of the fill. Wave refraction over irregular contours will tend to cause a systematic pattern of convergence and divergence of breaking waves. Different wave heights and directions along the beach will produce areas of varying erosion and accretion. If the material is not placed over a sufficient length of beach, the material will diffuse or spread laterally to the adjacent areas and the project will perform poorly. The longer the original fill distance, the longer the material will remain in the original fill area.

Using both engineering and sound coastal engineering principles and previous experience a constructible beach fill plan was formulated. That plan utilized the data in Table 14 to include the following attributes.

In Construction Reach 1, (R1-11 to R1-16), unjustified reach R1-12 was added for constructability reasons. Filling this reach ties R1-11 into the larger neighboring reach which would present a robust beach fill of about 6,000 feet. Dune widths were standardized, 10 feet of added dune width in reaches R1-11 to R1-14 and 30 feet of added dune width for reaches R1-15 and R1-16. This reach, R1-11 to R1-16, with transitions is about 7,191 feet or 1.4 miles.

In Construction Reach 2, (R3-2 to R3-23), the 2000-foot justified segment R3-2 and R3-3 is too small of a beach fill segment and would perform too poorly to provide hurricane and storm damage reduction adequately. Filling the unjustified reaches R3-4 to R3-7 would tie this smaller segment in with the larger segment Reach R3-9 through R3-23. A robust beach fill segment from R3-2 to R3-23 would be constructed. Two uniform dune widths would be constructed, 10 feet of added dune with in reaches R3-2 to R3-8 and 30 feet of added dune width in reaches R3-9 to R3-23. This reach, R3-2 to R3-23, with transitions is about 23,980 feet or 4.5 miles.

In Construction Reach 3, (R4-1 to R4-6), the unjustified reaches R4-3 and R4-4 would be filled to provide a uniform and high performing beach fill. This would also eliminate

the need for transitions that would have been required in the unjustified reaches. The predominate 10 feet of added dune width is recommended for this construction reach. This reach R4-1 to R4-6, with transitions is about 7,100 feet or 1.3 miles.

In Construction Reach 4, (R5-1 to R5-21) reaches R5-1 to R5-4 would receive 10 feet of added dune width based on constructability and engineering performance reasons to match the 10 feet of added dune width optimized for the remainder of this construction segment. This reach, R5-1 to R5-21, with transitions is about 22,690 feet or 4.3 miles.

In Construction Reach 5, (R5-30 to R5-51), unjustified reaches R5-45 and R5-48 would receive full beach fill based on engineering and constructability reasons. In addition R5-1to R5 -4 would be constructed with an added dune width of 10 feet to tie into the higher dune elevation along the adjacent State Recreation Area (see construction drawing F-110 of Appendix A, Section 2, Attachment I) This reach, R5-30 to R5-51, is about 22,320 feet or 4.4 miles.

5.0 COMPARING ALTERNATIVE PLANS

From the alternatives analyzed, three plans were developed to satisfy the study objectives. Those plans are the No Action, Acquisition Alternative, and Beach Fill. The plan that maximizes beneficial contributions to the Nation while satisfying the study objectives is designated as the National Economic Development (NED) Plan. Based on the foregoing analysis, that plan is the beach fill alternative.

5.1 NO ACTION PLAN

The no action plan is essentially a status quo plan. It assumes that no additional actions other than that which occurs currently will be undertaken to provide hurricane storm damage and erosion protection to damageable properties in Walton County. The No Action Alternative uses emergency nourishment as the plan to provide hurricane storm damage and erosion protection to damageable properties in Walton County. There are no costs or benefits associated with this plan.

5.2 NON-STRUCTURAL ACQUISITION PLAN

The acquisition alternative would remove damageable property off of the beach and dune area. This would consist of acquiring those damage elements and the front lots in the study area. This alternative would remove all damageable structures from the front lots and would eliminate storm damage to approximately 81 percent of the approximately 814 damage elements in the study area. This results in about a $3,106,000 reduction of the average annual damages. The approximate cost is about $3.42 billion dollars. The annual cost of this acquisition alternative would be about $193,303,000. The resulting BCR is about 0.02

5.3 NATIONAL ECONOMIC DEVELOPMENT (NED) PLAN

5.3.1 General

In Table 14 the constructible added dune width column identifies the NED Plan. This plan is a robust design is based on economics, engineering performance characteristics, constructability and beach fill uniformity. The reach length of the NED Plan is 79,280 feet, about 15.0 miles without transitions, with transitions it is 84,280 feet about 16.0 miles.

Table 15 summarizes the optimum added dune width within the five construction reaches by representative profile.

TABLE 15
OPTIMUM ADDED DUNE WIDTH – REPRESENTATIVE PROFILE

Construction Reach	Representative Profile	Existing Dune Width	Optimum Added Dune Width	Construction Reach Length w/o transitions (feet)	Construction Reach Length w/o transitions (miles)
CR1	R1P1	55	+10		
	R1P2	100	+30		
				6,191	1.2
CR2	R3P1	76	+10 & +30		
	R3P2	45	+10		
				22,980	4.4
CR3	R4P1	50	+10		
	R4P2	85	+10		
				6,101	1.2
CR4	R5P1	185	+10		
	R5P2	65	+10		
	R5P3	50	+10		
				21,688	4.1
CR5	R5P1	185	+10		
	R5P2	65	+10		
	R5P3	50	+10		
				22,319	4.2

5.3.2 Periodic Nourishment – NED Plan

Periodic nourishment is placement of suitable material on a beach at appropriate intervals of time to maintain the design template. Periodic nourishment plans for Walton County do not include any form of retaining structures that would reduce littoral drift from reaching down-drift beaches.

Beach-*fx* examines all reaches to be nourished to determine if mobilization is warranted. The existing reach profile is compared to the design template, and a nourishment volume is determined. If the total nourishment volume for all reaches exceeds a user-defined threshold, then mobilization and nourishment take place. If nourishment is required, then nourishment time is determined based on placement rates. A start

nourishment and end nourishment event for the first reach are created. At the end nourishment event, the reach profile is set to the design template, and the next reach in processing order is examined, to see if nourishment is required. The process continues until all reaches have been handled. The cost of nourishment, including mobilization and placement costs, is calculated based on nourishment volumes and user-defined cost-related parameters.

Once the optimized beach fill template was determined then GENESIS runs were undertaken to determine the effect of longshore transport on the constructed project. These results were incorporated into the Beach-*fx* model and rerun then re-examined to determine renourishment quantities and cycles.

The results of the Beach-*fx* runs with GENESIS information for the NED Plan alternative revealed that there would be four renourishments. The initial fill and four renourishments make for 5 nourishments in 50 years, therefore a 10-year nourishment cycle.

From the 100 different realizations of alternative futures came the total period of analysis volume of 9,613,000 cy and on average five nourishment cycles, the initial and four renourishments. The initial fill is estimated to require on average 3,273,000 cy and each of the four renourishments averaging 1,585,000 cy each. Renourishment summary statistics are presented in Tables 16 and 17. A frequency distribution of renourishment cycles obtained from 100 possible realizations is produced in Table 18.

5.3.2.1 Comparison With Other Renourishment Projects

With the determination that the renourishment cycle for this project will be a 10-year cycle, it would be prudent to compare this with any adjacent renourishment projects to insure that they will perform in concert with this project. The only adjacent Federal project is Panama City Beach, which is immediately updrift in Bay County. The average renourishment interval of 5 years was found to produce the lowest total average equivalent cost in the 1996 Panama City Beaches, Florida General Reevaluation Report (GRR). However, the Panama City Beaches, Florida Beach Erosion Control and Storm Damage Reduction Project 5-year Monitoring Report showed that the 1998/1999 constructed beach project (R-l to R- 91.5) performed above expectations. The 5-year monitoring data showed that the project had retained 85 percent of the as-built fill within the Federal project limits and suggested that the design standard had been violated only at R-84, R-85 and R-86. The post-construction monitoring supports the notion that the average beach nourishment cycle for the project is much greater than 5-years. In addition, the 2009 limited reevaluation study for Carillon Beach and Pinnacle Port updated the economics to determine whether the currently authorized yet federally un-constructed Carillon Beach and Pinnacle Port portion of the Panama City Beaches, Florida Beach Erosion Control and Storm Damage Reduction project was still economically justified. To calculate erosion, wave attack and inundation benefits the engineering-economic Monte Carlo simulation model, Beach- *fx*, which relates beach profile change to storms, coastal processes and nourishment programs was used. The average periodic nourishment for this reach was determined to be on average every 10 years based on 100 iterations in Beach-*fx*.·

TABLE 16
NED PLAN PERIODIC NOURISHMENT SUMMARY STATISTICS
(VOLUMES IN CUBIC YARDS)

	Average	Standard Deviation
Average Total Nourishment Volume	9,613,000	3,828,971
Average Initial Construction Volume	3,273,000	1,418,378
Average Total Renourishment Volume	6,340,000	3,525,053
Average Number of Renourishment	4	
Average Renourishment Volume	1,585,000	

TABLE 17
NED PLAN PERIODIC NOURISHMENT CONFIDENCE INTERVALS
(VOLUMES IN CUBIC YARDS)

Average Initial Construction Volume	2,639,000	
Standard Deviation	1,418,378	
95% Confidence Interval	1,534,626	2,090,620
90% Confidence Interval	1,579,321	2,045,926
Average Total Renourishment Volume	6,341,000	
Standard Deviation	3,525,053	
95% Confidence Interval	5,182,321	6,564,117
90% Confidence Interval	5,293,399	6,453,038

TABLE 18
NOURISHMENT FREQUENCY DISTRIBUTION
100 POSSIBLE FUTURE REALIZATIONS

Number of nourishment	Number of Occurrences
0	0
1	0
2	1
3	11
4	32
5	30
6	19
7	7
8	0
9	0
10	0

5.3.3 Benefit Analysis –NED Plan

Table 19 presents the Hurricane and Storm Damage Reduction (HSDR) benefits by reach, profile and added dune width for the NED Plan. Total HSDR benefits are about $6,375,000.

TABLE 19
WALTON COUNTY - NATIONAL ECONOMIC DEVELOPMENT PLAN HSDR BENEFITS

Model Reach	Profile	Constructed Added Dune Width	Average Annual Benefits	Net Benefits
R1-1	R1P1			
R1-2	R1P1			
R1-3	R1P1			
R1-4	R1P1			
R1-5	R1P1			
R1-6	R1P1			
R1-7	R1P1			
R1-8	R1P1			
R1-9	R1P1			
R1-10	R1P1			
R1-11	R1P1	+10	$73,200	$56,895
R1-12	R1P1	+10	$6,724	-$21,595
R1-13	R1P1	+10	$224,969	$164,890
R1-14	R1P1	+10	$144,690	$76,523
R1-15	R1P2	+30	$243,959	$131,552
R1-16	R1P2	+30	$198,584	$119,998
R1-17	R1P2			
R1-18	R1P2			
R1-19	R1P2			
R1-20	R1P2			
R1-21	R1P1			
R1-22	R1P1			
R1-23	R1P1			
R1-24	R1P1			
SUBTOTALS	**CONSTRUCTION REACH 1**		**$892,126**	**$528,263**
R2-1	R2P1			
R2-2	R2P1			
R2-3	R2P2			
R2-4	R2P1			
R2-5	R2P2			
R2-6	R2P1			
R2-7	R2P1			

TABLE 19 (CONTINUED)
WALTON COUNTY - NATIONAL ECONOMIC DEVELOPMENT PLAN
HSDR BENEFITS

Model Reach	Profile	Constructed Added Dune Width	Average Annual Benefits	Net Benefits
R3-1	R3P1			
R3-2	R3P1	+10	$141,423	$88,440
R3-3	R3P1	+10	$29,953	$2,903
R3-4	R3P2	+10	$5,429	-$8,046
R3-5	R3P2	+10	$7,911	-$7,497
R3-6	R3P2	+10	$7,880	-$9,546
R3-7	R3P2	+10	$12,225	-$9,368
R3-8	R3P1	+10	$48,793	$10,978
R3-9	R3P1	+30	$75,572	$33,918
R3-10	R3P1	+30	$270,209	$194,603
R3-11	R3P1	+30	$105,765	$53,628
R3-12	R3P1	+30	$209,218	$127,568
R3-13	R3P1	+30	$105,096	$41,955
R3-14	R3P1	+30	$231,799	$128,119
R3-15	R3P1	+30	$133,717	$56,257
R3-16	R3P1	+30	$103,195	$44,743
R3-17	R3P1	+30	$163,262	$77,139
R3-18	R3P1	+30	$180,787	$88,165
R3-19	R3P1	+30	$169,918	$82,970
R3-20	R3P1	+30	$396,750	$294,440
R3-21	R3P1	+30	$208,111	$123,926
R3-22	R3P1	+30	$152,143	$72,274
R3-23	R3P1	+30	$120,997	$54,111
R3-24	R3P2			
R3-25	R3P2			
R3-26	R4P1			
SUBTOTALS	**CONSTRUCTION REACH 2**		**$2,880,154**	**$1,541,680**

TABLE 19 (CONTINUED)
WALTON COUNTY - NATIONAL ECONOMIC DEVELOPMENT PLAN
HSDR BENEFITS

Model Reach	Profile	Constructed Added Dune Width	Average Annual Benefits	Net Benefits
R4-1	R4P1	+10	$71,122	$60,774
R4-2	R4P1	+10	$52,477	$69,534
R4-3	R4P2	+10		-$1,372
R4-4	R4P2	+10		-$1,313
R4-5	R4P1	+10	$33,929	$25,615
R4-6	R4P2	+10	$5,415	$3,772
R4-7	R4P2			
R4-8	R4P1			
R4-9	R4P1			
SUBTOTALS	**CONSTRUCTION REACH 3**		**$162,943**	**$157,010**
R5-1	R5P2	+10	$113,617	$98,415
R5-2	R5P2	+10	$80,091	$68,018
R5-3	R5P2	+10	$47,651	$37,398
R5-4	R5P2	+10	$19,353	$10,860
R5-5	R5P2	+10	$13,386	$3,602
R5-6	R5P1	+10	$175,371	$157,419
R5-7	R5P1	+10	$239,830	$214,153
R5-8	R5P1	+10	$126,180	$100,229
R5-9	R5P2	+10	$25,403	$15,448
R5-10	R5P2	+10	$28,271	$17,865
R5-11	R5P2	+10	$35,413	$25,100
R5-12	R5P2	+10	$28,976	$19,473
R5-13	R5P2	+10	$34,186	$23,227
R5-14	R5P2	+10	$28,753	$18,371
R5-15	R5P2	+10	$34,408	$23,919
R5-16	R5P2	+10	$42,398	$31,720
R5-17	R5P3	+10	$23,700	$10,436
R5-18	R5P2	+10	$36,055	$25,944
R5-19	R5P3	+10	$11,997	$4,253
R5-20	R5P2	+10	$10,537	$825

TABLE 19 (CONTINUED)
WALTON COUNTY - NATIONAL ECONOMIC DEVELOPMENT PLAN
HSDR BENEFITS

Model Reach	Profile	Constructed Added Dune Width	Average Annual Benefits	Net Benefits
R5-21	R5P2	+10	$11,737	$985
R5-22	R5P3			
R5-23	R5P3			
R5-24	R5P2			
R5-25	R5P2			
R5-26	R5P1			
R5-27	R5P3			
R5-28	R5P3			
R5-29	R5P2			
SUBTOTALS CONSTRUCTION REACH 4			**$1,167,316**	**$907,660**
R5-30	R5P2	+10	$11,702	$32,542
R5-31	R5P2	+10	$22,988	$40,628
R5-32	R5P1	+10	$87,887	$116,901
R5-33	R5P1	+10	$42,941	$76,230
R5-34	R5P1	+10	$27,691	$51,558
R5-35	R5P1	+10	$32,058	$56,658
R5-36	R5P1	+10	$104,824	$124,305
R5-37	R5P1	+10	$29,558	$79,651
R5-38	R5P1	+10	$45,484	$107,768
R5-39	R5P1	+10	$23,597	$91,422
R5-40	R5P2	+10	$11,162	$47,040
R5-41	R5P2	+10	$11,694	$42,989
R5-42	R5P2	+10	$10,664	$28,539
R5-43	R5P2	+10	$9,887	$17,377
R5-44	R5P2	+10	$9,268	$4,253
R5-45	R5P2	+10	$8,952	-$1,157
R5-46	R5P2	+10	$15,341	$6,642
R5-47	R5P2	+10	$24,513	$17,635
R5-48	R5P3	+10	$3,661	-$3,737
R5-49	R5P3	+10	$3,669	$4,860
R5-50	R5P3	+10	$3,626	$9,714
R5-51	R5P3	+10	$4,352	$124,305
SUBTOTALS CONSTRUCTION REACH 5			**$1,272,875**	**$1,076,123**
TOTALS ALL CONSTRUCTION REACHES			**$6,375,413**	**$4,210,736**

5.3.4 NED Plan Costs and Benefits

Modeling with Beach-*fx* began in January 2005 using the post Hurricane Ivan surveys. Post Ivan, the very active 2005 hurricane season sent five named storms to the State of Florida. In the Gulf of Mexico, Hurricane Katrina, which made landfall in Mississippi and several other storms since then, Hurricane Dennis for example, have devastated the beaches of Northwest Florida of which Walton County is no exception. These conditions have changed the morphology of the study area in significant ways since the post Ivan surveys used in the Beach-*fx* modeling.

The Beach-*fx* modeling efforts predicted an initial fill requirement of 2,639,000 cy for the NED Plan. Recent surveys have shown that the erosion activity that has occurred since the post Hurricane Ivan surveys would require an equivalent initial NED placement of about 3,273,000 cy to fill the initial construction template. Renourishments will still be on a 10-year cycle with the renourishment volume of 1,585,000 for the NED Plan.

The FY 2011 initial construction costs are $55,496,000 and a single renourishment FY 2011 cost is $22,517,000. Renourishment costs for each fill are lower that the FY 2011 cost due to present worthing. Total project first cost including Interest during construction for this plan is $91,459,000. The annualized cost including O&M is $4,4474,000. The annualized benefits,$6,391,000 include both HSDR benefits of about $6,375,000 and recreation benefits of about $16,000. The BCR is 1.43 to 1 which yields net benefits of about $1,917,000.

Table 20 summarizes the costs, benefits and other pertinent information on project justification for the NED Plan.

