

REPORT SUMMARY

Flagler County, Florida
Hurricane and Storm Damage Reduction Project
Integrated Feasibility Study and Environmental Assessment

Feasibility Cost Sharing Agreement:	02 September 2004
Feasibility Scoping Meeting:	28 January 2011
Alternative Formulation Briefing:	13 December 2013
Draft Report Guidance Memorandum:	19 May 2014
Division Engineer Transmittal:	13 June 2014
Received at CECW-PC:	DD MMM YYYY
CWRB Briefing:	DD MMM YYYY
30-Day S&A Review start:	DD MMM YYYY
30-Day S&A Review end:	DD MMM YYYY
FEA filed with EPA:	DD MMM YYYY

STUDY INFORMATION

Study Authority. The authority for conducting this Feasibility Study is contained in House Resolution 2676 adopted May 22, 2002:

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 shoreline erosion protection, hurricane and storm damage reduction, and related purposes to the shores of Flagler County, Florida.

Study Sponsor. The non-Federal sponsor is Flagler County.

Study Purpose and Scope. This study will determine the feasibility of providing hurricane and storm damage reduction within Flagler County, with particular attention to the Marineland, Painters Hill, Beverly Beach, and Flagler Beach reaches of the Flagler County coastline (see **Figure 1**). Alternatives considered will include: no action, non-structural measures (flood proofing, relocation, land acquisition, etc.), shore protection with hard structures (seawalls, revetments, groins, etc.), shore protection with soft structures (beach nourishment, geotubes, etc.), combinations of the above, and others.

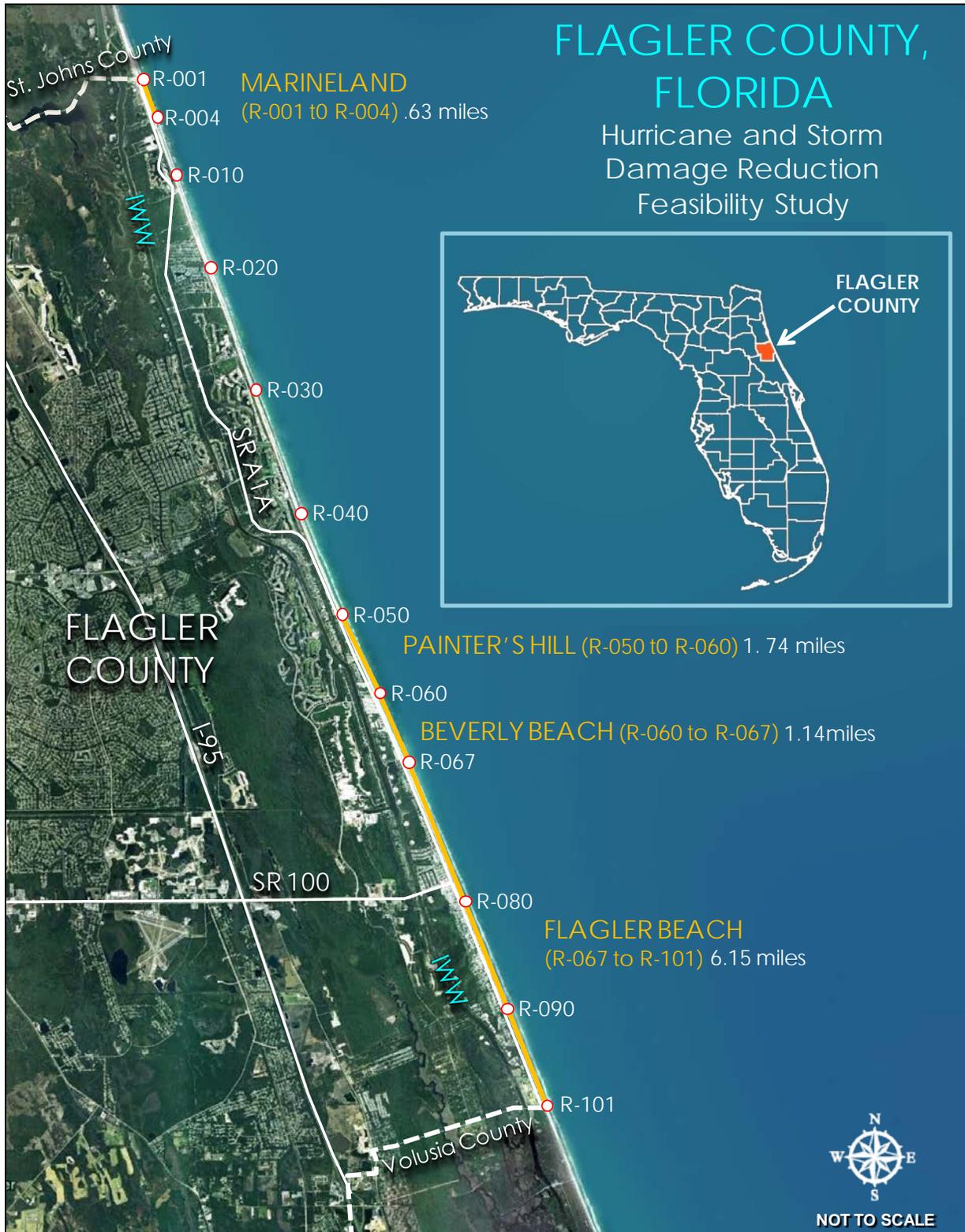
This report will recommend a plan that is technically sound, environmentally acceptable, and economically justified. Engineering analysis and design will include suitable data to proceed into the preconstruction, engineering, and design (PED) phase of the project, contingent upon funding. Following the PED phase, construction of the recommended plan will be contingent upon congressional authorization, available Federal and non-federal sponsor funds, and will be subject to Department of the Army policy, guidance, and regulations.