TABLE 20
SUMMARY BENEFITS NED PLAN
WALTON COUNTY, FLORIDA - FEASIBILITY

	FY 2011 Dollars	Category
	$55,496,000	2014 Initial Construction
	$14,434,620	2024 Renourishment
	$9,635,078	2034 Renourishment
	$6,431,393	2044 Renourishment
	$4,292,941	2054 Renourishment
Total Economic First Cost	$90,290,000	
Interest During Construction	$1,168,568	
Total Project Economic First Cost	$91,459,000	
Average Annual Economic First Cost	$4,349,000	
Annual O&M	$124,500	
Total Average Annual Economic Cost	$4,474,000	
Average Annual HSDR Benefits	$6,375,000	
Average Annual Recreation Benefits	$16,000	
Total Average Annual Benefits	$6,391,000	
Benefit-to-Cost Ratio	1.43	
Net Benefits	$1,917,000	

5.4 LOCALLY PREFERRED PLAN (LPP)

5.4.1 General

The PDT met with the non-Federal sponsor and presented the NED Plan. The non-Federal sponsor approved of the plan and committed to supporting that conclusion. When asked if that plan was also the preferred plan, the non-Federal sponsor indicated that they would like to have added to the project the unjustified reaches R1-1 to R1-10. The non-Federal sponsor has just recently constructed a similar project in those reaches. Also they would like to have reaches R1-17 to R1-24 added to the project. The beach fill in the added reaches will match the adjacent beach fill of the NED Plan, a 50-foot berm width and 30-feet of added dune in profile R1P2 and 10-feet of added dune width in profile R1P1. The LPP adds 18,811 feet to construction reach one which gives a total length of 25,002 feet about 4.7 miles. Total reach length of the LPP without transitions is 98,091 feet, about 18.6 miles. With transitions the LPP is 103,091 feet, about 19.5 miles. Table 21 details the features of the LPP.

TABLE 21
LOCALLY PREFERRED PLAN
ADDED REACHES R1-1 TO R1-10 AND R1-17 TO R1-24

Model Reach	Summed Net Benefits No added Dune Width	Summed Net Benefits 10-ft added Dune Width	Summed Net Benefits 20-ft added Dune Width	Summed Net Benefits 30-ft added Dune Width	Summed Net Benefits 40-ft added Dune Width	Maximized Added Dune width by Sub-Reach	Profile	LPP Added Dune Width
R1-1	-$21,973	-$24,268	-$29,633	-$32,663	-$70,656	+00	R1P1	+10
R1-2	-$20,560	-$23,275	-$28,261	-$31,277	-$64,626	+00	R1P1	+10
R1-3	-$19,452	-$22,450	-$26,062	-$28,842	-$59,847	+00	R1P1	+10
R1-4	-$20,515	-$21,875	-$26,597	-$29,331	-$59,152	+00	R1P1	+10
R1-5	-$22,644	-$24,528	-$27,754	-$30,620	-$62,686	+00	R1P1	+10
R1-6	-$26,738	-$25,173	-$31,575	-$34,387	-$66,491	+10	R1P1	+10
R1-7	-$25,776	-$24,932	-$30,447	-$33,119	-$64,351	+10	R1P1	+10
R1-8	-$27,070	-$26,652	-$31,812	-$34,591	-$67,592	+10	R1P1	+10
R1-9	-$23,183	-$23,071	-$27,636	-$30,195	-$60,899	+10	R1P1	+10
R1-10	-$19,414	-$20,251	-$22,745	-$25,250	-$53,615	+00	R1P1	+10
R1-11	$30,826	$56,895	$68,085	$66,491	$34,057	+20	R1P1	+10
R1-12	-$24,859	-$21,595	-$29,833	-$32,618	-$64,658	+10	R1P1	+10
R1-13	$163,848	$164,890	$159,465	$156,755	$120,973	+10	R1P1	+10
R1-14	$74,404	$76,523	$72,382	$69,860	$34,592	+10	R1P1	+10
R1-15	$108,037	$131,552	$189,573	$212,157	$204,933	+30	R1P2	+30
R1-16	$108,817	$119,998	$151,449	$162,735	$137,214	+30	R1P2	+30
R1-17	-$10,947	-$8,672	-$12,337	-$13,249	-$44,213	+10	R1P2	+30
R1-18	-$6,686	-$4,787	-$8,185	-$10,136	$12,779	+10	R1P2	+30
R1-19	-$16,464	-$11,762	-$16,353	-$16,455	-$44,967	+10	R1P2	+30
R1-20	-$18,102	-$14,543	-$17,092	-$16,619	-$41,608	+10	R1P2	+30
R1-21	-$23,864	-$24,628	-$28,267	-$30,742	-$60,704	+00	R1P1	+10
R1-22	-$22,459	-$22,298	-$26,891	-$29,509	-$59,756	+10	R1P1	+10
R1-23	-$22,482	-$24,929	-$28,360	-$31,250	-$65,072	+00	R1P1	+10
R1-24	-$18,535	-$19,329	-$25,302	-$28,140	-$58,971	+00	R1P1	+10

TABLE 21 (CONTINUED)
LOCALLY PREFERRED PLAN
ADDED REACHES R1-1 TO R1-10 AND R1-17 TO R1-24

Model Reach	Summed Net Benefits No added Dune Width	Summed Net Benefits 10-ft added Dune Width	Summed Net Benefits 20-ft added Dune Width	Summed Net Benefits 30-ft added Dune Width	Summed Net Benefits 40-ft added Dune Width	Maximized Added Dune width by Sub-Reach	Profile	LPP Added Dune Width
R3-1	-$6,480	-$1,676	-$523	-$1,133	-$48,529	+20	R3P1	
R3-2	$60,918	$88,440	$99,635	$105,914	$67,319	+30	R3P1	+10
R3-3	-$3,637	$2,903	$495	-$467	-$39,895	+10	R3P1	+10
R3-4	-$8,604	-$8,046	-$11,455	-$12,306	-$36,443	+10	R3P2	+10
R3-5	-$10,952	-$7,497	-$13,443	-$14,081	-$40,631	+10	R3P2	+10
R3-6	-$13,879	-$9,546	-$16,724	-$17,106	-$44,795	+10	R3P2	+10
R3-7	-$12,437	-$9,368	-$15,972	-$16,624	-$44,681	+10	R3P2	+10
R3-8	$6,269	$10,978	$10,427	$10,154	-$33,177	+10	R3P1	+10
R3-9	$21,777	$33,172	$32,887	$33,918	-$7,904	+30	R3P1	+30
R3-10	$54,721	$115,738	$157,575	$194,603	$178,292	+30	R3P1	+30
R3-11	$29,313	$44,573	$49,252	$53,628	$13,442	+30	R3P1	+30
R3-12	$46,295	$80,649	$104,132	$127,568	$103,900	+30	R3P1	+30
R3-13	$37,990	$42,943	$42,354	$41,955	$656	+10	R3P1	+30
R3-14	$107,187	$125,032	$125,659	$128,119	$74,087	+30	R3P1	+30
R3-15	$53,578	$57,577	$56,864	$56,257	$11,006	+10	R3P1	+30
R3-16	$42,516	$44,866	$45,067	$44,743	$13,220	+20	R3P1	+30
R3-17	$70,535	$75,378	$76,840	$77,139	$32,760	+30	R3P1	+30
R3-18	$76,242	$84,878	$86,728	$88,165	$42,842	+30	R3P1	+30
R3-19	$77,587	$81,617	$83,045	$82,970	$38,210	+20	R3P1	+30
R3-20	$239,534	$274,140	$287,533	$294,440	$252,339	+30	R3P1	+30
R3-21	$90,529	$112,124	$118,304	$123,926	$80,356	+30	R3P1	+30
R3-22	$60,602	$71,894	$70,982	$72,274	$30,460	+30	R3P1	+30
R3-23	$45,841	$55,004	$53,541	$54,111	$17,947	+10	R3P1	+30
R4-1	$57,579	$60,774	$59,376	$59,220	-$1,796	+10	R4P1	+10
R4-2	$56,114	$69,534	$65,479	$66,614	-$9,366	+10	R4P1	+10
R4-3	-$5,402	-$1,372	-$6,935	-$7,651	$1,532	+10	R4P2	+10
R4-4	-$1,736	-$1,313	-$3,208	-$3,895	$1,471	+10	R4P2	+10
R4-5	$22,248	$25,615	$23,096	$22,401	-$848	+10	R4P1	+10
R4-6	-$405	$3,772	$3,267	$2,791	-$3,672	+10	R4P2	+10

TABLE 21 (CONTINUED)
LOCALLY PREFERRED PLAN
ADDED REACHES R1-1 TO R1-10 AND R1-17 TO R1-24

Model Reach	Summed Net Benefits No added Dune Width	Summed Net Benefits 10-ft added Dune Width	Summed Net Benefits 20-ft added Dune Width	Summed Net Benefits 30-ft added Dune Width	Summed Net Benefits 40-ft added Dune Width	Maximized Added Dune width by Sub-Reach	Profile	LPP Added Dune Width
R5-1	$101,205	$98,415	$95,873	$95,109	$5,332	+00	R5P2	+10
R5-2	$70,355	$68,018	$64,932	$63,312	$5,423	+00	R5P2	+10
R5-3	$37,513	$37,398	$33,074	$31,024	$4,439	+00	R5P2	+10
R5-4	$11,335	$10,860	$6,833	$3,971	$4,502	+00	R5P2	+10
R5-5	$1	$3,602	-$1,157	-$3,562	$1,157	+10	R5P2	+10
R5-6	$140,226	$157,419	$154,409	$151,764	-$14,183	+10	R5P1	+10
R5-7	$200,024	$214,153	$209,752	$206,797	-$9,729	+10	R5P1	+10
R5-8	$86,384	$100,229	$95,839	$93,221	-$9,455	+10	R5P1	+10
R5-9	$12,641	$15,448	$8,646	$6,694	$3,995	+10	R5P2	+10
R5-10	$16,735	$17,865	$12,965	$11,068	$3,770	+10	R5P2	+10
R5-11	$22,492	$25,100	$18,724	$16,681	$3,768	+10	R5P2	+10
R5-12	$19,276	$19,473	$16,094	$14,321	$3,182	+10	R5P2	+10
R5-13	$17,898	$23,227	$15,965	$13,943	$1,934	+10	R5P2	+10
R5-14	$15,842	$18,371	$12,358	$10,452	$3,484	+10	R5P2	+10
R5-15	$22,419	$23,919	$18,097	$15,770	$4,322	+10	R5P2	+10
R5-16	$25,421	$31,720	$27,972	$26,043	-$2,551	+10	R5P2	+10
R5-17	$6,949	$10,436	$4,477	$3,815	$2,472	+10	R5P3	+10
R5-18	$24,250	$25,944	$22,209	$20,851	$2,041	+10	R5P2	+10
R5-19	$462	$4,253	$70	$647	$392	+10	R5P3	+10
R5-20	-$563	$825	-$3,538	-$5,666	$2,975	+10	R5P2	+10
R5-21	$135	$985	-$3,266	-$5,468	$3,401	+10	R5P2	+10
R5-30	$31,359	$32,542	$27,446	$25,763	-$4,71	+10	R5P2	+10
R5-31	$39,204	$40,628	$34,506	$32,596	$2,163	+10	R5P2	+10
R5-32	$93,797	$116,901	$120,434	$119,260	$77,242	+20	R5P1	+10
R5-33	$70,338	$76,230	$72,162	$69,274	$25,221	+10	R5P1	+10
R5-34	$47,939	$51,558	$46,369	$43,212	-$235	+10	R5P1	+10
R5-35	$52,939	$56,658	$52,726	$49,924	$8,037	+10	R5P1	+10
R5-36	$97,937	$124,305	$126,632	$126,125	$83,916	+20	R5P1	+10
R5-37	$76,094	$79,651	$74,974	$71,484	$28,353	+10	R5P1	+10
R5-38	$97,013	$107,768	$99,436	$95,873	$48,203	+10	R5P1	+10
R5-39	$90,626	$91,422	$88,855	$86,031	$41,575	+10	R5P1	+10
R5-40	$49,424	$47,040	$44,289	$42,296	$11,247	+00	R5P2	+10

TABLE 21 (CONTINUED)
LOCALLY PREFERRED PLAN
ADDED REACHES R1-1 TO R1-10 AND R1-17 TO R1-24

Model Reach	Summed Net Benefits No added Dune Width	Summed Net Benefits 10-ft added Dune Width	Summed Net Benefits 20-ft added Dune Width	Summed Net Benefits 30-ft added Dune Width	Summed Net Benefits 40-ft added Dune Width	Maximized Added Dune width by Sub-Reach	Profile	LPP Added Dune Width
R5-41	$44,150	$42,989	$39,376	$37,311	$6,701	+00	R5P2	+10
R5-42	$28,280	$28,539	$23,859	$21,635	-$8,858	+10	R5P2	+10
R5-43	$17,851	$17,377	$13,587	$11,494	-$17,881	+00	R5P2	+10
R5-44	$3,985	$4,253	-$3	-$2,204	-$26,622	+10	R5P2	+10
R5-45	-$1,618	-$1,157	-$5,345	-$7,562	-$15,038	+10	R5P2	+10
R5-46	$621	$6,642	$2,709	$408	-$27,913	+10	R5P2	+10
R5-47	$2,923	$17,635	$15,037	$13,057	-$1,926	+10	R5P2	+10
R5-48	-$4,635	-$3,737	-$7,661	-$8,418	-$31,424	+10	R5P3	+10
R5-49	$5,033	$4,860	$3,240	$2,480	-$20,329	+00	R5P3	+10
R5-50	$9,987	$9,714	$7,843	$7,514	-$20,651	+00	R5P3	+10
R5-51	$21,836	$23,141	$19,461	$18,844	-$6,300	+10	R5P3	+10

LEGEND

CONSTRUCTION TEMPLATE 10 FEET OF ADDED DUNE WIDTH	+10
CONSTRUCTION TEMPLATE 30 FEET OF ADDED DUNE WIDTH	+30
ECONOMICALLY JUSTIFIED MODEL REACHES	

5.4.2 Periodic Nourishment – Locally Preferred Plan

The results of the Beach-*fx* runs with GENESIS information for the Locally Preferred Plan alternative revealed that there would be four renourishments. The initial fill and four renourishments make for five nourishments in 50-years, therefore a 10-year nourishment cycle.

From the 100 different realizations of alternative futures came the total period of analysis nourishment volume of 11,024,000 cy and five nourishment cycles, the initial and four renourishments. The initial fill is estimated to require on average 3,868,000 cy, and a total 7,157,000 cy for the four renourishments which average 1,789,000 cy each. Renourishment summary statistics are presented in Tables 22 and 23. A frequency distribution of renourishment cycles obtained from 100 possible realizations is produced in Table 24.

TABLE 22
LOCALLY PREFERRED PLAN PERIODIC NOURISHMENT SUMMARY STATISTICS
(VOLUMES IN CUBIC YARDS)

	Average
Average Total Nourishment Volume	11,024,000
Average Initial Construction Volume	3,868,000
Average Total Renourishment Volume	7,157,000
Average Number of Renourishments	4
Average Renourishment Volume	1,789,000

TABLE 23
LOCALLY PREFERRED PLAN PERIODIC NOURISHMENT CONFIDENCE INTERVALS
(VOLUMES IN CUBIC YARDS)

Average Initial Construction Volume	3,152,000	
Standard Deviation	1,599,545	
95% Confidence Interval	1,913,051	2,237,091
90% Confidence Interval	1,862,647	2,287,494
Average Total Renourishment Volume	7,157,000	
Standard Deviation	4,088,020	
95% Confidence Interval	5,388,314	6,990,788
90% Confidence Interval	5,517,131	6,861,970

TABLE 24
NOURISHMENT FREQUENCY DISTRIBUTION
100 POSSIBLE FUTURE REALIZATIONS

Number of Nourishments	Number of Occurrences
0	0
1	0
2	0
3	14
4	34
5	29
6	19
7	4
8	0
9	0
10	0

5.4.3 Summary Benefit Analysis – Locally Preferred Plan

Table 25 represents the LPP benefits.

TABLE 25
WALTON COUNTY - LOCALLY PREFERRED PLAN BENEFITS

Model Reach	Profile	Constructed Added Dune Width	Average Annual Benefits
R1-1	R1P1	+10	$17,956
R1-2	R1P1	+10	$1,457
R1-3	R1P1	+10	$1,498
R1-4	R1P1	+10	$1,734
R1-5	R1P1	+10	$1,464
R1-6	R1P1	+10	$2,038
R1-7	R1P1	+10	$2,693
R1-8	R1P1	+10	$2,369
R1-9	R1P1	+10	$2,782
R1-10	R1P1	+10	$1,921
R1-11	R1P1	+10	$95,831
R1-12	R1P1	+10	$6,737
R1-13	R1P1	+10	$224,999
R1-14	R1P1	+10	$146,006
R1-15	R1P2	+30	$265,587
R1-16	R1P2	+30	$197,561
R1-17	R1P2	+30	$30,670
R1-18	R1P2	+30	$36,146
R1-19	R1P2	+30	$24,548
R1-20	R1P2	+30	$8,657
R1-21	R1P1	+10	$1,278
R1-22	R1P1	+10	$1,944
R1-23	R1P1	+10	$1,436
R1-24	R1P1	+10	$7,196
R2-1	R2P1		
R2-2	R2P1		
R2-3	R2P2		
R2-4	R2P1		
R2-5	R2P2		
R2-6	R2P1		
R2-7	R2P1		

TABLE 25 (CONTINUED)
WALTON COUNTY - LOCALLY PREFERRED PLAN
BENEFITS

Model Reach	Profile	Constructed Added Dune Width	Average Annual Benefits
R3-1	R3P1		
R3-2	R3P1	+10	$16,564
R3-3	R3P1	+10	$123,080
R3-4	R3P2	+10	$28,920
R3-5	R3P2	+10	$5,396
R3-6	R3P2	+10	$7,669
R3-7	R3P2	+10	$7,533
R3-8	R3P1	+10	$12,117
R3-9	R3P1	+30	$49,759
R3-10	R3P1	+30	$76,139
R3-11	R3P1	+30	$275,161
R3-12	R3P1	+30	$105,910
R3-13	R3P1	+30	$209,524
R3-14	R3P1	+30	$105,083
R3-15	R3P1	+30	$231,743
R3-16	R3P1	+30	$133,717
R3-17	R3P1	+30	$103,195
R3-18	R3P1	+30	$163,242
R3-19	R3P1	+30	$180,744
R3-20	R3P1	+30	$169,906
R3-21	R3P1	+30	$396,536
R3-22	R3P1	+30	$208,199
R3-23	R3P1	+30	$152,371
R3-24	R3P2		
R3-25	R3P2		
R3-26	R4P1		
R4-1	R4P1	+10	$69,522
R4-2	R4P1	+10	$47,773
R4-3	R4P2	+10	$0
R4-4	R4P2	+10	$0
R4-5	R4P1	+10	$32,221
R4-6	R4P2	+10	$5,415
R4-7	R4P2		
R4-8	R4P1		
R4-9	R4P1		