Project Location/Congressional District. Flagler County is located on the northeast coast of Florida approximately midway between the Florida/Georgia state line and Cape Canaveral to the

south (refer to **Figure 1**). The county is bounded to the north by St. Johns County and to the south by Volusia County. Flagler County has approximately 18 miles of sandy shoreline, all of which are authorized for Federal study. The coast has no inlets or embayments and the beaches are typically fronted by steep dune faces or rock revetment.

Flagler County is in the 6th Congressional District. Representative Ron DeSantis supports the project.

FIGURE 1: LOCATION OF FLAGLER COUNTY AND STUDY AREA REACHES



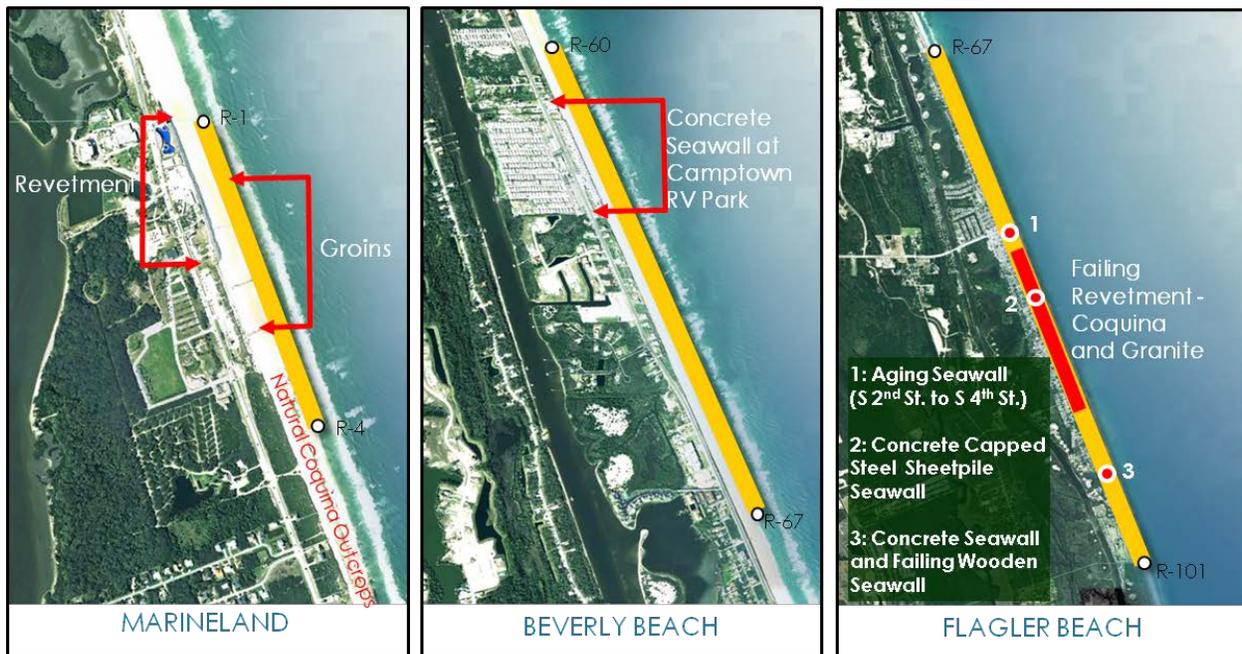
Prior Reports and Existing Projects.

Prior Reports. A reconnaissance report was completed by the Jacksonville District in 1980 that recommended that further study be conducted to develop non-structural alternatives for erosion control. Further Federal study was not funded based on the 1980 reconnaissance report. In 1982, a Section 14 Continuing Authorities Program (CAP) study for emergency streambank and shoreline erosion protection by the Jacksonville District investigated the feasibility of building a stone revetment along state road A1A in Flagler Beach to protect a 2,200 foot long section of the road from being undermined by storm induced erosion. Based on lack of financial support from the non-federal sponsor, no Federal project was adopted. Another reconnaissance report was completed by the Jacksonville District in 1988 which concluded that there was no Federal interest in further study for Flagler County beaches at that time.

The Section 905(b) Analysis, Reconnaissance Report completed by the Jacksonville District in 2004 represents the most recent effort to assess the needs for hurricane and storm damage protection along the coastline of Flagler County. Following the previous reconnaissance report in 1988, as erosion along the shoreline continued, the population in Flagler County greatly increased as well as the amount of development along the coast. The study concluded that there is strong Federal interest in initiating a feasibility phase study based on the likelihood that a Federal project may be justified and implementable.

Existing Projects. No Federal HSDR projects have been authorized or constructed along the Atlantic Coast of Flagler County, Florida. The Intracoastal Waterway (IWW) is located to the west of the study area. Several coastal armoring efforts undertaken at the local level exist within the study area and are shown in **Figure 2**.

FIGURE 2: EXISTING FLAGLER COUNTY SHORELINE ARMORING



Federal Interest. As a result of the Reconnaissance Report determination of strong Federal interest in initiating a feasibility phase study, a cost sharing agreement for the Feasibility Study was entered into on 2 September 2004. The study is cost shared at 50/50 with the non-federal sponsor per WRDA 1986.

Congress has authorized Federal participation in the cost of restoring and protecting the shores of the United States, its territories and possessions. Under current policy, shore protection projects are designed to reduce damages caused by wind-generated and tide-generated waves and currents along the Nation's ocean coasts, Gulf of Mexico, Great Lakes, and estuary shores. Hurricane protection was added to the erosion control mission in 1956 when Congress authorized cost-shared Federal participation in shore protection and restoration of publicly owned shore areas. (ER 1105-2-100 Chapter 3-4)

This project meets these definitions for Federal interest. Project implementation will generate approximately \$1,168,000 in average annual net benefits at a benefit-to-cost ratio of 1.9.