TABLE 25 (CONTINUED)
WALTON COUNTY - LOCALLY PREFERRED PLAN
BENEFITS

Model Reach	Profile	Constructed Added Dune Width	Average Annual Benefits
R5-1	R5P2	+10	$113,687
R5-2	R5P2	+10	$80,078
R5-3	R5P2	+10	$47,634
R5-4	R5P2	+10	$19,346
R5-5	R5P2	+10	$13,331
R5-6	R5P1	+10	$174,603
R5-7	R5P1	+10	$239,130
R5-8	R5P1	+10	$125,823
R5-9	R5P2	+10	$25,396
R5-10	R5P2	+10	$28,256
R5-11	R5P2	+10	$35,413
R5-12	R5P2	+10	$28,964
R5-13	R5P2	+10	$34,162
R5-14	R5P2	+10	$28,731
R5-15	R5P2	+10	$34,400
R5-16	R5P2	+10	$42,357
R5-17	R5P3	+10	$23,698
R5-18	R5P2	+10	$36,040
R5-19	R5P3	+10	$11,863
R5-20	R5P2	+10	$10,526
R5-21	R5P2	+10	$11,736
R5-22	R5P3		
R5-23	R5P3		
R5-24	R5P2		
R5-25	R5P2		
R5-26	R5P1		
R5-27	R5P3		
R5-28	R5P3		
R5-29	R5P2		
R5-30	R5P2	+10	$41,615
R5-31	R5P2	+10	$54,424
R5-32	R5P1	+10	$135,413
R5-33	R5P1	+10	$89,447
R5-34	R5P1	+10	$64,991
R5-35	R5P1	+10	$68,957

TABLE 25 (CONTINUED)
WALTON COUNTY - LOCALLY PREFERRED PLAN
BENEFITS

Model Reach	Profile	Constructed Added Dune Width	Average Annual Benefits
R5-36	R5P1	+10	$147,407
R5-37	R5P1	+10	$98,230
R5-38	R5P1	+10	$123,595
R5-39	R5P1	+10	$108,862
R5-40	R5P2	+10	$57,539
R5-41	R5P2	+10	$54,804
R5-42	R5P2	+10	$39,019
R5-43	R5P2	+10	$26,194
R5-44	R5P2	+10	$11,719
R5-45	R5P2	+10	$8,952
R5-46	R5P2	+10	$15,328
R5-47	R5P2	+10	$24,451
R5-48	R5P3	+10	$6,763
R5-49	R5P3	+10	$23,356
R5-50	R5P3	+10	$29,212
R5-51	R5P3	+10	$41,083
Average Annual Benefits LPP			**$6,542,998**

5.4.4 Locally Preferred Plan Costs and Benefits

Modeling with Beach-*fx* began in January 2005 using the post Hurricane Ivan surveys. During the very active 2005 hurricane season, five named storms affected the State of Florida. In the Gulf of Mexico, Hurricane Katrina, which made landfall in Mississippi and several other storms since then, Hurricane Dennis, for example, have devastated the beaches of Northwest Florida of which Walton is no exception. These conditions have changed the morphology of the study area in significant ways since the post Hurricane Ivan surveys used in Beach-*fx* modeling efforts predicted initial fill requirements of 3,152,000 cy. The NED and the LPP plans maintain the same placement template (see Economic Appendix Figure B-6) but the LPP extends the coverage area to the westernmost limits of the county where the NED Plan could not justify the coverage. Recent surveys have shown that the erosion activity that has occurred since the post Hurricane Ivan surveys would require an equivalent LPP placement of 2,980,000 cy. If the historical long-term erosion rate is applied to the predicted construction timeframe of FY14, then the necessary LPP beach fill initial construction requirements will be 3,868,000 cy. Renourishments will still be on a 10-year cycle and the renourishment volume is 1,789,000 cy for the LPP. The economic benefit period for this project begins with the base year of 2014, and ends at the conclusion of 2063. The project will be fully

constructed in 2014, and will be renourished in 2024, 2034, 2044, and 2054. The final renourishment in 2054 will function through 2063, the last year of the economic benefit evaluation period.

The FY2011 initial construction costs are $63,306,000 and a single renourishment FY 2011 cost is $25,300,000. Renourishment costs for each fill are lower than the FY 2011 cost due to present worthing. Total project cost including interest during construction for this plan is $103,762,000. The average annual construction cost is about $4,934,000 and annual O&M is $168,000 making total average annual costs of$5,102,000. The annualized benefits, $6,559,000, include both HSDR benefits of about $6,543,000 and recreation benefits of about $16,000. The BCR is 1.21 to 1 which yields net benefits of about $1,457,000. Table 26 summarized the costs, benefits and other pertinent information on project justification for the LPP Plan.

TABLE 26
SUMMARY BENEFITS LPP PLAN
WALTON COUNTY, FLORIDA - FEASIBILITY

	FY 2011 Dollars	Category
	$63,306,000	2014 Initial Construction
	$16,218,674	2024 Renourishment
	$10,825,930	2034 Renourishment
	$7,226,285	2044 Renourishment
	$4,922,478	2054 Renourishment
Total Economic First Cost	$102,499,000	
Interest During Construction	$1,263,422	
Total Economic Project First Cost	$103,762,000	
Average Annual Economic First Cost	$4,934,000	
Annual O&M	$168,000	
Total Average Annual Economic Cost	$5,102,000	
Average Annual HSDR Benefits	$6,543,000	
Average Annual Recreation Benefits	$16,000	
Total Average Annual Benefits	$6,559,000	
Benefit-to-Cost Ratio	1.29	
Net Benefits	$1,457,000	

5.5 SYSTEM OF ACCOUNTS

Principles and Guidelines prescribe for an evaluation of project benefits for the final array of alternatives and the selected plan according to the four accounts: National Economic Development (NED), Regional Economic Development (RED), Other Social Effects (OSE), and Environmental Quality (EQ).

The NED benefits were fully and illustratively presented throughout the economic analysis. Regional Economic Development Benefits are calculated using the Economic Impact Forecasting System (EIFS). EIFS is an regional economic impact assessment model that uses economic multipliers and a database of economic and financial statistics by county to measure the economic and financial impact to a community through various increases and/or decreases in economic activity in that community.

The Other Social Effects (OSE) account, would report that there are either no negative impacts on community cohesion or community growth. There will be minor to no appreciable impacts on tax or property values. There will be a small positive impact to front row residents who are likely to incur less impacts from erosion and wave action due to the project.

The evaluation of the System of Accounts is displayed in Table 27.

TABLE 27
SYSTEM OF ACCOUNTS

Problem Area: Walton County, Florida				
Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.				
Item	**No Action**	**Acquisition**	**NED Plan**	**LPP Plan**
A. PLAN DESCRIPTION	No Federal Action	Buyout all row one damageable elements and land	Construct a 50-foot beach fill project in five reaches	Construct a 50-foot beach fill project in five reaches
B. IMPACT ASSESSMENT				
1. National Economic Development				
a. Beneficial Impacts				
(1) Damages Prevented	$0	$3,106,000	$6,375,000	$6,543,000
(2) Emergency Costs Avoided	$0	$0	$0	$0
(3) Recreation	$0	$0	$16,000	$16,000
(4) Total Beneficial Impacts	None.	$3,106,000	$6,391,000	$6,559,000
b. Adverse Impacts				
(1) Project Cost	$0	$3,420,000,000	$90,290,000	$102,500,000
(2) Interest During Construction	$0	$32,665,600	$1,168,000	$1, 263,000
(3) Average Annual First Cost	N/A	$193,303,000	$4,349,000	$4,934,000
(4) Annual O&M	$0		$125,000	$168,000
(5) Total Avg. Annual Costs	$0	$193,303,000	$4,474,000	$5,102,000
2. Environmental Quality (EQ)				
(1) Ecosystem Restoration	No ecosystem restoration benefits.	Significantly Increased dune habitat from added dune width	Increased habitat from added dune and berm width	Increased habitat from added dune and berm width
(2) Water Circulation	No anticipated effect on water circulation.	No anticipated effect on water circulation.	No anticipated effect on water circulation.	No anticipated effect on water circulation.
(3) Noise Level Changes	No change in noise levels	No change in noise levels	Temporary increase in noise levels during construction	Temporary increase in noise levels during construction

TABLE 27 (CONTINUED)
SYSTEM OF ACCOUNTS

Problem Area: Walton County, Florida				
Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.				
Item	**No Action**	**Acquisition**	**NED Plan**	**LPP Plan**
(4) Public Facilities	N/A	N/A	N/A	N/A
(5) Aesthetic Values	No significant change in aesthetic values	Significant increase to aesthetic improvement	Significant increase to aesthetic improvement	Significant increase to aesthetic improvement
(6) Natural Resources	No impact.	Alternative would result in restoration of coastal marsh resources.	Alternative would result in restoration of coastal marsh resources.	Alternative would result in restoration of coastal marsh resources.
(7) Biological Resources	No impact.	Biological resources would be improved versus the no-action alternative.	Biological resources would be improved versus the no-action alternative.	Biological resources would be improved versus the no-action alternative.
(8) Air Quality	Alternative would have no anticipated effect on air quality	Air emission would be *de minimus*	Air emission would be *de minimus*	Air emission would be *de minimus*
(9) Water Quality	No impact.	No impact.	Temporary negative impacts to water quality due to construction.	Temporary negative impacts to water quality due to construction.
(10) Public Services	Public services to community would continue to be interrupted during storm events	Public services to community would continue to be interrupted during storm events	Public services to community would continue to be interrupted during storm events	Public services to community would continue to be interrupted during storm events
(11) Cultural and Historical Preservation	No impact.	No impact.	No impact.	No impact.
(12) Total Quality of the Environment	No impact.	Environmental quality would be improved.	Environmental quality would be improved.	Environmental quality would be improved.
3. Regional Economic Development (RED)				
(1) Impact on Sales Volume	No impact.	Decrease of **$47,819,840** in sales volume.	Increase of **$171,371,800** in additional sales volume.	Increase of **$180,616,600** in additional sales volume.
(2) Impact on Income	No impact.	Decrease of **$35,723,610** in local income.	Increase of **$31,288,070** in additional local income.	Increase of **$32,975,920** in additional local income.
(3) Impact on Employment	No impact.	Decrease of **1141** jobs.	Increase of **1078** new jobs.	Increase of **1137** new jobs.
(4) Tax Changes	No impact.	Would result in loss of some local tax revenue due to acquisition of properties.	No Change	No Change

TABLE 27 (CONTINUED)
SYSTEM OF ACCOUNTS

Problem Area: Walton County, Florida				
Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.				
Item	**No Action**	**Acquisition**	**NED Plan**	**LPP Plan**
4. Other Social Effects (OSE)				
a. Beneficial Impacts				
(1) Security of Life, Health, and Safety	Continued risks to life, health and safety	Major reduction in potential loss of life of persons and property.	No appreciable difference	No appreciable difference
(2) Community Cohesion	No negative impact on community cohesion.	Community would be dispersed and/or relocated	No negative impact on community cohesion.	No negative impact on community cohesion.
(3) Tax Values	No Impact.	Ownership and land use changes would impact tax value	Increase due to enhanced property values	Increase due to enhanced property values
(4) Community Growth	No Impact.	No Impact.	No Impact.	No Impact.
(5) Property Values	No Impact.	Minor temporary negative impact to adjacent properties during acquisition phase.	Minor Positive impact to protected properties.	Minor Positive impact to protected properties.
(6) Displacement of Businesses	N/A	N/A	N/A	N/A
(7) Public Facilities	N/A	Enhances opportunities for additional public facilities for recreation	Minor improvement to recreational activities from increased beach	Minor improvement to recreational activities from increased beach
(8) Injurious Displacement of Farms	N/A	N/A	N/A	N/A
b. Preservation of loss of life	No Impact.	Some reduction in potential loss of life.	No Change	No Change
C. PLAN EVALUATION				
1. Contributions to Planning Objectives				
a. Flood, Hurricane and/or Storm Damage Reduction	No Improvement.	Total reduction in damages at project site and less stress on dune system.	Significant reduction of storm damages and loss of land	Significant reduction of storm damages and loss of land
b. Recovery of lost environmental resources	Continued loss of environmental resources.	Significant opportunity to recover environmental resources negatively impacted in past	Some Recovery of environmental resources through additional dune area for nesting birds, beach mice and turtles	Some Recovery of environmental resources through additional dune area for nesting birds, beach mice and turtles
2. Response to Planning Constraints				
a. Avoid environmental impacts and minimize induced damages	Continued loss of environmental resources.	Positive effect on environmental resources.	Positive effect on environmental resources.	Positive effect on environmental resources.

TABLE 27 (CONTINUED)
SYSTEM OF ACCOUNTS

Problem Area: Walton County, Florida				
Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.				
Item	**No Action**	**Acquisition**	**NED Plan**	**LPP Plan**
b. Institutional Acceptability	Not supported by state or local government	Not supported by state or local government	Is supported by local and state governments	Is supported by local and state governments
3. Response to Evaluation Criteria				
a. Acceptability	NO	NO	YES	YES
b. Completeness	NO	YES	YES	YES
c. Effectiveness	NO	YES	YES	YES
d. Efficiency (Cost-Effectiveness; i.e., most efficient use of Federal and Non-Federal Funds)	NO	NO	YES	NO
e. Integration	N/A	N/A	N/A	N/A
f. Reversibility	N/A	NO - land could not be resold for development	YES - project nourishment can be abandoned	YES - project nourishment can be abandoned
4. Stakeholder Preference Score (From MCDA weightings analysis)				
a. Summary Score	N/A	N/A	N/A	N/A
Cluster Group A	N/A	N/A	N/A	N/A
Cluster Group B	N/A	N/A	N/A	N/A
Cluster Group C	N/A	N/A	N/A	N/A
Cluster Group D	N/A	N/A	N/A	N/A
b. Stakeholder Preference	NO	NO	Stakeholder would approve.	Stakeholder Preference
D. Implementation Responsibility	No implementation responsibilities	Joint Federal/Non-Federal implementation responsibility.	Joint Federal/Non-Federal implementation responsibility.	Joint Federal/Non-Federal implementation responsibility.
E. State and other Non-Federal Coordination	No State or other Non-Federal coordination activities	Would require State or other Non-Federal coordination activities	Would require State or other Non-Federal coordination activities	Would require State or other Non-Federal coordination activities
F. Risk Evaluation				
1. Risk and Vulnerabilities				
a. Risk of Failure	N/A	Very low risk of failure	Moderate risk of failure.	Moderate risk of failure.
b. Residual Risk	Residual risk of all actions will remain substantial due to storm surge.	Residual risk of all properties purchased virtually eliminated	Residual risk of all actions will remain substantial due to storm surge.	Residual risk of all actions will remain substantial due to storm surge.
c. Reliability	N/A	This plan would provide a significant degree of reliability to properties purchased. Residents are moved out of harm's way.	This plan would provide a significant degree of reliability, would receive damage from storm events, and would require maintenance.	This plan would provide a significant degree of reliability, would receive damage from storm events, and would require maintenance.

TABLE 27 (CONTINUED)
SYSTEM OF ACCOUNTS

Problem Area: Walton County, Florida				
Problems ID: Damages suffered by hurricane-induced surge and wave attack; Potential future damages from storm and hurricane events.				
Item	**No Action**	**Acquisition**	**NED Plan**	**LPP Plan**
d. Relative Sea Level Rise	Problems will be substantially exacerbated by an increasing relative rise of sea level	This Plan will be minimally impacted by an increasing relative rise of sea level over the period of analysis	This Plan will be minimally impacted by an increasing relative rise of sea level over the period of analysis	This Plan will be minimally impacted by an increasing relative rise of sea level over the period of analysis
e. Risk of Ecosystem Damage	Ecosystem damage will continue to accrue at a rate at least that of recent history with substantial negative outcomes.	Ecosystem damage will continue to accrue at a rate at least that of recent history with substantial negative outcomes.	Ecosystem damage will continue to accrue at a rate at less than that of recent history with less substantial negative outcomes.	Ecosystem damage will continue to accrue at a rate at less than that of recent history with less substantial negative outcomes.
f. Risk to Life and Safety	Significant threats to Life and Safety from storm surge will continue. Damages to front row structures and contents will be substantial.	Significant threats to Life and Safety from storm surge will continue. Damages to front row structures would be eliminated.	Significant threats to Life and Safety from storm surge will continue. Damages to front row structures and contents substantially reduced.	Significant threats to Life and Safety from storm surge will continue. Damages to front row structures and contents substantially reduced.
g. Risk to Mental and Physical Health	N/A	N/A	N/A	N/A
2. Recommendations and Preferences				
a. Federal Recommendation			The NED Plan is the plan that maximizes net benefits	
b. Stakeholder Preference	No clear stakeholder preference indicated, but all action plans preferred to no action plan.			The Locally Preferred Plan provides a higher extent of protection over the NED Plan but is more costly. The sponsor is willing to pay 100 percent of the additional cost for this added extent of protection

6.0 SELECTING A PLAN

Based on plan comparison, as shown in Table 27, it is apparent that implementation of a beach fill plan will satisfy the study objectives and provide hurricane and storm damage reduction and environmental restoration along the coastline of Walton County, Florida. Further, both the NED and LPP beach fill plans were found superior to the Acquisition and No Action plans in each of the System of Accounts. The Acquisition Plan would cost nearly 40 times more than the NED and LPP Plans while providing less economic benefit and the no action plan would provide no economic benefit. The NED Plan would have an annual cost of about $4,474,000 with the LPP annual cost totaling about $5,102,000. The annual benefits of the NED Plan would total about $6,391,000 with the LPP annual benefits totaling about $6,559,000. The BCR of the NED Plan is about 1.43 while the BCR of the LPP is about 1.29. The NED Plan would protect about 15.2 miles of the Walton County shoreline while the LPP would protect about 18.8 miles.

Of the plans considered, the non-Federal sponsor has expressed their desire to implement the LPP. Per ER 1105-2-100, the recommended plan may deviate from the NED plan if the non-Federal sponsor agrees to pay the cost difference between the NED plan and the LPP, the LPP has outputs similar in-kind, and the LPP has benefits that are equal or greater to the NED benefits. A waiver, that the LPP be considered for recommendation, was requested and on 7 February 2012, was approved by the ASA (CW). As such, the LPP is the Tentatively Selected Plan (TSP).