STUDY OBJECTIVES

Problems and Opportunities. Beach erosion, both long term and storm induced, is the greatest problem in the study area. Due to the unique beach sediments and proximity of existing coastal development, Flagler County's beaches are experiencing a long-term erosional trend with little natural recovery. Specific problems in the study area include the following:

- Effects from storms including erosion, storm surge (inundation), and wave attack are causing damage to coastal structures and infrastructure.
- Natural beach habitat of nesting sea turtles, benthic invertebrates, and shore birds is being lost to coastal erosion.
- Shoreline erosion is decreasing beach width, threatening recreational and tourism opportunities and safe hurricane evacuation.

Opportunities focus on desirable future conditions and potential ways to address the specific problems within the study area. Opportunities that may result from management measures are to:

- Reduce storm damage to coastal structures and infrastructure, and residential and commercial property.
- Restore dunes to function naturally where possible in the study area.
- Protect habitat of nesting sea turtles, benthic invertebrates, and shore birds.
- Protect the current hurricane evacuation route capability in eastern Flagler County.
- Maintain existing recreation and tourism opportunities.

Planning Objectives. The overarching goal of the project is to reduce the damages caused by erosion and coastal storms to shorefront structures and infrastructure within the study area. The following objectives are based on the project problems, opportunities, goals, and Federal and state objectives and regulations:

- 1) Reduce storm damages to structures and infrastructure within the Flagler County project area over the 50-year period of Federal participation.

- 2) Maintain environmental quality in the project area and adjacent areas, for human and natural use, including air and water quality, habitat, and aesthetics over the life of the project.
- 3) Maintain opportunities for recreational use of beach and nearshore areas in Flagler County including surfing, fishing, and wildlife viewing over the life of the project.
- 4) Maintain a safe hurricane evacuation route for the Flagler County project area over the life of the project.

Planning Constraints. A constraint is a restriction that limits the extent of the planning process; it is a statement of effects the alternative plans should avoid. The only planning constraint for this study area is to avoid conflict with Federal and state regulations, as stated in Federal law, USACE regulations, executive orders and State of Florida statutes. While local and state policy is considered for consistency, the emphasis is on legal requirements.

ALTERNATIVES

Plan Formulation Rationale. Four accounts, making up the Federal objectives, are established in the Principles and Guidelines (P&G 1983) to facilitate the evaluation of management measures and display the effects of alternative plans. The national economic development (NED) account displays the plan with the greatest net economic benefit consistent with protecting the nation's environment; the environmental quality (EQ) account displays non-monetary effects on ecological, cultural, and aesthetic resources including the positive and adverse effects of alternative plans; the regional economic development (RED) account displays changes in the distribution of regional economic activity (e.g., income and employment); and the other social effects (OSE) account displays plan effects on social aspects such as community impacts, health and safety, displacement, energy conservation and others. The Federal Principles and Guidelines require that for Hurricane and Storm Damage Reduction (HSDR) Projects the NED plan is to be the selected plan unless an exception is granted. As discussed above, the NED plan must also meet the test of four criteria: completeness, effectiveness, efficiency, and acceptability. Each alternative plan shall be formulated in consideration of these four criteria.

Management Measures and Alternative Plans. Management measures were selected to accomplish at least one of the planning objectives for the Flagler County study. Eight non-structural measures and 12 structural measures were identified. The Federal objectives (four accounts) were used to evaluate management measures for each of the study reaches. The following management measures with the greatest potential to contribute to planning objectives, Federal objectives, and consistency with planning constraints were carried forward:

- NS-1: No-Action
- NS-6: Relocate SR A1A (Flagler Beach reach only)
- NS-8: Buyout and Land Acquisition (Painters Hill and Beverly Beach reaches only)
- S-1: Seawalls
- S-2: Revetments
- S-3: Sand Covered Soft Structures
- S-4: Beach Nourishment
- S-5: Groins
- S-6: Submerged Artificial Reefs
- S-7: Submerged Artificial Multi-Purpose Reefs