6.1 PLAN DETAILS

6.1.1 NED Plan and TSP for Construction with Renourishments

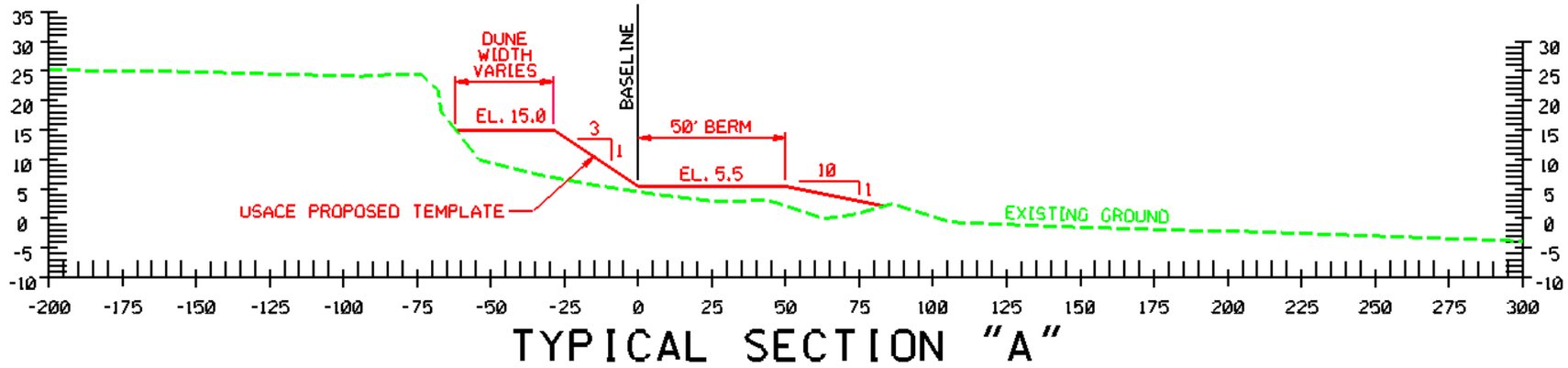
The modeling efforts have predicted initial fill requirements of 2,639,000 cy for the NED Plan and a TSP requirement of 3,152,000 cy. The two plans maintain the same placement template (see Figure 10) but the TSP extends the coverage area to the westernmost limits of the county where the NED Plan could not justify the coverage. If this condition accounts for depletion rates to the predicted construction timeframe of FY14, then the necessary beach fill requirements will be 3,273,000 cy and 3,868,000 cy for the NED and TSP, respectively. Renourishments will still be on a 10-year cycle with renourishment volumes of 1,585,000 and 1,789,000 for the NED and TSP, respectively. Approved borrow sources lie offshore within the State of Florida waters.

6.2 COST SHARE

Typical cost share for HSDR projects is 65 percent Federal and 35 percent non-Federal. Adjustment can be made to this ratio based on adequacy of public access and parking, whether private shoreline is being protected, and if any economically unjustified reach is being included in the selected plan. A cost share analysis presented in Table 28 shows that the cost share ratio for the initial construction costs of the NED Plan would be about 33 percent Federal and about 67 percent non-Federal. The renourishment costs were adjusted similarly while at the same time assuring that, per Section 215 of Water Re-

sources Development Act of 1999, the maximum Federal participation in any reach was limited to 50 percent. The resulting cost share for the NED renourishment costs is about 26 percent Federal and about 74 percent non-Federal. Similarly, the cost share analysis presented in Table 29 shows that the cost share ratio for the initial construction costs of the LPP would be about 31 percent Federal and about 69 percent non-Federal. The cost share ratio for the LPP renourishment costs is about 24 percent Federal and about 76 percent non-Federal. The overall cost ratio for both the initial construction costs and the renourishment costs of the NED plan is about 30 percent Federal and about 70 percent non-Federal. The overall cost ratio for both the initial construction costs and the renourishment costs of the LPP is about 28 percent Federal and about 72 percent non-Federal. Tables 30 and 30A shown below, exhibit the differences between the NED Plan and the LPP.

Table 31 demonstrates if a particular reach qualifies for cost share based on adequacy of public access and parking. The location of beach access points is publicly available on the World Wide Web. The analysis of adequate parking along the beaches requires either a beach capacity or peak user day point of view. Since the beach capacity is greater than the peak day visitation, the peak user day analysis is used. The most recent peak day visitation at Walton County beaches, which occurred during the July 4th 2009 holiday, was estimated at 13,537 visits. Assumptions of the analysis are (1) the demand for public parking originates from both resident and non-residents population; (2) beach rentals on the beach that have access to the beach contribute to the supply of parking in absolute parking space terms without turnover; (3) The large county beach access and parking available at Miramar Beach and other such large day use areas, are very popular and highly attended areas. These areas will, on peak day, operate at full parking capacity where the average daily turnover rate on purely public parking is 1.5 times. Assuming 4.5 persons per vehicle, each parking space will accommodate 6.75 visits per day. Surplus and deficits in parking areas in any reach are available to be used within a quarter mile radius of the loci of the parking supply except near the large day use areas whose supply is completely used.



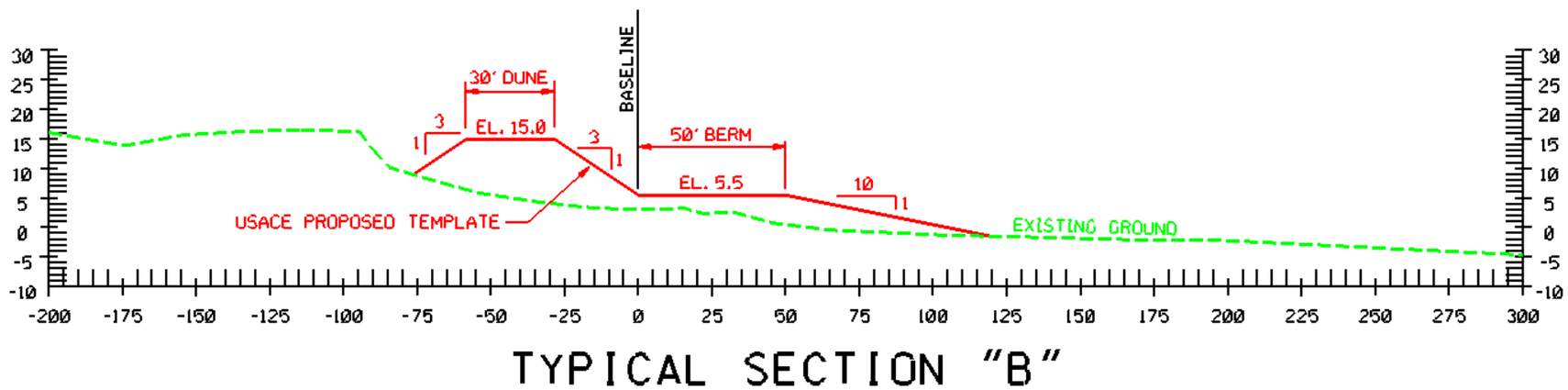


FIGURE 10. TYPICAL PROJECT SECTIONS TO BE CONSTRUCTED

TABLE 28
NED PLAN COST SHARE FEDERAL AND NON-FEDERAL

Reach	Model Reach	Reach Length (ft)	Developed Private	Un Developed Private	Undeveloped Public	Developed Public	Percent Developed Private	Percent Undeveloped Private	Percent Undeveloped Public	Percent Developed Public	Ratio of Reach length	Federal Participation	Federal Share	Non Federal Participation	Construction Reach Length (FEET)
			65%	0%	50%	65%	65%	0%	50%	65%					
			35%	100%	50%	35%	35%	100%	50%	35%					
1	R1-1	1150	1,150	0	0	0	0	0%	0%	0%		0.0%	0.0000		
2	R1-2	1102	560	0	0	0	0	0%	0%	0%		0.0%	0.0000		
3	R1-3	1044	0	0	0	0	0	0%	0%	0%		0.0%	0.0000		
4	R1-4	1002	102	0	0	0	0	0%	0%	0%		0.0%	0.0000		
5	R1-5	1062	1,062	0	0	0	0	0%	0%	0%		0.0%	0.0000		
6	R1-6	1045	998	0	0	0	0	0%	0%	0%		0.0%	0.0000		
7	R1-7	1003	1,003	0	0	0	0	0%	0%	0%		0.0%	0.0000		
8	R1-8	1061	984	0	0	0	0	0%	0%	0%		0.0%	0.0000		
9	R1-9	1014	984	0	0	0	0	0%	0%	0%		0.0%	0.0000		
10	R1-10	959	100	0	0	0	0	0%	0%	0%	0.0012	0.0%	0.0000	100.00%	
11	R1-11	1021	955	66	0	0	94%	6%	0%	0%	0.0127	0.0%	0.0000	100.00%	Construction Reach One
12	R1-12	1057	1057	0	0	0	100%	0%	0%	0%	0.0132	65.0%	0.0086	35.00%	
13	R1-13	1040	1,040	0	0	0	100%	0%	0%	0%	0.0130	65.0%	0.0084	35.00%	
14	R1-14	1051	1,051	0	0	0	100%	0%	0%	0%	0.0131	65.0%	0.0085	35.00%	
15	R1-15	998	923	75	0	0	92%	8%	0%	0%	0.0124	60.1%	0.0075	39.89%	
16	R1-16	1025	883	142	0	0	86%	14%	0%	0%	0.0128	56.0%	0.0071	43.99%	
17	R1-17	1114	100	0	0	0	0	0%	0%	0%	0.0012	62.3%	0.0080	37.66%	
18	R1-18	1133	1,033	100	0	0	0	9%	0%	0%		0.0%	0.0000		
19	R1-19	1058	1,058	0	0	0	0	0%	0%	0%		0.0%	0.0000		
20	R1-20	961	961	0	0	0	0	0%	0%	0%		0.0%	0.0000		
21	R1-21	952	952	0	0	0	0	0%	0%	0%		0.0%	0.0000		
22	R1-22	1028	1,028	0	0	0	0	0%	0%	0%		0.0%	0.0000		
23	R1-23	1086	956	130	0	0	0	12%	0%	0%		0.0%	0.0000		
24	R1-24	1139	1139	0	0	0	0	0%	0%	0%		0.0%	0.0000		
Construction Reach One Sub Totals													0.0482		6391.2

TABLE 28 (CONTINUED)

NED PLAN COST SHARE FEDERAL AND NON-FEDERAL

Reach	Model Reach	Reach Length (ft)	Developed Private	Un Developed Private	Undeveloped Public	Developed Public	Percent Developed Private	Percent Undeveloped Private	Percent Undeveloped Public	Percent Developed Public	Ratio of Reach length	Federal Participation	Federal Share	Non Federal Participation	Construction Reach Length (FEET)
25	R2-1	495	0	0	0	0	0%	0%	0%	0%					
26	R2-2	936	0	0	0	0	0%	0%	0%	0%					
27	R2-3	2160	0	0	0	0	0%	0%	0%	0%					
28	R2-4	2066	0	0	0	0	0%	0%	0%	0%					
29	R2-5	1001	0	0	0	0	0%	0%	0%	0%					
30	R2-6	10078	0	0	0	0	0%	0%	0%	0%					
31	R2-7	1040	0	0	0	0	0%	0%	0%	0%					
32	R3-1	1147	0	0	100	0	0%	0%	9%	0%	0.0012	0.0%	0.0000	100.00%	*
33	R3-2	1037	838	199	0	0	81%	19%	0%	0%	0.0129	0.0%	0.0000	100.00%	Construction Reach Two * *
34	R3-3	1052	904	148	0	0	86%	14%	0%	0%	0.0131	0.0%	0.0000	100.00%	
35	R3-4	1026	914	112	0	0	89%	11%	0%	0%	0.0128	57.9%	0.0074	42.10%	
36	R3-5	1121	1,121	0	0	0	100%	0%	0%	0%	0.0140	65.0%	0.0091	35.00%	
37	R3-6	1185	1,115	70	0	0	94%	6%	0%	0%	0.0148	0.0%	0.0000	100.00%	
38	R3-7	1156	1,120	36	0	0	97%	3%	0%	0%	0.0144	0.0%	0.0000	100.00%	
39	R3-8	1103	909	194	0	0	82%	18%	0%	0%	0.0137	53.6%	0.0074	46.43%	
40	R3-9	1058	875	183	0	0	83%	17%	0%	0%	0.0132	53.8%	0.0071	46.25%	
41	R3-10	1068	1,068	0	0	0	100%	0%	0%	0%	0.0133	65.0%	0.0086	35.00%	
42	R3-11	1045	794	55	196	0	76%	5%	19%	0%	0.0130	58.8%	0.0076	41.24%	
43	R3-12	1007	824	100	83	0	82%	10%	8%	0%	0.0125	57.3%	0.0072	42.69%	
44	R3-13	1004	716	288	0	0	71%	29%	0%	0%	0.0125	46.4%	0.0058	53.65%	
45	R3-14	1345	960	385	0	0	71%	29%	0%	0%	0.0168	46.4%	0.0078	53.61%	
46	R3-15	1062	997	65	0	0	94%	6%	0%	0%	0.0132	0.0%	0.0000	100.00%	
47	R3-16	732	732	0	0	0	100%	0%	0%	0%	0.0091	0.0%	0.0000	100.00%	
48	R3-17	1017	758	259	0	0	75%	25%	0%	0%	0.0127	0.0%	0.0000	100.00%	
49	R3-18	1039	667	372	0	0	64%	36%	0%	0%	0.0129	0.0%	0.0000	100.00%	
50	R3-19	1036	1,036	0	0	0	100%	0%	0%	0%	0.0129	0.0%	0.0000	100.00%	
51	R3-20	1027	922	0	105	0	90%	0%	10%	0%	0.0128	63.5%	0.0081	36.53%	
52	R3-21	1029	903	126	0	0	88%	12%	0%	0%	0.0128	57.0%	0.0073	42.96%	

TABLE 28 (CONTINUED)
NED PLAN COST SHARE FEDERAL AND NON-FEDERAL

Reach	Model Reach	Reach Length (ft)	Developed Private	Un Developed Private	Undeveloped Public	Developed Public	Percent Developed Private	Percent Undeveloped Private	Percent Undeveloped Public	Percent Developed Public	Ratio of Reach length	Federal Participation	Federal Share	Non Federal Participation	Construction Reach Length (FEET)
53	R3-22	978	978	0	0	0	100%	0%	0%	0%	0.0122	65.0%	0.0079	35.00%	
54	R3-23	855	775	80	100	0	91%	9%	12%	0%	0.0107	0.0%	0.0000	100.00%	
55	R3-24	1115	0	200	100	0	0%	18%	9%	0%	0.0139	4.5%	0.0006	95.52%	
Construction Reach Two Sub Totals													0.0913		23,180.4
56	R3-25	1274	0	200	0	0	0%	16%	0%	0%	0.0159	0.0%	0.0000	100.00%	
57	R3-26	1082	0	100	0	0	0%	9%	0%	0%	0.0135	0.0%	0.0000	100.00%	
58	R4-1	1082	922	160	100	0	85%	15%	9%	0%	0.0135	0.0%	0.0000	100.00%	Construction Reach Three
59	R4-2	1126	970	156	0	0	86%	14%	0%	0%	0.0140	0.0%	0.0000	100.00%	
60	R4-3	982	0	0	982	0	0%	0%	100%	0%	0.0122	0.0%	0.0000	100.00%	
61	R4-4	942	0	0	942	0	0%	0%	100%	0%	0.0117	0.0%	0.0000	100.00%	
62	R4-5	998	786	70	142	0	79%	7%	14%	0%	0.0124	58.3%	0.0072	41.70%	
63	R4-6	971	0	0	971	0	0%	0%	100%	0%	0.0121	50.0%	0.0061	50.00%	
64	R4-7	1061	0	0		100	0%	0%	0%	9%	0.0000	0.0%	0.0000	100.00%	
Construction Reach Three Sub Totals													0.0139		6,300.8
65	R4-8	2119	0				0%	0%	0%	0%					
66	R4-9	2075	0			100	0%	0%	0%	5%	0.0000	0.0%	0.0000	100.00%	*
67	R5-1	993	993	0	100	0	100%	0%	10%	0%	0.0124	0.0%	0.0000	100.00%	Construction Reach Four
68	R5-2	1003	805	198	0	0	80%	20%	0%	0%	0.0125	52.2%	0.0065	47.83%	
69	R5-3	1039	809	230	0	0	78%	22%	0%	0%	0.0129	50.6%	0.0066	49.38%	
70	R5-4	1304	1,224	80	0	0	94%	6%	0%	0%	0.0162	61.0%	0.0099	38.99%	
71	R5-5	1009	773	236	0	0	77%	23%	0%	0%	0.0126	49.8%	0.0063	50.20%	
72	R5-6	1062	858	204	0	0	81%	19%	0%	0%	0.0132	52.5%	0.0069	47.49%	
73	R5-7	1038	1,038	0	0	0	100%	0%	0%	0%	0.0129	65.0%	0.0084	35.00%	
74	R5-8	992	992	0	0	0	100%	0%	0%	0%	0.0124	0.0%	0.0000	100.00%	
75	R5-9	1027	881	146	0	0	86%	14%	0%	0%	0.0128	55.8%	0.0071	44.25%	
76	R5-10	1011	744	129	138	0	74%	13%	14%	0%	0.0126	54.7%	0.0069	45.34%	

TABLE 28 (CONTINUED)

NED PLAN COST SHARE FEDERAL AND NON-FEDERAL

Reach	Model Reach	Reach Length (ft)	Developed Private	Un Developed Private	Undeveloped Public	Developed Public	Percent Developed Private	Percent Undeveloped Private	Percent Undeveloped Public	Percent Developed Public	Ratio of Reach length	Federal Participation	Federal Share	Non Federal Participation	Construction Reach Length (FEET)
77	R5-11	1022	1,022	0	0	0	100%	0%	0%	0%	0.0127	65.0%	0.0083	35.00%	
78	R5-12	1018	578	440	0	0	57%	43%	0%	0%	0.0127	36.9%	0.0047	63.09%	
79	R5-13	1017	965	52	0	0	95%	5%	0%	0%	0.0127	61.7%	0.0078	38.33%	
80	R5-14	1005	876	129	0	0	87%	13%	0%	0%	0.0125	56.7%	0.0071	43.34%	
81	R5-15	1011	744	267	0	0	74%	26%	0%	0%	0.0126	47.8%	0.0060	52.17%	
82	R5-16	1035.2	443	592	0	0	43%	57%	0%	0%	0.0129	27.8%	0.0036	72.17%	
83	R5-17	942.6	824	119	0	0	87%	13%	0%	0%	0.0117	56.8%	0.0067	43.21%	
84	R5-18	999.9	689	311	0	0	69%	31%	0%	0%	0.0125	44.8%	0.0056	55.22%	
85	R5-19	1010.9	719	292	0	0	71%	29%	0%	0%	0.0126	46.2%	0.0058	53.78%	
86	R5-20	1028.6	487	168	374	0	47%	16%	36%	0%	0.0128	0.0%	0.0000	100.00%	*
87	R5-21	1122	684	438	100	0	61%	39%	9%	0%	0.0140	0.0%	0.0000	100.00%	*
88	R5-22	1029.7	0		100		0%	0%	10%	0%	0.0012	0.0%	0.0000	100.00%	
Construction Reach Four Sub Totals													0.1141		21,888.4
89	R5-23	1013	0				0%	0%	0%	0%					
90	R5-24	1022	0				0%	0%	0%	0%					
91	R5-25	1054	0				0%	0%	0%	0%					
92	R5-26	884	0				0%	0%	0%	0%					
93	R5-27	1044	0				0%	0%	0%	0%					
94	R5-28	1059	0				0%	0%	0%	0%					
95	R5-29	987	0	0	100		0%	0%	10%	0%	0.0000	0.0%	0.0000	100.00%	*
96	R5-30	1022	556	466	100		54%	46%	10%	0%	0.0127	0.0%	0.0000	100.00%	Construction Reach Five
97	R5-31	1015	737	278	0		73%	27%	0%	0%	0.0126	0.0%	0.0000	100.00%	
98	R5-32	985	985	0	0		100%	0%	0%	0%	0.0123	0.0%	0.0000	100.00%	
99	R5-33	1025	854	171	0		83%	17%	0%	0%	0.0128	54.2%	0.0069	45.84%	
100	R5-34	1038	936	102	0		90%	10%	0%	0%	0.0129	58.6%	0.0076	41.39%	
101	R5-35	1002	945	57	0		94%	6%	0%	0%	0.0125	61.3%	0.0077	38.70%	

TABLE 28 (CONTINUED)

NED PLAN COST SHARE FEDERAL AND NON-FEDERAL

Reach	Model Reach	Reach Length (ft)	Developed Private	Un Developed Private	Undeveloped Public	Developed Public	Percent Developed Private	Percent Undeveloped Private	Percent Undeveloped Public	Percent Developed Public	Ratio of Reach length	Federal Participation	Federal Share	Non Federal Participation	Construction Reach Length (FEET)
102	R5-36	944	826	118	0		87%	13%	0%	0%	0.0118	0.0%	0.0000	100.00%	
103	R5-37	1020	820	200	0		80%	20%	0%	0%	0.0127	0.0%	0.0000	100.00%	
104	R5-38	1094	945	149	0		86%	14%	0%	0%	0.0136	0.0%	0.0000	100.00%	
105	R5-39	1024	925	99	0		90%	10%	0%	0%	0.0128	0.0%	0.0000	100.00%	
106	R5-40	1010	848	162	0		84%	16%	0%	0%	0.0126	0.0%	0.0000	100.00%	
107	R5-41	1004	274	730	0		27%	73%	0%	0%	0.0125	0.0%	0.0000	100.00%	
108	R5-42	1023	0	1,023	0		0%	100%	0%	0%	0.0127	0.0%	0.0000	100.00%	
109	R5-43	1002	918	84	0		92%	8%	0%	0%	0.0125	0.0%	0.0000	100.00%	
110	R5-44	1001	1,001	0	0		100%	0%	0%	0%	0.0125	0.0%	0.0000	100.00%	
111	R5-45	969	969	0	0		100%	0%	0%	0%	0.0121	0.0%	0.0000	100.00%	
112	R5-46	988	682	306	0		69%	31%	0%	0%	0.0123	44.9%	0.0055	55.14%	
113	R5-47	1031	675	356	0		65%	35%	0%	0%	0.0128	42.5%	0.0055	57.45%	
114	R5-48	1026	1,026	0	0		100%	0%	0%	0%	0.0128	65.0%	0.0083	35.00%	
115	R5-49	1041	1,041	0	0		100%	0%	0%	0%	0.0130	65.0%	0.0084	35.00%	
116	R5-50	1032	862	170	0		84%	16%	0%	0%	0.0129	54.3%	0.0070	45.71%	
117	R5-51	1126	943	83	100		84%	7%	9%	0%	0.0140	58.9%	0.0083	41.12%	
Construction Reach Five Sub Totals													0.0651		22,519.2
	Reach with Transition Zone														
* Designates that all or portion of reach is in a CBRA zone (all work in CRBA zone will be 100% non-Federal funded)															
TOTAL FEDERAL COST SHARE													0.3320		
TOTAL NON FEDERAL COST SHARE													0.6680		
TOTAL CONSTRUCTED PROJECT LENGTH							80,280								80280.0

TABLE 29

TENTATIVELY SELECTED PLAN COST SHARE FEDERAL AND NON FEDERAL

Reach	Model Reach	Reach Length (ft)	Developed Private	Un Developed Private	Undeveloped Public	Developed Public	Percent Developed Private	Percent Undeveloped Private	Percent Undeveloped Public	Percent Developed Public	Ratio of Reach length	Federal Participation	Federal Share	Non Federal Participation	Construction Reach Length (FEET)
			65%	0%	50%	65%	65%	0%	50%	65%					
			35%	100%	50%	35%	35%	100%	50%	35%					
1	R1-1	1250	1,250	0	0	0	100%	0%	0%	0%	0.0127	0.0%	0.0000	100.00%	*
2	R1-2	1102	560	0	542	0	51%	0%	49%	0%	0.0112	0.0%	0.0000	100.00%	*
3	R1-3	1044	0	0	1,044	0	0%	0%	100%	0%	0.0106	0.0%	0.0000	100.00%	*
4	R1-4	1002	102	0	900	0	10%	0%	90%	0%	0.0102	0.0%	0.0000	100.00%	*
5	R1-5	1062	1,062	0	0	0	100%	0%	0%	0%	0.0108	0.0%	0.0000	100.00%	
6	R1-6	1045	998	47	0	0	96%	4%	0%	0%	0.0106	0.0%	0.0000	100.00%	
7	R1-7	1003	1,003	0	0	0	100%	0%	0%	0%	0.0102	0.0%	0.0000	100.00%	
8	R1-8	1061	984	77	0	0	93%	7%	0%	0%	0.0108	0.0%	0.0000	100.00%	
9	R1-9	1014	984	30	0	0	97%	3%	0%	0%	0.0103	0.0%	0.0000	100.00%	
10	R1-10	959	761	198	0	0	79%	21%	0%	0%	0.0097	0.0%	0.0000	100.00%	
11	R1-11	1021	955	66	0	0	94%	6%	0%	0%	0.0104	0.0%	0.0000	100.00%	Construction Reach One
12	R1-12	1057	1,057	0	0	0	100%	0%	0%	0%	0.0107	65.0%	0.0070	35.00%	
13	R1-13	1040	1,040	0	0	0	100%	0%	0%	0%	0.0106	65.0%	0.0069	35.00%	
14	R1-14	1051	1,051	0	0	0	100%	0%	0%	0%	0.0107	65.0%	0.0069	35.00%	
15	R1-15	998	923	75	0	0	92%	8%	0%	0%	0.0101	60.1%	0.0061	39.89%	
16	R1-16	1025	883	142	0	0	86%	14%	0%	0%	0.0104	56.0%	0.0058	44.01%	
17	R1-17	1114	667	447	0	0	60%	40%	0%	0%	0.0113	0.0%	0.0000	100.00%	
18	R1-18	1133	1,033	100	0	0	91%	9%	0%	0%	0.0115	0.0%	0.0000	100.00%	
19	R1-19	1058	1,058	0	0	0	100%	0%	0%	0%	0.0107	0.0%	0.0000	100.00%	
20	R1-20	961	961	0	0	0	100%	0%	0%	0%	0.0098	0.0%	0.0000	100.00%	
21	R1-21	952	952	0	0	0	100%	0%	0%	0%	0.0097	0.0%	0.0000	100.00%	
22	R1-22	1028	1,028	0	0	0	100%	0%	0%	0%	0.0104	0.0%	0.0000	100.00%	
23	R1-23	1086	956	130	0	0	88%	12%	0%	0%	0.0110	0.0%	0.0000	100.00%	
24	R1-24	1039	1039	0	0	0	100%	0%	0%	0%	0.0105	0.0%	0.0000	100.00%	
25	R2-1	495	100	0	0	0	20%	0%	0%	0%	0.0010	13.1%	0.0001	86.87%	
Construction Reach One Sub Totals													0.0327		25,202.3

TABLE 29 (CONTINUED)

TENTATIVELY SELECTED PLAN COST SHARE FEDERAL AND NON FEDERAL

Reach	Model Reach	Reach Length (ft)	Developed Private	Un Developed Private	Undeveloped Public	Developed Public	Percent Developed Private	Percent Undeveloped Private	Percent Undeveloped Public	Percent Developed Public	Ratio of Reach length	Federal Participation	Federal Share	Non Federal Participation	Construction Reach Length (FEET)
26	R2-2	936	0	0	0	0	0%	0%	0%	0%					
27	R2-3	2160	0	0	0	0	0%	0%	0%	0%					
28	R2-4	2066	0	0	0	0	0%	0%	0%	0%					
29	R2-5	1001	0	0	0	0	0%	0%	0%	0%					
30	R2-6	10078	0	0	0	0	0%	0%	0%	0%					
31	R2-7	1040	0	0	0	0	0%	0%	0%	0%					
32	R3-1	1147	0	0	100	0	0%	0%	9%	0%	0.0012	0.0%	0.0000	100.00%	*
33	R3-2	1037	838	199	0	0	81%	19%	0%	0%	0.0129	0.0%	0.0000	100.00%	Construction Reach Two
34	R3-3	1052	904	148	0	0	86%	14%	0%	0%	0.0131	0.0%	0.0000	100.00%	
35	R3-4	1026	914	112	0	0	89%	11%	0%	0%	0.0128	57.9%	0.0074	42.10%	
36	R3-5	1121	1,121	0	0	0	100%	0%	0%	0%	0.0140	65.0%	0.0091	35.00%	
37	R3-6	1185	1,115	70	0	0	94%	6%	0%	0%	0.0148	0.0%	0.0000	100.00%	
38	R3-7	1156	1,120	36	0	0	97%	3%	0%	0%	0.0144	0.0%	0.0000	100.00%	
39	R3-8	1103	909	194	0	0	82%	18%	0%	0%	0.0137	53.6%	0.0074	46.43%	
40	R3-9	1058	875	183	0	0	83%	17%	0%	0%	0.0132	53.8%	0.0071	46.25%	
41	R3-10	1068	1,068	0	0	0	100%	0%	0%	0%	0.0133	65.0%	0.0086	35.00%	
42	R3-11	1045	794	55	196	0	76%	5%	19%	0%	0.0130	58.8%	0.0076	41.24%	
43	R3-12	1007	824	100	83	0	82%	10%	8%	0%	0.0125	57.3%	0.0072	42.69%	
44	R3-13	1004	716	288	0	0	71%	29%	0%	0%	0.0125	46.4%	0.0058	53.65%	
45	R3-14	1345	960	385	0	0	71%	29%	0%	0%	0.0168	46.4%	0.0078	53.61%	
46	R3-15	1062	997	65	0	0	94%	6%	0%	0%	0.0132	0.0%	0.0000	100.00%	*
47	R3-16	732	732	0	0	0	100%	0%	0%	0%	0.0091	0.0%	0.0000	100.00%	*
48	R3-17	1017	758	259	0	0	75%	25%	0%	0%	0.0127	0.0%	0.0000	100.00%	
49	R3-18	1039	667	372	0	0	64%	36%	0%	0%	0.0129	0.0%	0.0000	100.00%	
50	R3-19	1036	1,036	0	0	0	100%	0%	0%	0%	0.0129	0.0%	0.0000	100.00%	
51	R3-20	1027	922	0	105	0	90%	0%	10%	0%	0.0128	63.5%	0.0081	36.53%	
52	R3-21	1029	903	126	0	0	88%	12%	0%	0%	0.0128	57.0%	0.0073	42.96%	

TABLE 29 (CONTINUED)

TENTATIVELY SELECTED PLAN COST SHARE FEDERAL AND NON FEDERAL

Reach	Model Reach	Reach Length (ft)	Developed Private	Un Developed Private	Undeveloped Public	Developed Public	Percent Developed Private	Percent Undeveloped Private	Percent Undeveloped Public	Percent Developed Public	Ratio of Reach length	Federal Participation	Federal Share	Non Federal Participation	Construction Reach Length (FEET)
53	R3-22	978	978	0	0	0	100%	0%	0%	0%	0.0122	65.0%	0.0079	35.00%	
54	R3-23	855	775	80	100	0	91%	9%	12%	0%	0.0107	0.0%	0.0000	100.00%	
55	R3-24	1115	0	200	100	0	0%	18%	9%	0%	0.0139	4.5%	0.0006	95.52%	
Construction Reach Two Sub Totals													0.0913		23,180.4
56	R3-25	1274	0	200	0	0	0%	16%	0%	0%	0.0159	0.0%	0.0000	100.00%	
57	R3-26	1082	0	100	0	0	0%	9%	0%	0%	0.0135	0.0%	0.0000	100.00%	
58	R4-1	1082	922	160	100	0	85%	15%	9%	0%	0.0135	0.0%	0.0000	100.00%	Construction Reach Three
59	R4-2	1126	970	156	0	0	86%	14%	0%	0%	0.0140	0.0%	0.0000	100.00%	
60	R4-3	982	0	0	982	0	0%	0%	100%	0%	0.0122	0.0%	0.0000	100.00%	
61	R4-4	942	0	0	942	0	0%	0%	100%	0%	0.0117	0.0%	0.0000	100.00%	
62	R4-5	998	786	70	142	0	79%	7%	14%	0%	0.0124	58.3%	0.0072	41.70%	
63	R4-6	971	0	0	971	0	0%	0%	100%	0%	0.0121	50.0%	0.0061	50.00%	
64	R4-7	1061	0	0		100	0%	0%	0%	9%	0.0000	0.0%	0.0000	100.00%	
Construction Reach Three Sub Totals													0.0139		6,300.8
65	R4-8	2119	0				0%	0%	0%	0%					
66	R4-9	2075	0			100	0%	0%	0%	5%	0.0000	0.0%	0.0000	100.00%	*
67	R5-1	993	993	0	100	0	100%	0%	10%	0%	0.0124	0.0%	0.0000	100.00%	Construction Reach Four
68	R5-2	1003	805	198	0	0	80%	20%	0%	0%	0.0125	52.2%	0.0065	47.83%	
69	R5-3	1039	809	230	0	0	78%	22%	0%	0%	0.0129	50.6%	0.0066	49.38%	
70	R5-4	1304	1,224	80	0	0	94%	6%	0%	0%	0.0162	61.0%	0.0099	38.99%	
71	R5-5	1009	773	236	0	0	77%	23%	0%	0%	0.0126	49.8%	0.0063	50.20%	
72	R5-6	1062	858	204	0	0	81%	19%	0%	0%	0.0132	52.5%	0.0069	47.49%	
73	R5-7	1038	1,038	0	0	0	100%	0%	0%	0%	0.0129	65.0%	0.0084	35.00%	
74	R5-8	992	992	0	0	0	100%	0%	0%	0%	0.0124	0.0%	0.0000	100.00%	
75	R5-9	1027	881	146	0	0	86%	14%	0%	0%	0.0128	55.8%	0.0071	44.25%	
76	R5-10	1011	744	129	138	0	74%	13%	14%	0%	0.0126	54.7%	0.0069	45.34%	

TABLE 29 (CONTINUED)

TENTATIVELY SELECTED PLAN COST SHARE FEDERAL AND NON FEDERAL

Reach	Model Reach	Reach Length (ft)	Developed Private	Un Developed Private	Undeveloped Public	Developed Public	Percent Developed Private	Percent Undeveloped Private	Percent Undeveloped Public	Percent Developed Public	Ratio of Reach length	Federal Participation	Federal Share	Non Federal Participation	Construction Reach Length (FEET)
77	R5-11	1022	1,022	0	0	0	100%	0%	0%	0%	0.0127	65.0%	0.0083	35.00%	
78	R5-12	1018	578	440	0	0	57%	43%	0%	0%	0.0127	36.9%	0.0047	63.09%	
79	R5-13	1017	965	52	0	0	95%	5%	0%	0%	0.0127	61.7%	0.0078	38.33%	
80	R5-14	1005	876	129	0	0	87%	13%	0%	0%	0.0125	56.7%	0.0071	43.34%	
81	R5-15	1011	744	267	0	0	74%	26%	0%	0%	0.0126	47.8%	0.0060	52.17%	
82	R5-16	1035.2	443	592	0	0	43%	57%	0%	0%	0.0129	27.8%	0.0036	72.17%	
83	R5-17	942.6	824	119	0	0	87%	13%	0%	0%	0.0117	56.8%	0.0067	43.21%	
84	R5-18	999.9	689	311	0	0	69%	31%	0%	0%	0.0125	44.8%	0.0056	55.22%	
85	R5-19	1010.9	719	292	0	0	71%	29%	0%	0%	0.0126	46.2%	0.0058	53.78%	
86	R5-20	1028.6	487	168	374	0	47%	16%	36%	0%	0.0128	0.0%	0.0000	100.00%	*
87	R5-21	1122	684	438	100	0	61%	39%	9%	0%	0.0140	0.0%	0.0000	100.00%	*
88	R5-22	1029.7	0		100		0%	0%	10%	0%	0.0012	0.0%	0.0000	100.00%	
Construction Reach Four Sub Totals													0.1141		21,888.4
89	R5-23	1013	0				0%	0%	0%	0%					
90	R5-24	1022	0				0%	0%	0%	0%					
91	R5-25	1054	0				0%	0%	0%	0%					
92	R5-26	884	0				0%	0%	0%	0%					
93	R5-27	1044	0				0%	0%	0%	0%					
94	R5-28	1059	0				0%	0%	0%	0%					
95	R5-29	987	0	0	100		0%	0%	10%	0%	0.0000	0.0%	0.0000	100.00%	*
96	R5-30	1022	556	466	100		54%	46%	10%	0%	0.0127	0.0%	0.0000	100.00%	Construction Reach Five
97	R5-31	1015	737	278	0		73%	27%	0%	0%	0.0126	0.0%	0.0000	100.00%	
98	R5-32	985	985	0	0		100%	0%	0%	0%	0.0123	0.0%	0.0000	100.00%	
99	R5-33	1025	854	171	0		83%	17%	0%	0%	0.0128	54.2%	0.0069	45.84%	
100	R5-34	1038	936	102	0		90%	10%	0%	0%	0.0129	58.6%	0.0076	41.39%	
101	R5-35	1002	945	57	0		94%	6%	0%	0%	0.0125	61.3%	0.0077	38.70%	
102	R5-36	944	826	118	0		87%	13%	0%	0%	0.0118	0.0%	0.0000	100.00%	
103	R5-37	1020	820	200	0		80%	20%	0%	0%	0.0127	0.0%	0.0000	100.00%	