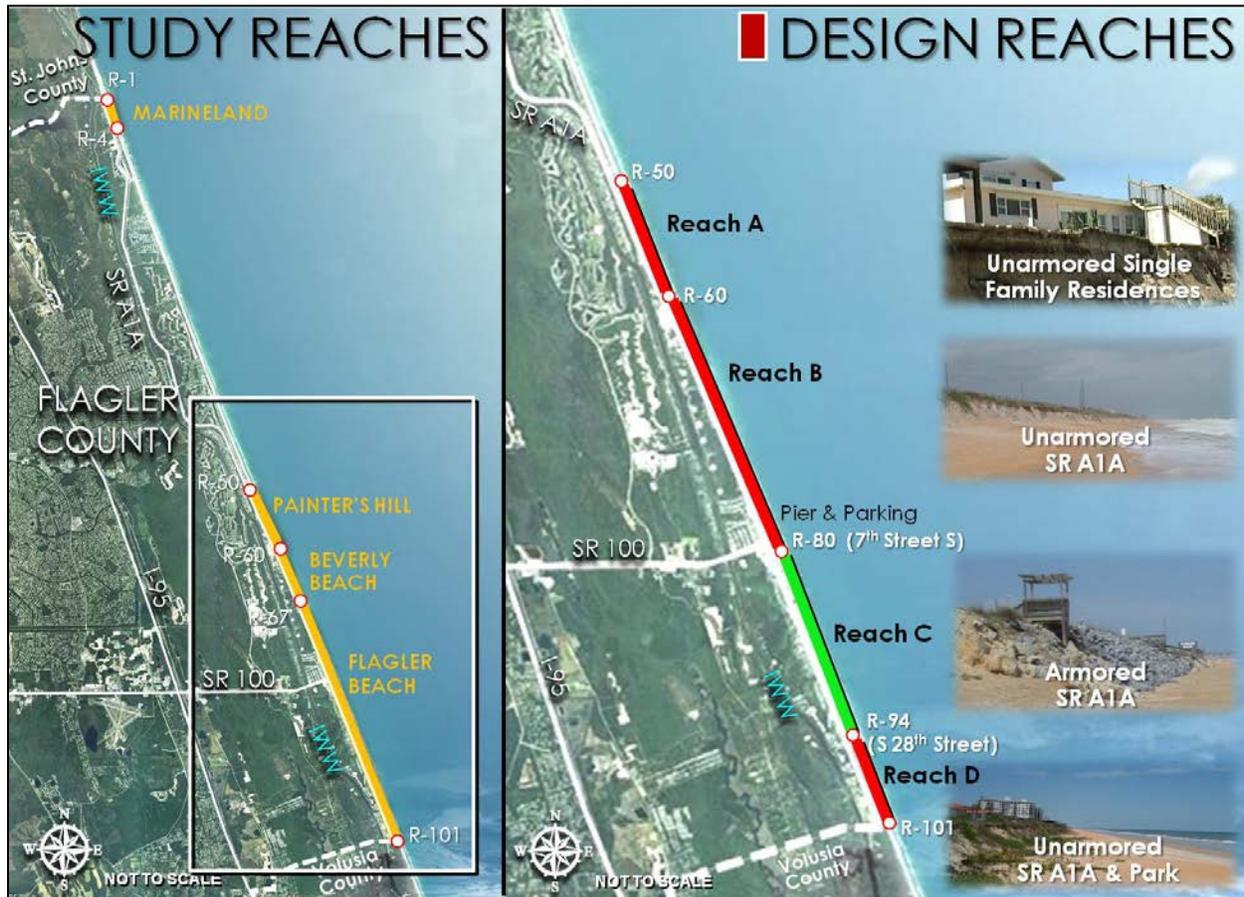
S-10: Dunes and Vegetation

The future without-project (FWOP) conditions in the study area were determined using the Beach-*fx* model. Marineland was eliminated from consideration because modeling found insignificant FWOP damages in this study reach.

Measures, used singularly or in combination with others, create alternatives; and varying scales of each create additional alternatives. Combinability and dependency rules established which measures could or could not be combined with other measures and which measures would be dependent on other measures being implemented. This resulted in 39 possible alternatives, for which rough order of magnitude (ROM) cost estimates were developed. Alternatives with ROM cost estimates greater than the FWOP damages were screened out because it is not likely that these alternatives would be economically justified. The five alternatives resulting from this screening were No-action, Geotube with dune, Revetment, Dune, and Beach Nourishment with dune.

Four Beach-*fx* design reaches were created based on average present value (PV) damages of the FWOP condition (see **Figure 3**), as well as existing shoreline conditions such as existing beach width and profile. Beach-*fx* modeling was used to further screen the remaining alternatives down to a final array of eight dune and beach nourishment alternatives. The no-action alternative is not recommended.

FIGURE 3: LOCATION OF STUDY AND DESIGN REACHES



Final Array of Alternative Plans. The results of the cost and benefit evaluations are shown in **Table 1**. Alternatives that include Reach A do not meet the acceptability criteria because Reach A is essentially a private beach, and not publicly accessible per current USACE policy. For this reason Reach A is screened out. With Reach AC duneH screened out, the NED Plan with the highest net benefits and BCR is Reach C duneH.

TABLE 1: AAEQ BENEFITS AND COSTS FOR FINAL ARRAY OF ALTERNATIVES

Alternatives	Brief Description	Benefits	Cost	Net Benefits	BCR
Reach A duneH	Dune extension and 10' sacrificial berm in Reach A only	\$220,000	\$170,000	\$52,000	1.35
Reach A 30	Dune extension and 30' sacrificial berm in Reach A only	\$690,000	\$700,000	-\$16,000	0.98
Reach B duneH	Dune extension and 10' sacrificial berm in Reach B only	\$200,000	\$250,000	-\$57,000	0.78
Reach B 30	Dune extension and 30' sacrificial berm in Reach B only	\$210,000	\$1,030,000	-\$809,000	0.21
Reach C duneH (NED)	Dune extension and 10' sacrificial berm in Reach C only	\$2,190,000	\$810,000	\$1,387,000	2.72
Reach C 30	Dune extension and 30' sacrificial berm in Reach C only	\$2,250,000	\$1,180,000	\$1,065,000	1.90
Reach AC duneH	Dune extension and 10' sacrificial berm in Reaches A and C (non-contiguous)	\$2,940,000	\$1,130,000	\$1,814,000	2.61
Reach AC 30	Dune extension and 30' sacrificial berm in Reaches A and C (non-contiguous)	\$2,960,000	\$1,750,000	\$1,206,000	1.69

Note: Costs were developed by SAJ District cost engineering personnel in FY2013 dollars, and deflated back to 2011 price levels. The original real estate assessment was completed in 2011, so the benefits are in 2011 price levels.

Key Uncertainties. Beach-*fx* modeling accounts for many uncertainties in the physical and economic analysis by using a triangular distribution for model inputs and simulating 100 iterations of the 50 period of analysis. Modeling was also performed for the historic, intermediate, and high sea-level rise scenarios to ensure that the NED plan will still be economically justified across a range of possible FWOP conditions. To account for uncertainties in the cost estimate, a contingency was applied based on a cost and schedule risk analysis.

Recommended Plan. The recommended plan, that is the National Economic Development (NED) plan, consists of a ten foot dune and beach profile extension along 2.6 miles of shoreline in Flagler Beach and mainly prevents damage to State Road (SR) A1A, an important hurricane evacuation route. Initial construction will require approximately 330,000 cubic yards of sand, and each periodic nourishment event will require approximately 320,000 cubic yards. The renourishment interval is expected to be approximately 11 years, equaling 4 renourishment events in addition to initial construction over the 50 year period of Federal participation. The borrow area is located 7 miles offshore of the placement area within Federal waters.

Environmental Operating Principles. In coordination with the agencies and other stakeholders, USACE proactively considered the environmental consequences of the proposed project. The recommended plan avoids adverse impacts to environmental resources, and no mitigation is required for the project. The plan is environmentally preferable to the FWOP condition because it will help to establish a natural dune system that will promote biodiversity and nesting habitat. The project would be constructed in compliance with all applicable laws and is consistent with the Florida Coastal Management Program. A risk management assessment has been performed, which included environmental concerns. In addition, USACE coordinated with all stakeholders to gather scientific, economic, and social information. This coordination was conducted in a manner that encouraged all groups to express their views.