TABLE 29 (CONTINUED)

TENTATIVELY SELECTED PLAN COST SHARE FEDERAL AND NON FEDERAL

Reach	Model Reach	Reach Length (ft)	Developed Private	Un Developed Private	Undeveloped Public	Developed Public	Percent Developed Private	Percent Undeveloped Private	Percent Undeveloped Public	Percent Developed Public	Ratio of Reach length	Federal Participation	Federal Share	Non Federal Participation	Construction Reach Length (FEET)
104	R5-38	1094	945	149	0		86%	14%	0%	0%	0.0136	0.0%	0.0000	100.00%	
105	R5-39	1024	925	99	0		90%	10%	0%	0%	0.0128	0.0%	0.0000	100.00%	
106	R5-40	1010	848	162	0		84%	16%	0%	0%	0.0126	0.0%	0.0000	100.00%	
107	R5-41	1004	274	730	0		27%	73%	0%	0%	0.0125	0.0%	0.0000	100.00%	
108	R5-42	1023	0	1,023	0		0%	100%	0%	0%	0.0127	0.0%	0.0000	100.00%	
109	R5-43	1002	918	84	0		92%	8%	0%	0%	0.0125	0.0%	0.0000	100.00%	
110	R5-44	1001	1,001	0	0		100%	0%	0%	0%	0.0125	0.0%	0.0000	100.00%	
111	R5-45	969	969	0	0		100%	0%	0%	0%	0.0121	0.0%	0.0000	100.00%	
112	R5-46	988	682	306	0		69%	31%	0%	0%	0.0123	44.9%	0.0055	55.14%	
113	R5-47	1031	675	356	0		65%	35%	0%	0%	0.0128	42.5%	0.0055	57.45%	
114	R5-48	1026	1,026	0	0		100%	0%	0%	0%	0.0128	65.0%	0.0083	35.00%	
115	R5-49	1041	1,041	0	0		100%	0%	0%	0%	0.0130	65.0%	0.0084	35.00%	
116	R5-50	1032	862	170	0		84%	16%	0%	0%	0.0129	54.3%	0.0070	45.71%	
117	R5-51	1126	943	83	100		84%	7%	9%	0%	0.0140	58.9%	0.0083	41.12%	
Construction Reach Five Sub Totals													0.0651		22,519.2
	Reach with Transition Zone														
* Designates that all or portion of reach is in a CBRA zone (all work in CRBA zone will be 100% non-Federal funded)															
TOTAL FEDERAL COST SHARE													0.2560		
TOTAL NON FEDERAL COST SHARE													0.7440		
TOTAL CONSTRUCTED PROJECT LENGTH							98,491								98,491

TABLE 30						
NED AND TSP - COSTS AND COST SHARE						
	NED Plan ($)	Percent	TSP Plan ($)	Percent	Change ($)	Change (%)
Initial Construction Cost	$55,730,000		$63,559,000		$7,829,000	
Federal	$18,558,000	33%	$18,558,000	31%	$0	-2%
Non-Federal	$37,172,000	67%	$45,001,000	69%	$7,829,000	2%
Total Renourishment Cost	$35,729,000		$40,105,000		$4,376,000	0%
Federal	$9,290,000	26%	$9,290,000	24%	$0	-2%
Non-Federal	$26,439,000	74%	$30,495,000	76%	$4,055,000	2%
Total Construction Cost	$91,459,000		$103,664,000		$12,205,000	0%
Federal	$27,486,000	30%	$27,486,000	28%	$0	-2%
Non-Federal	$63,973,000	70%	$74,894,000	72%	$10,922,000	2%
Benefits	$6,391,000		$6,559,000		$168,000.0	
Mitigation	$0.0		$0.0		$0.0	

TABLE 30A						
NED AND TSP AVERAGE ANNUAL EQUIVALENT COSTS AND COST SHARE						
	NED Plan ($)	Percent	TSP Plan ($)	Percent	Change ($)	Change (%)
Initial Construction Cost	$2,650,000		$3,022,000		$372,000	
Federal	$882,000	33%	$882,000	31%	$0	-2.5%
Non-Federal	$1,768,000	67%	$2,140,000	69%	$372,000	2.5%
Total Renourishment Cost	$1,699,000		$1,907,000		$160,000	
Federal	$442,000	26%	$442,000	24%	$0	-2.0%
Non-Federal	$1,257,000	74%	$1,465,000	76%	$160,000	2.0%
Total Construction Cost	$4,349,000		$4,929,000		$356,000	
Federal	$1,307,000	30%	$1,307,000	28%	$0	-2.3%
Non-Federal	$3,042,000	70%	$3,559,000	72%	$356,000	2.3%
OMRR&R	$125,000		$168,000		$43,500	

Table 31															
Parking - Access - Cost Sharing Qualifying															
Sub Reach	**Model Reach**	**MAP ID**	**GIS -Database Access Name**	**GIS - Database Address**	**Large Day Use Public Areas and Access Points**	**Day Use Parking Spaces**	**Visits Parking Will Support (4.5 persons per Vehicle times 1.5 Turnover Rate)**	**Peak Day Parking Demand***	**Rental Parking Spaces**	**Visits Rental Parking Will Support (4.5 persons per Vehicle)**	**Total Parking**	**Parking Adequate or Not Adequate**	**Neighboring Reaches Requisite Parking Provided From**	**Access Adequate or Not Adequate**	**Qualify for Cost Sharing Yes/No**
1	R1-1					0	0	55	0	0	0	Not Adequate		Not Adequate	No ***
2	R1-2					0	0	55	22	99	99	Not Adequate		Adequate	No ***
3	R1-3	A1a	Miramar Beach Regional Access W (Parking/Access)	2375 Scenic Gulf Drive	2375 Scenic Gulf Drive	85	574	574	28	126	700	Adequate		Adequate	No ***
4	R1-4	A1b	Miramar Beach Regional Access E (Parking/Access)	2375 Scenic Gulf Drive		85	574	55	15	68	641	Adequate		Adequate	No ***
5	R1-5					0	0	55	16	72	72	Adequate		Adequate	No ***
6	R1-6					0	0	55	18	81	0	Not Adequate		Not Adequate	No ***
7	R1-7					0	0	55	0	0	0	Not Adequate		Not Adequate	No ***
8	R1-8					0	0	55	10	45	0	Not Adequate		Not Adequate	No ***
9	R1-9					0	0	55	3	14	14	Adequate	R1-10	Adequate	No ***
10	R1-10	A2	Scenic Gulf Drive Access ROW (Parking/Access)	Scenic Gulf Drive		100	675	55	33	149	824	Adequate		Adequate	No ***
11	R1-11					0	0	55	16	72	0	Not Adequate		Not Adequate	No
12	R1-12					0	0	55	31	140	140	Adequate		Adequate	Yes
13	R1-13	A3	Gerinimo Street (Access)	735 Scenic Gulf Drive	735 Scenic Gulf Drive	0	0	55	76	342	342	Adequate		Adequate	Yes
14	R1-14					0	0	55	33	149	149	Adequate		Adequate	Yes
15	R1-15	A4	Norwood Drive (Access)	132 Norwood Dirve	132 Norwood Dirve	0	0	55	77	347	347	Adequate		Adequate	Yes

Table 31 (Continued)															
Parking - Access - Cost Sharing Qualifying															
Sub Reach	**Model Reach**	**MAP ID**	**GIS -Database Access Name**	**GIS - Database Address**	**Large Day Use Public Areas and Access Points**	**Day Use Parking Spaces**	**Visits Parking Will Support (4.5 persons per Vehicle times 1.5 Turnover Rate)**	**Peak Day Parking Demand***	**Rental Parking Spaces**	**Visits Rental Parking Will Support (4.5 persons per Vehicle)**	**Total Parking**	**Parking Adequate or Not Adequate**	**Neighboring Reaches Requisite Parking Provided From**	**Access Adequate or Not Adequate**	**Qualify for Cost Sharing Yes/No**
16	R1-16	A5	Open Gulf (Access)	213 Open Gulf St.	Open Gulf Street	6	41	55	103	464	504	Adequate		Adequate	Yes
17	R1-17	A6, A7	Sand Trap & Tango De Mer (Parking & Access)	253 Sand Trap Rd & End of Tango De Mer	253 Sand Trap Road	3	20	55	4	18	38	Adequate	R1-16	Adequate	No ***
18	R1-18		Acess at End of Tango De Mer	Acess at End of Tango De Mer	End of Tango De Mer	0	0	55	0	0	0	Adequate	R1-19	Adequate	No ***
19	R1-19					0	0	55	55	248	0	Not Adequate		Not Adequate	No ***
20	R1-20					0	0	55	81	365	0	Not Adequate		Not Adequate	No ***
21	R1-21					0	0	55	146	657	657	Adequate		Adequate	No ***
22	R1-22	A8	Sand Destin Day Use Area (Parking & Access)		San Destin Day Use Area	110	743	743	92	414	1,157	Adequate		Adequate	No ***
23	R1-23					0	0	55	155	698	698	Adequate		Not Adequate	No ***
24	R1-24					0	0	55	0	0	0	Adequate	R1-23	Not Adequate	No ***
25	R2-1					0	0	55	0	0	0				
26	R2-2					0	0	55	0	0	0				
27	R2-3					0	0	55	0	0	0				
28	R2-4					0	0	55	0	0	0				
29	R2-5		State Park (Parking & Access)	719 Top Sail Hill Road		0	0	55	0	0	0				
30	R2-6					0	0	55	0	0	0				
31	R2-7					0	0	55	0	0	0				
32	R3-1	A10	Stallworth Preserve North (Access)	140 Stallworth Blvd.		5	34	55	0	0	34				

Table 31 (Continued)

Parking - Access - Cost Sharing Qualifying

Sub Reach	Model Reach	MAP ID	GIS -Database Access Name	GIS - Database Address	Large Day Use Public Areas and Access Points	Day Use Parking Spaces	Visits Parking Will Support (4.5 persons per Vehicle times 1.5 Turnover Rate)	Peak Day Parking Demand*	Rental Parking Spaces	Visits Rental Parking Will Support (4.5 persons per Vehicle)	Total Parking	Parking Adequate or Not Adequate	Neighboring Reaches Requisite Parking Provided From	Access Adequate or Not Adequate	Qualify for Cost Sharing Yes/No
33	R3-2	A11, A12	Beach Highland & Bullard Beach Neighborhood Access (Parking & Access)	127 & 363 Highland Avenue	127 & 363 Highland Avenue	3	20	55	0	0	20	Not Adequate		Adequate	No
34	R3-3					0	0	55	5	23	23	Not Adequate		Adequate	No
35	R3-4					5	34	55	7	32	65	Adequate		Adequate	Yes
36	R3-5	A13	Dune Allen (Parking & Access)	5753 W. Co Hwy 30A	Dune Allen 5753 W. Co Hwy 30A	75	506	506	0	0	506	Adequate		Adequate	Yes
37	R3-6	A14	West Allen (Access)	5605 Co. Hwy 30-A		0	0	55	0	0	55	Not Adequate	R3-5	Adequate	Yes
38	R3-7	A15	Palms Ave W (Parking & Access)	4850 w. Co Hwy 30A		0	0	55	0	0	0	Not Adequate		Adequate	No
39	R3-8	A16a	Palms Ave E (Parking & Access)	4850 w. Co Hwy 30A		0	0	55	12	54	54	Adequate	R3-9	Adequate	Yes
40	R3-9	A16b	Lake Causeway (Access)	5173 Co Hwy 30A	4850 & 4991 & 5605 Co Hwy 30A	15	101	55	0	0	101	Adequate		Adequate	Yes
41	R3-10	A17a, A17b	Gulf Place West and Middle (Access)		4850 w. Co Hwy 30A	5	34	55	0	0	34	Adequate	R3-9	Adequate	Yes
42	R3-11	A17c, A18	Gulf Place East & Ed Walline Regional Beach Access (Parking & Access)	4447 W Co Hwy 30A	4447 W Co Hwy 30A & Gulf Place West Access Point	55	371	55	13	59	430	Adequate		Adequate	Yes
43	R3-12	A19	Spooky lane & Shellseekers (Access and Parking)	92 South Spooky Lane & 4201 W. Co. Rd. Hwy 30-A	92 South Spooky Lane & Gulf Place East Access Point	13	88	55	0	0	88	Adequate		Adequate	Yes

Table 31 (Continued)															
Parking - Access - Cost Sharing Qualifying															
Sub Reach	Model Reach	MAP ID	GIS -Database Access Name	GIS - Database Address	Large Day Use Public Areas and Access Points	Day Use Parking Spaces	Visits Parking Will Support (4.5 persons per Vehicle times 1.5 Turnover Rate)	Peak Day Parking Demand*	Rental Parking Spaces	Visits Rental Parking Will Support (4.5 persons per Vehicle)	Total Parking	Parking Adequate or Not Adequate	Neighboring Reaches Requisite Parking Provided From	Access Adequate or Not Adequate	Qualify for Cost Sharing Yes/No
44	R3-13	A20				14	95	55	16	72	167	Adequate		Adequate	Yes
45	R3-14	A21	Gulfview Heights (Parking & Access)	186 Gulfview Heights St	4201 Co. Hwy 30A & 186 Gulf View Heights Street	30	203	55	0	0	203	Adequate		Adequate	Yes
46	R3-15					0	0	55	0	0	0	Adequate	R3-14	Not Adequate	No
47	R3-16					0	0	55	0	0	0	Not Adequate		Not Adequate	No
48	R3-17					0	0	55	0	0	0	Not Adequate		Not Adequate	No
49	R3-18					0	0	55	24	108	0	Not Adequate		Not Adequate	No
50	R3-19					0	0	55	111	500	0	Not Adequate		Not Adequate	No
51	R3-20					0	0	55	23	104	104	Adequate		Adequate	Yes
52	R3-21	A22, A23	Blue Mountain and Gulf Point (Parking & Access)	2365 S Co Hwy 83 & 446 Blue Mountain Road	2365 S. Co Hwy 83 & 446, 590 and 726 Blue Mountain Road	37	250	55	0	0	250	Adequate		Adequate	Yes
53	R3-22	A24	Seagrade Road Neighborhood Access (Access)	590 Blue Mountain Road		0	0	55	0	0	0	Adequate	R3-21	Adequate	Yes
54	R3-23	A25	Blue Lake (Access)	726 Blue Mountain Road		0	0	55	0	0	0	Not Adequate		Adequate	No
55	R3-24					0	0	55	0	0	0				
56	R3-25					0	0	55	0	0	0				
57	R3-26					0	0	55	0	0	0				
58	R4-1	A26	Grayton State Park (Acess & Parking)			0	0	55	0	0	0	Not Adequate		Adequate	No
59	R4-2					0	0	55	0	0	0	Not Adequate		Not Adequate	No

Table 31 (Continued)															
Parking - Access - Cost Sharing Qualifying															
Sub Reach	Model Reach	MAP ID	GIS -Database Access Name	GIS - Database Address	Large Day Use Public Areas and Access Points	Day Use Parking Spaces	Visits Parking Will Support (4.5 persons per Vehicle times 1.5 Turnover Rate)	Peak Day Parking Demand*	Rental Parking Spaces	Visits Rental Parking Will Support (4.5 persons per Vehicle)	Total Parking	Parking Adequate or Not Adequate	Neighboring Reaches Requisite Parking Provided From	Access Adequate or Not Adequate	Qualify for Cost Sharing Yes/No
60	R4-3					0	0	55	0	0	0	Not Adequate		Not Adequate	No
61	R4-4					0	0	55	0	0	0	Not Adequate	R4-5	Not Adequate	No
62	R4-5	A27	Ray's Multi-Moutain (Access)	125 Sandy Lane	125 Sandy Lane	12	81	55	0	0	81	Adequate		Adequate	Yes
63	R4-6	A28, A29	Grayton Dunes and Weston (Parking & Access)	288 Garfield St & 208 Holtz Ave	288 Garfield St. & 199 Banfill St.& 208 Holtz Avenue & 913 Main Park Road	82	554	554	0	0	554	Adequate		Adequate	Yes
64	R4-7				91 Boat Ramp Road	0	0	55	0	0	0		R4-6		
65	R4-8	A301, A30B, A30C	Grayton State Park (Acess & Parking)			0	0	55	0	0	0				
66	R4-9					0	0	55	0	0	0				
67	R5-1					0	0	55	0	0	0	Not Adequate		Not Adequate	No
68	R5-2	A31	Van Ness Butler (Parking and Access)	1931 E Co Hwy 30A	Dune Allen 5753 W. Co Hwy 30A & Water Color Park Gargae and Access	100	675	675	11	50	725	Adequate		Adequate	Yes
69	R5-3					0	0	0	0	0	0	Adequate	R5-4	Adequate	Yes
70	R5-4	A32	Seaside (Access and Parking)			60	405	55	0	0	405	Adequate		Adequate	No
71	R5-5	A33	Dogwood/Thyme (Access)	2560 E. Co Hwy 30A	2560 Co Hwy 30A	0	0	55	0	0	0	Adequate	R5-6	Adequate	Yes

Table 31 (Continued)															
Parking - Access - Cost Sharing Qualifying															
Sub Reach	Model Reach	MAP ID	GIS -Database Access Name	GIS - Database Address	Large Day Use Public Areas and Access Points	Day Use Parking Spaces	Visits Parking Will Support (4.5 persons per Vehicle times 1.5 Turnover Rate)	Peak Day Parking Demand*	Rental Parking Spaces	Visits Rental Parking Will Support (4.5 persons per Vehicle)	Total Parking	Parking Adequate or Not Adequate	Neighboring Reaches Requisite Parking Provided From	Access Adequate or Not Adequate	Qualify for Cost Sharing Yes/No
72	R5-6	A34, A35, A36	Nightcap, Live Oak, Hickory (Access)	30A at End of Nightcap Street, 2680 E. Co Hwy 30A, 2624 E. Co Hwy 30A	2624, 2680, ~2750 and 2790 Co Hwy 30 A	32	216	55	0	0	216	Adequate		Adequate	Yes
73	R5-7	A37, A38, A39	Hollywood, Azela, Hwy 395 (Access)	2790, 2845, 2920 E. Co. Hwy 30-A	2845 and 2920 Co Hwy 30A	0	0	55	0	0	0	Adequate	R5-6	Adequate	Yes
74	R5-8	A40, A41, A42	Headland, Greenwood, Gardenia (Access)	3020 Co Hwy 30A, 30 & 118 Montgomery	3020 Co Hwy 30A	4	27	55	0	0	27	Not Adequate		Adequate	No
75	R5-9	A43, A44	Dothan and Andalusia (Access)	52 South Andalusia St and South End of Dothan Ave on Montgomery St.	52 South Andalusia St and South End of Dothan Ave on Montgomery St.	0	0	55	0	0	0	Adequate	R5-9	Adequate	Yes
76	R5-10	A45, A46, A47	Santa Clara, Santa Juan, Pelayo & Montego (Parking & Access)	3458, 3512, 3468, & 3576 E. Co Hwy 30A	3458, 3512 and 3576 E. Co Hwy 30A - San Juan & Pelaya Neighborhood G A	20	135	55	0	0	135	Adequate		Adequate	Yes
77	R5-11	A48, A49	Campbell	3694 E Co Hwy 30A		0	0	55	71	320	320	Adequate		Adequate	Yes
78	R5-12	A50	Beachwood villas (Access)	3874 E. Co Hwy 30A	3694 and 3874 E. Co Hwy 30 A - (Campbell Street)	95	641	641	50	225	866	Adequate		Adequate	Yes
79	R5-13	A51	One Seagrove (Access)		57 Seagrove Place	9	61	55	70	315	376	Adequate		Adequate	Yes
80	R5-14	A52	Sugar Cliffs (Access)			0	0	55	137	617	617	Adequate		Adequate	Yes

Table 31 (Continued)															
Parking - Access - Cost Sharing Qualifying															
Sub Reach	Model Reach	MAP ID	GIS -Database Access Name	GIS - Database Address	Large Day Use Public Areas and Access Points	Day Use Parking Spaces	Visits Parking Will Support (4.5 persons per Vehicle times 1.5 Turnover Rate)	Peak Day Parking Demand*	Rental Parking Spaces	Visits Rental Parking Will Support (4.5 persons per Vehicle)	Total Parking	Parking Adequate or Not Adequate	Neighboring Reaches Requisite Parking Provided From	Access Adequate or Not Adequate	Qualify for Cost Sharing Yes/No
81	R5-15					0	0	55	0	0	0	Adequate	R5-14	Adequate	Yes
82	R5-16	A53	Ramsgate (Access)	679 Eastern Lake Rd	679 and 491 Eastern Lake Road	0	0	55	2	9	9	Adequate	R5-17	Adequate	Yes
83	R5-17	A54	Eastern Lake (Parking & Access)	28 Lakewood Dr		0	0	55	36	162	162	Adequate		Adequate	Yes
84	R5-18	A55	Port Property (Access)	188 San Roy Rd	188 San Roy Road	6	41	55	0	0	41	Adequate	R5-17, R5-19	Adequate	Yes
85	R5-19	A56	Sugar Dunes (Access)	11 Beachside Drive	11 Beachside Dune - Sugar Dune	16	108	55	0	0	108	Adequate		Adequate	Yes
86	R5-20					10	68	55	51	230	297	Adequate		Adequate	Yes
87	R5-21	A57	Walton Dunes (Access)	258 Beachfront Taril - Walton Dune	258 Beachfront Taril - Walton Dune - Beachside Drive & Deer Lake State Park	0	0	55	9	41	41	Adequate	R5-20, R5-22	Adequate	Yes
88	R5-22					27	182	55	0	0	182				
89	R5-23					0	0	55	0	0	0				
90	R5-24					0	0	55	0	0	0				
91	R5-25					0	0	55	0	0	0				
92	R5-26					0	0	55	0	0	0				
93	R5-27					0	0	55	0	0	0				
94	R5-28					0	0	55	0	0	0				
95	R5-29					0	0	55	0	0	0				
96	R5-30					0	0	55	0	0	0	Not Adequate		Not Adequate	No
97	R5-31					0	0	55	0	0	0	Not Adequate		Adequate	No

Table 31 (Continued)															
Parking - Access - Cost Sharing Qualifying															
Sub Reach	Model Reach	MAP ID	GIS -Database Access Name	GIS - Database Address	Large Day Use Public Areas and Access Points	Day Use Parking Spaces	Visits Parking Will Support (4.5 persons per Vehicle times 1.5 Turnover Rate)	Peak Day Parking Demand*	Rental Parking Spaces	Visits Rental Parking Will Support (4.5 persons per Vehicle)	Total Parking	Parking Adequate or Not Adequate	Neighboring Reaches Requisite Parking Provided From	Access Adequate or Not Adequate	Qualify for Cost Sharing Yes/No
98	R5-32	A58	Gulf Lake (Access)	8040 E. Co Highway 30A	8040 E Co Hwy 30A - Gulf Lakes Neighborhood	0	0	55	0	0	0	Not Adequate		Adequate	No
99	R5-33	A59	Sea Breeze (Access)	8286 E. Co Hwy 30A	8286 E. Co. Hwy 30A - Seabreeze Neighborhood B A	0	0	55	13	59	59	Adequate		Adequate	Yes
100	R5-34		Seacrest (Access)	8520 E Co Hwy 30A	Saint Lucia Lane & Rosemary Avenue & 8520 E Co Hwy30A - Seacrest Dr.	10	68	55	4	18	86	Adequate		Adequate	Yes
101	R5-35					100	675	675	6	27	702	Adequate		Adequate	Yes
102	R5-36					0	0	55	0	0	0	Not Adequate		Not Adequate	No
103	R5-37					0	0	55	0	0	0	Not Adequate		Not Adequate	No
104	R5-38					0	0	55	0	0	0	Not Adequate		Not Adequate	No
105	R5-39					0	0	55	0	0	0	Not Adequate		Not Adequate	No
106	R5-40					0	0	55	0	0	0	Not Adequate		Not Adequate	No
107	R5-41					0	0	55	0	0	0	Not Adequate		Not Adequate	No
108	R5-42					0	0	55	13	59	0	Not Adequate		Not Adequate	No
109	R5-43					0	0	55	0	0	0	Not Adequate		Not Adequate	No
110	R5-44					0	0	55	0	0	0	Not Adequate		Not Adequate	No
111	R5-45					0	0	55	0	0	0	Not Adequate		Not Adequate	No

Table 31 (Continued)															
Parking - Access - Cost Sharing Qualifying															
Sub Reach	Model Reach	MAP ID	GIS -Database Access Name	GIS - Database Address	Large Day Use Public Areas and Access Points	Day Use Parking Spaces	Visits Parking Will Support (4.5 persons per Vehicle times 1.5 Turnover Rate)	Peak Day Parking Demand*	Rental Parking Spaces	Visits Rental Parking Will Support (4.5 persons per Vehicle)	Total Parking	Parking Adequate or Not Adequate	Neighboring Reaches Requisite Parking Provided From	Access Adequate or Not Adequate	Qualify for Cost Sharing Yes/No
112	R5-46	A61	Inlet beach Neighborhood (Access)	188 Winston Lane	188 Winstor lane	105	709	709	0	0	709	Adequate		Adequate	Yes
113	R5-47	A62	Wall Street (Access)	264 South Wall Street	435 West Park Place Ave. & 264 South Wall Street	76	513	513	0	0	513	Adequate		Adequate	Yes
114	R5-48	A63A	Inlet Beach Regional Access West (Parking & Access)	438 South Orange Street Center	438 South Orange Street	67	452	452	0	0	452	Adequate		Adequate	Yes
115	R5-49	A63B	Inlet Beach Regional Access Middle & East (Parking and Access)	438 South Orange Street Center	118 West Park Place Avenue FL #20	67	452	452	0	0	452	Adequate		Adequate	Yes
116	R5-50	A64	Philips Inlet (Access)	202 South Walton Lakeshore Drive	202 South Walton Lakeshore Drive Phillips Inlet Access	15	101	55	0	0	101	Adequate		Adequate	Yes
117	R5-51					0	0	55	0	0	0	Adequate	R5-49, R5-50	Adequate	Yes
TOTALS						1,559	10,523	13537**	1,698	7,641	16,743				

* Assuming Large Public Day Use Area Parking is fully utilized and remainder of parking demand is distributed uniformly throughout the study area

** Peak Day Demand (July 4th)

*** LPP Reaches not economically justified, not eligible for cost sharing

Rental Parking disqualified - No Public Access Available

LPP Construction Reaches

6.3 RESIDUAL DAMAGES

With a project in place to reduce hurricane and storm damage not all damages will be prevented only reduced. It is important to provide information on residual damages to demonstrate project performance and communicate that fact that the project will not eliminate all risks. Table 32 shows the average annual remaining damages provided as output from the Beach-*fx* model runs.

TABLE 32
AVERAGE ANNUAL RESIDUAL DAMAGES - BY REACH
TENTATIVELY SELECTED PLAN

R1-1	$1,923	CONSTRUCTION REACH ONE
R1-2	$1,612	
R1-3	$2,197	
R1-4	$348	
R1-5	$430	
R1-6	$1,081	
R1-7	$1,600	
R1-8	$789	
R1-9	$1,466	
R1-10	$2,364	
R1-11	$31,577	
R1-12	$2,881	
R1-13	$3,704	
R1-14	$2,970	
R1-15	$54,058	
R1-16	$26,066	
R1-17	$1,876	
R1-18	$3,646	
R1-19	$4,544	
R1-20	$5,960	
R1-21	$2,047	
R1-22	$2,985	
R1-23	$1,064	
R1-24	$1,176	
R3-1	$0	CONSTRUCTION REACH TWO
R3-2	$53,074	
R3-3	$5,603	
R3-4	$451	
R3-5	$10,745	
R3-6	$5,766	
R3-7	$4,874	
R3-8	$11,011	

TABLE 32
AVERAGE ANNUAL RESIDUAL DAMAGES - BY REACH
TENTATIVELY SELECTED PLAN

R3-9	$7,620	
R3-10	$59,828	
R3-11	$11,647	
R3-12	$39,648	
R3-13	$1,827	
R3-14	$15,285	
R3-15	$1,765	
R3-16	$821	
R3-17	$1,849	
R3-18	$4,649	
R3-19	$1,037	
R3-20	$12,615	
R3-21	$13,255	
R3-22	$3,675	
R3-23	$2,625	
R4-1	$9,952	CONSTRUCTION REACH THREE
R4-2	$41,990	
R4-3	$0	
R4-4	$0	
R4-5	$67,910	
R4-6	$88,265	
R5-1	$2,764	CONSTRUCTION REACH FOUR
R5-2	$1,365	
R5-3	$15,482	
R5-4	$1,432	
R5-5	$2,229	
R5-6	$9,643	
R5-7	$8,002	
R5-8	$7,205	
R5-9	$2,619	
R5-10	$3,215	
R5-11	$7,131	
R5-12	$4,623	
R5-13	$13,263	
R5-14	$3,858	
R5-15	$3,194	
R5-16	$4,445	
R5-17	$3,143	
R5-18	$4,542	
R5-19	$10,755	
R5-20	$4,287	
R5-21	$3,366	

TABLE 32
AVERAGE ANNUAL RESIDUAL DAMAGES - BY REACH
TENTATIVELY SELECTED PLAN

R5-30	$3,112	CONSTRUCTION REACH FIVE
R5-31	$2,071	
R5-32	$25,530	
R5-33	$5,711	
R5-34	$2,206	
R5-35	$4,215	
R5-36	$19,201	
R5-37	$1,790	
R5-38	$4,991	
R5-39	$627	
R5-40	$269	
R5-41	$909	
R5-42	$412	
R5-43	$852	
R5-44	$7,534	
R5-45	$35,862	
R5-46	$5,953	
R5-47	$9,480	
R5-48	$276	
R5-49	$8,397	
R5-50	$1,108	
R5-51	$3,716	
Total	$896,936	

6.4 RISK AND UNCERTAINTY

Analysis of shore protection projects has moved from the traditional deterministic approach to a more comprehensive probabilistic, risk-based methodology. Shore protection projects are now formulated to provide economical protection for storm and erosion prone areas, selecting the plan that maximizes net economic benefits consistent with acceptable risk and functional performance. The technical task of any risk-based analysis is to balance the risk of design exceedance with damages prevented, uncertainty of storm characteristics with design accommodations, and to provide for safe, predictable performance. Risk-based analysis enables risk issues and uncertainty in critical data to be explicitly included in project formulation and evaluation. The uncertainties associated with the sequencing of storms and natural recovery and those associated with storm damages and erosion losses can now take on a very large number of values. Evaluating the effects of each sequence of storms becomes a life cycle analysis problem and many lifecycles must be evaluated in order to quantify the distribution of economic losses both without a shore protection project and with each alternative formulated. The use of the lifecycle approach helps explain the evaluation

process for erosion and nourishment much more easily since the lifecycle approach is more realistic and more closely mimics the dynamic coastal conditions.

A major design consideration for this project was to incorporate risk and uncertainty as an integral part of the formulation process. Chapter 6 of ER 1105-2-100, entitled “Risk-Based Analysis for Evaluation of Hydrology/Hydraulics and Economics in Shore Protection Studies” specifies the analysis requirements for shore protection projects, the fundamental requirement being that all shore protection analysis adopt a life cycle approach. The Beach-Fx model which was used for this study incorporates the life cycle approach into the formulation process.

6.4.1 Residual Risks

The proposed beachfill plan would greatly reduce average annual storm damages. The tentatively selected plan, will reduce combined wave and erosion damages by 75.2%. Some wave and erosion damages will still occur, estimated to average about $897,000 per year over the 50-year period of analysis. The project is designed to protect mainly against storm waves and storm-induced erosion, two major categories of storm damage. The project will not prevent any damage from bay side flooding from saltwater that will flow into Choctawhatchee Bay through East Pass Inlet. Structures will continue to be subject to damage from hurricane winds and windblown debris. Damages from flooding and winds will decrease as older structures are replaced with those meeting floodplain ordinances and wind hazard building construction standards. But even new construction is not immune to damage, especially from severe storm events. Also, the condition of the project at the time of storm occurrence can affect the performance of the project for that event. The proposed beachfill reduces damages, but does not have a specific design level. In other words, the project is not designed to fully withstand a certain category of hurricane or a certain frequency storm event. The project purpose is storm damage reduction, and the berm-and-dune is not designed to prevent loss of life. Loss of life is prevented by the existing procedures of evacuating completely well before expected hurricane landfall and removing the residents from harm’s way.

6.4.2 Risk and Uncertainly in Relative Sea Level Rise Assumptions

The Corps planning guidance, specifically Water Resource Policies and Authorities Incorporating Sea-Level Change Considerations in Civil Works Programs EC 1165-2-212 and Appendix E, Section IV, Paragraph E-24 of the Guidance Notebook ER 1105-2-100, requires that potential relative sea level rise be taken into consideration for coastal or estuarine projects at the feasibility level of study and recommends, given the uncertainty of future sea level rise estimates, preference be given to developing strategies that are robust over the entire range of potential sea level rise rates versus those that perform well only over a limited range of potential sea level rise rates.

Systematic long-term tide elevation observations suggest that the elevation of oceanic water bodies is gradually rising and this phenomenon is termed ‘sea level rise.’ The rate of rise is neither constant with time nor uniform over the globe. In addition to

elevation of oceanic water bodies, is the gradual depression or uplifting of land surface along the coast, which becomes an additional factor in the relationship between the land's elevation over time, and that of changing sea levels. Because portions of the coast of the Florida panhandle is affected by subsidence and global sea level rise (adjusted for local conditions), these factors combine (and are referred to in this analysis) in a single element of "relative" sea level rise. Relative sea level (RSL) rise at a given location, then, is simply the change in mean sea level at that location with respect to an observer standing on or near the shoreline.

Sea-level change can cause a number of impacts in coastal and estuarine zones, including changes in shoreline erosion and changes in storm and flood damages. Sea level rise rates over time are the subject of many predictions. Historically, relative sea level rise has been determined by fitting a linear relationship to monthly mean or annual mean sea level, either of which is computed from tide gage observations. The slope of the fitted line gives the rate of sea level rise at the location of the tide gage. The computed rate includes the rate of subsidence or uplift of the location upon which the tide gage is founded, and thus the computed RSL rates may be extended locally or regionally to areas with similar geotechnical and tidal conditions.

Project performance in this study effort was evaluated for both an extrapolation of the observed historic rate plus subsidence, which resulted in RSL rise over a 50-year planning horizon of approximately 0.3 ftand also for higher rates than that historically observed, as required by the EC 1165-2-212, equivalent to up to approximately 2.4 feet over a 50-year planning horizon. The recession rate due to sea level rise based on extrapolation of the historic observed rate of 0.4 ft/yr is not significant when compared to the historical averaged shoreline change of roughly 2.4 ft/yr. The influence of current sea level rise on the project is relatively low as compared to other factors causing erosion (waves, currents, winds and storms). An analysis of shoreline change rate over the time period of 1973 to 2004 indicates that the magnitude of the short-term storm-induced erosion, which was as high as 12.4 ft/year during Hurricane Ivan has a much greater affect along the beaches of Walton County than those indicated by the natural long term shoreline trends.

The tentatively selected plan is not a hard structure and adjusts to natural forces. The project is designed to include a significant amount of sacrificial sand in the advance nourishment berm. The optimization of the advance nourishment was performed with a conservative background erosion rate of 5 ft/yr combined with the effects of 46 historic storms with 12 variants of the astronomical tide at the time of landfall. The estimated projected average rate of shoreline recession due to accelerated sea-level rise over the next 50 years based on this analysis would not exceed the 5 ft/yr background erosion rate used in the optimization of the advance nourishment berm. Based on this and the estimated average renourishment interval of every10 years the projected accelerated rise in sea level would not be expected to overwhelm the project before the next nourishment of sand.

An increase in potential shoreline recession as the beach profile attempts to re-establish in response to a rise in sea level would result in increased volume losses from the design template. The additional volume of sand that may be needed to maintain the shoreline could increase on average by approximately 1.3 cy/ft/yr above the standard deviation of the mean nourishment volume under the high modified NRC Curve III RSL scenario.

Regardless of the rate of RSL rise, the beach fill project would be monitored and renourished on average every 10 years. Monitoring data provides input to determining the details of each renourishment of the beach. If an accelerated RSL rise occurs, erosion volumes increase and renourishment volumes will increase, shortening the life of designated borrow areas. A Limited Reevaluation Report (LRR) on borrow sources would be conducted to investigate additional borrow sources should this occur. All alternative plans contain a 5.5-foot NGVD berm elevation and all would be affected similarly by accelerated RSL rise. Therefore, no change to the tentatively selected plan by accelerated RSL is expected other than possible minor modifications of the berm and dune elevation. There is no expectation that accelerated RSL would result in selection of other major categories of alternative plans such as the nonstructural plan or hard structure plans.

6.4.4 Risk and Uncertainly in Project Reliability

The coastal processes results (i.e. changes in dune height, dune width, berm width, upland width, and cross-shore profiles of erosion) of the project over the simulated life cycle were reviewed to determine its robustness under various simulated plausible storms. Under the smaller simulated events the project primarily undergoes beach berm erosion with little to no dune escarpments; however, under larger simulated storm events (i.e. Hurricane Ivan, Opal, Eloise, etc.) substantial beach berm erosion and escarpment of the constructed dune occurs as a result of the associated higher water levels and waves. In all simulations the project acts as the first line of defense receiving the brunt of the damage, while protecting the existing dune feature. It is important to put emphasis on the fact that the project is a dynamic feature that will continuously undergo changes, both seasonally and annually. The condition of the project at the time of storm occurrence can affect the performance of the project for that event. In addition, as discussed under the risk and uncertainty in the storm climate section the size of the storm as well as the sequencing of events (how quickly one event occurs after another) and natural beach recovery can also greatly affect the project performance and thus reliability. The tentatively selected plan would provide a significant degree of reliability; however, as anticipated damage to the project from storm events will occur and maintenance of the project will be required.

6.4.5 Risk to Life and Safety

As previously stated under residual risk the project purpose is storm damage reduction. The berm-and-dune is not designed to prevent loss of life. Loss of life is prevented by the existing procedures of evacuating completely well before expected hurricane landfall

and removing the residents from harm's way. The erratic nature and unpredictability of hurricane path and intensity require early and safe evacuation. This policy should be continued both with and without the storm damage reduction project.

6.5 VALUE ENGINEERING

Per ER 1110-2-1150, a value engineering (VE) study shall be performed on the earliest document available that satisfies the functional requirements of the project and includes a MCACES cost estimate. While all feasibility efforts are directed to define a project that most economically provides the desired project outputs, a VE study can assure that the project design captures that goal and/or may suggest alternatives that could enhance the project. A VE review of the material in this draft report was conducted by a review team on September 22, 2010. The review team did not suggest any changes to consider for incorporating into this report.

7.0 TENTATIVE RECOMMENDATION

Based on the conclusions of this study, after having given consideration to all significant aspects in the overall public interest, including environmental, social, and economic effects; and engineering feasibility; I recommend the implementation of the tentatively selected plan, which consists of five construction reaches for hurricane and storm damage reduction along the shoreline of Walton County, Florida, which will be composed of a 50-foot berm width, a 25-foot berm and an additional 25 feet of advanced nourishment in all construction reaches and will also feature added dune width in all construction reaches of either 10 or 30 feet, with such modifications thereof as in the discretion of the Commander, USACE, may be advisable. Figures 11A-11C display the proposed construction reaches along with the study (model) reaches. Summary benefits of the tentatively selected plan are presented in Table 33.

TABLE 33
SUMMARY BENEFITS TSP
WALTON COUNTY, FLORIDA - FEASIBILITY

	FY 2011 Dollars	Category
	$63,306,000	2014 Initial Construction
	$16,218,674	2024 Renourishment
	$10,825,930	2034 Renourishment
	$7,226,285	2044 Renourishment
	$4,922,478	2054 Renourishment
Total Economic First Cost	$102,499,000	
Interest During Construction	$1,263,422	
Total Economic Project First Cost	$103,762,000	
Average Annual Economic First Cost	$4,934,000	
Annual O&M	$168,000	
Total Average Annual Economic Cost	$5,102,000	
Average Annual HSDR Benefits	$6,543,000	
Average Annual Recreation Benefits	$16,000	
Total Average Annual Benefits	$6,559,000	
Benefit-to-Cost Ratio	1.29	
Net Benefits	$1,457,000	

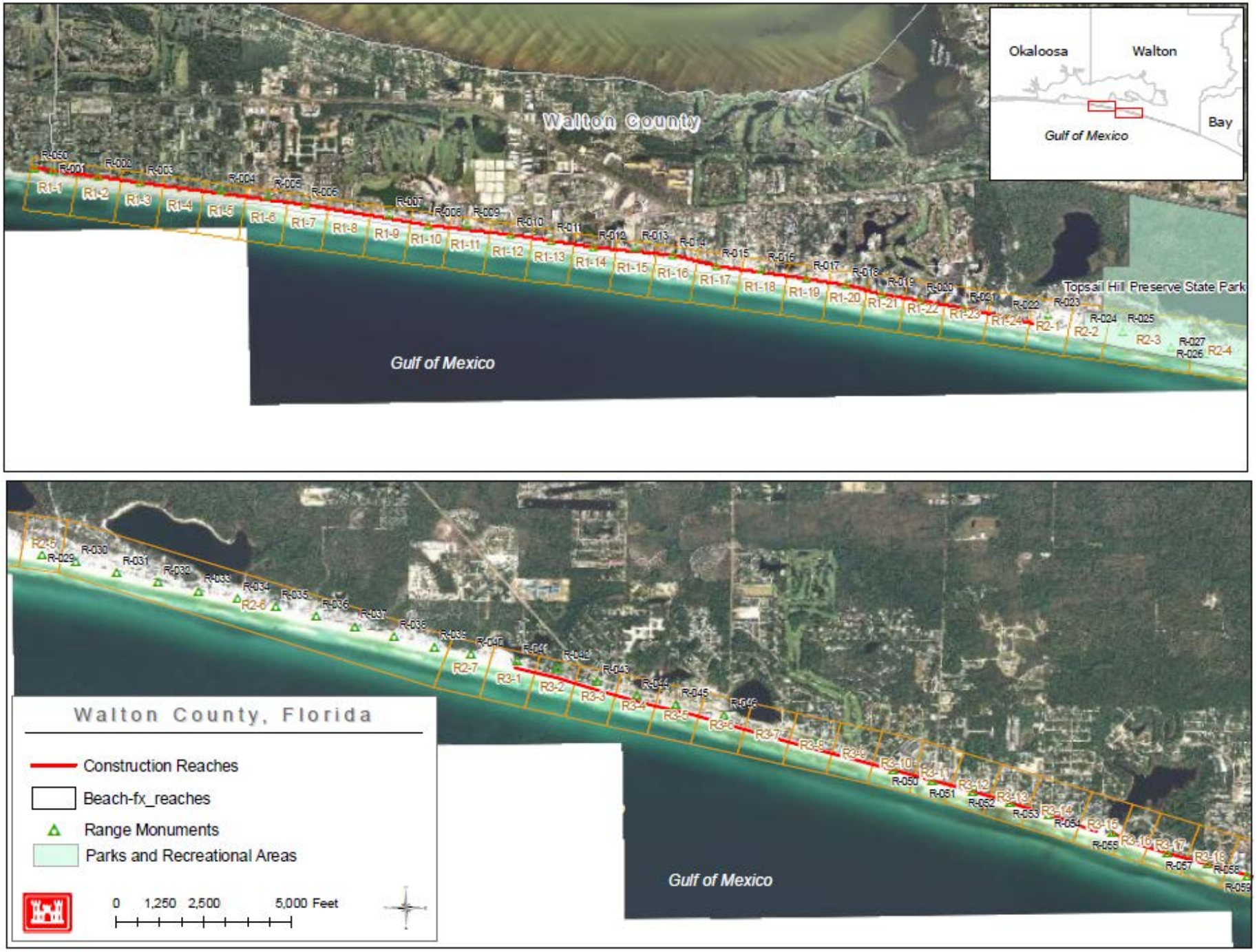


FIGURE 11A. CONSTRUCTION AND STUDY REACHES

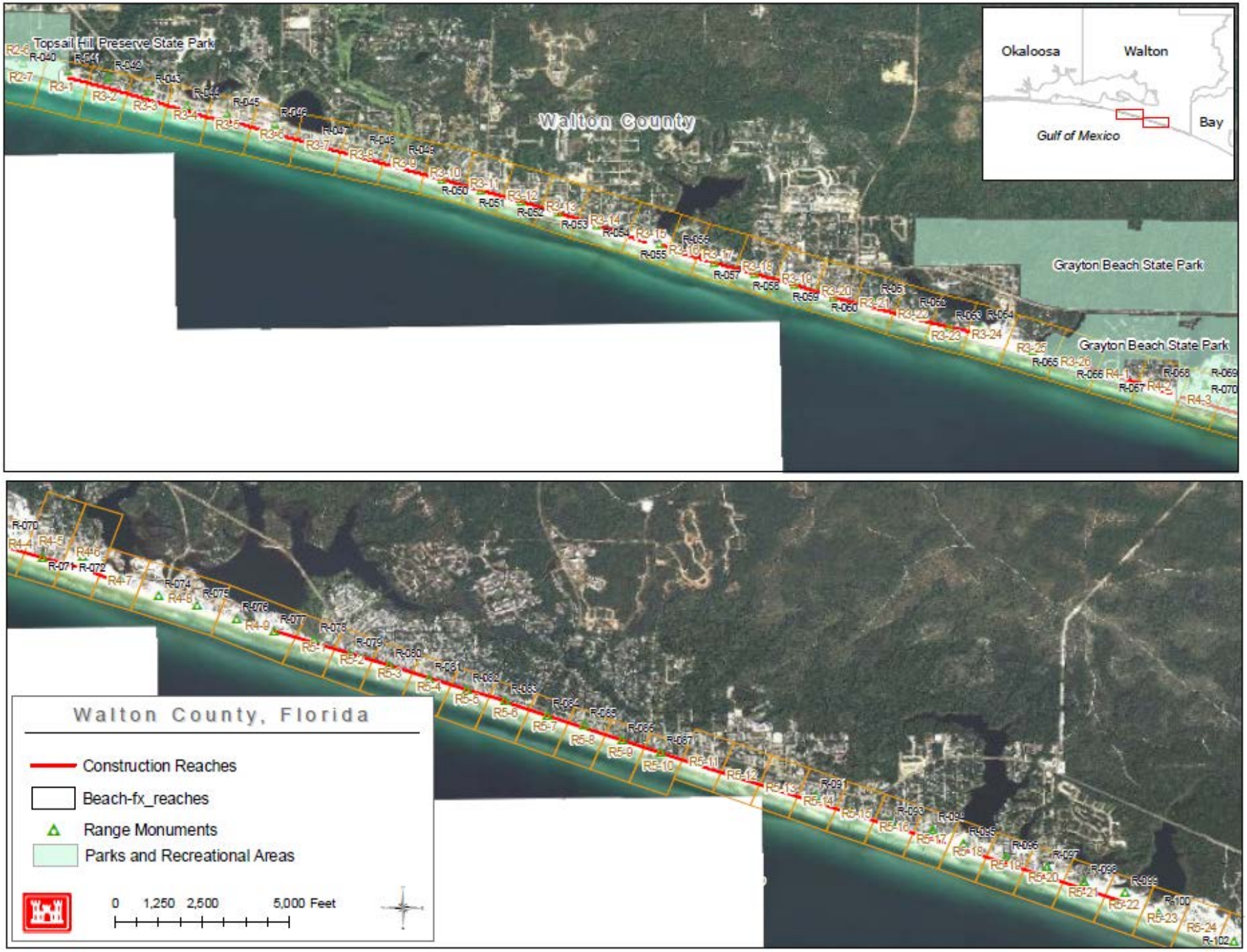


FIGURE 11B. CONSTRUCTION AND STUDY REACHES

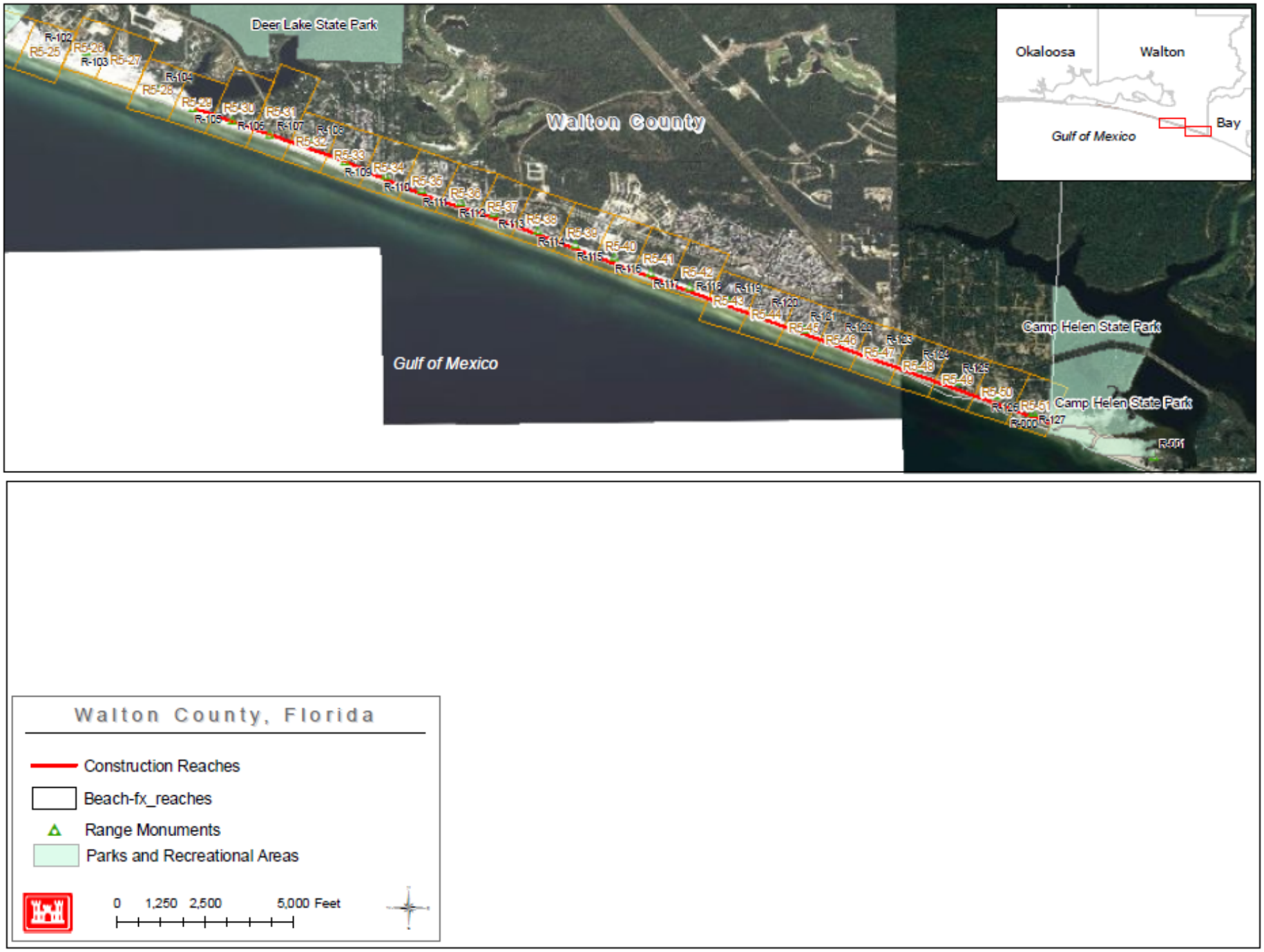


FIGURE 11C. CONSTRUCTION AND STUDY REACHES

The construction of the proposed project shall be contingent on the project sponsor giving written assurances satisfactory to the Secretary of the Army that it will satisfy its responsibilities of local cooperation as detailed in a fully coordinated Project Partnership Agreement (PPA) package (to include the non-Federal sponsor's financing plan) prepared subsequent to the approval of the feasibility phase and will reflect the recommendations of this Feasibility Study. The non-Federal sponsor has indicated support of the recommendations presented in this Feasibility Study and desires to execute a PPA for the tentatively selected plan. The non-Federal sponsor will:

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

   (1) Enter into an agreement which provides, prior to execution of the project partnership agreement, 25 percent of design costs;
   (2) Provide, during the first year of construction, any additional funds needed to cover the non-federal share of design costs;
   (3) Provide all lands, easements, and rights-of-way, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the initial construction, periodic nourishment, operation, and maintenance of the project;
   (4) Provide, during construction, any additional amounts as are necessary to make its total contribution equal to 35 percent of initial project costs assigned to hurricane and storm damage reduction plus 100 percent of initial project costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits and 50 percent of periodic nourishment costs assigned to hurricane and storm damage reduction plus 100 percent of periodic nourishment costs assigned to protecting undeveloped private lands and other private shores which do not provide public benefits;
   (5) Provide 100 percent of the total project costs that reflect the difference between the National Economic Development (NED) Plan and the Locally Preferred Plan (LPP);

b. For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, including any mitigation features, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance

with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

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

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

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

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

g. Assume, as between the Federal Government and the non-Federal Sponsor, complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands,

easements, or rights-of-way that the Federal Government determines to be necessary for the initial construction, periodic nourishment, operation, or maintenance of the project;

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

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

j. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army," and all applicable Federal labor standards and requirements, including but not limited to, 40 U./S.C. 3141 – 3148 and 40 U.S.C. 3701 – 3708 (revising, codifying, and enacting without substantial change the provisions of the Davis- Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.) and the Copeland Anti-Kickback Act (formerly 40 U.S. C. 276c et seq.);

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

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

m. Participate in and comply with applicable Federal floodplain management and flood insurance programs;

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

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

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

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

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

s. Provide, keep and maintain the recreation features, and necessary access roads, parking areas, and other associated public use facilities, open and available to all on equal terms;

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

u. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 22130, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the Non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.

v. Provide, during construction, 100 percent of the total recreation costs that exceed an amount equal to 10 percent of the sum of the Federal share of total flood damage reduction costs and the Federal share of total ecosystem restoration costs;

w. Agree to participate in and comply with applicable Federal floodplain management and flood insurance programs; and,

x. Comply with Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), which requires a non-Federal interest to prepare a floodplain management plan within one year after the date of signing a project cooperation agreement, and to implement such plan not later than one year after completion of construction of the flood damage reduction features.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding." However, prior to transmittal to the Congress, the sponsor, the States, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Steven J. Roemhildt
Colonel, Corps of Engineers
District Commander

PLATES

Plates No. 1-11

Photos: Pre-Ivan, Post Ivan, and Post Dennis

Coastal Bluff Erosion Near Hotel, Seagrove Beach, FL: Vegetation was removed from the bluff face by Hurricane Ivan. At the left center of the post-Dennis image, a pile of sand and debris is seen at the foot of the bluff.

PLATE 1

Coastal Bluff Erosion Near Homes, Seagrove, FL: During Hurricane Ivan, coastal erosion at the base of the bluff destroyed stairways. Bluff erosion continued during Hurricane Dennis.

PLATE 2

Coastal Bluff Erosion Near Town Homes: Seagrove, FL: During Hurricane Ivan, vegetation was removed from the steep bluff face. The bluff was eroded landward during Hurricane Dennis threatening structures near the bluff edge.

PLATE 3

Hurricane Ivan

Before

After

Hurricane Ivan

Before

After

PLATE 5

Hurricane Ivan

Before

After

Hurricane Dennis

Before

After

Hurricane Dennis

Before

After

Hurricane Dennis

Before

After

Post Dennis

PLATE 10

Post Dennis