Agency Technical Review (ATR): An ATR was performed by a multi-disciplinary team. The ATR team membership and the scope of ATR work were coordinated with the USACE National Planning Center for Coastal Storm Risk Management. During the ATR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. Certification was provided on 13 June 2013.

Independent External Peer Review (IEPR): An exclusion from IEPR was approved by HQUSACE on 20 May 2013.

EXPECTED PROJECT PERFORMANCE

Project Costs, Equivalent Annual Costs and Benefits.

Project Costs and Cost Sharing. Total project first costs and cost share breakdown in October 2014 price levels are tabulated below in **Table 2**. The cost of the final periodic renourishment is slightly less than the first 3 periodic renourishments only because less post-construction monitoring is required for the final event.

Federal participation in HSDR projects is limited to shorelines open to public use. Guidance is provided in ER 1105-2-100 wherein user fees, parking, access, beach use by private organizations, and public shores with limitations are addressed (E-24.d). Federal participation is determined by project purpose, either hurricane and storm damage reduction or recreation, and by shoreline ownership. Shoreline ownership is separated into lands that are federally owned, publicly and privately owned with public use, and privately owned with limited use.

The length of shoreline where the recommended plan will be constructed, Reach C, has adequate parking and access. Two areas have adequate street-side parking but lack a sign indicating that public parking is available. The sponsor has indicated that signage will be posted in order to claim 100% public access and parking coverage in Reach C.

TABLE 2: COST SUMMARY AND COST SHARING (PROJECT FIRST COSTS)

Flagler County, Florida Hurricane and Storm Damage Reduction Project			
Summary of Project Costs (Constant Dollar Basis, FY15 (1 Oct 14) price levels)			
Initial Construction (First Cost)	Total Cost	Federal Cost (65%)	Non-Federal Cost (35%)
Dune/Beach Nourishment	\$ 7,258,000	\$ 4,717,700	\$ 2,540,300
LERRD			
USACE Administrative Costs	\$ 1,297,000	\$ 843,050	\$ 453,950
*Non-Federal Administrative Costs	\$ 2,161,000	\$ 1,404,650	\$ 756,350
*Relocation of Dune Walkovers	\$ 1,175,000	\$ 763,750	\$ 411,250
PED	\$ 1,654,000	\$ 1,075,100	\$ 578,900
Construction Management (S&A)	\$ 637,000	\$ 414,050	\$ 222,950
Total First Cost	\$ 14,182,000	\$ 9,218,300	\$ 4,963,700
<i>LERRD Credit</i>			\$ (3,336,000)
<i>Initial Cash Contribution</i>	\$ 10,846,000	\$ 9,218,300	\$ 1,627,700
Periodic Renourishments 1-3	Total Cost	Federal Cost (50%)	Non-Federal Cost (50%)
Dune/Beach Nourishment	\$ 6,157,000	\$ 3,078,500	\$ 3,078,500
PED	\$ 1,095,000	\$ 547,500	\$ 547,500
Construction Management (S&A)	\$ 465,000	\$ 232,500	\$ 232,500
Total Each Periodic Renourishment 1-3	\$ 7,717,000	\$ 3,858,500	\$ 3,858,500
Periodic Renourishment 4	Total Cost	Federal Cost (50%)	Non-Federal Cost (50%)
Dune/Beach Nourishment	\$ 6,157,000	\$ 3,078,500	\$ 3,078,500
PED	\$ 1,007,000	\$ 503,500	\$ 503,500
Construction Management (S&A)	\$ 465,000	\$ 232,500	\$ 232,500
Total Periodic Renourishment 4	\$ 7,629,000	\$ 3,814,500	\$ 3,814,500
Total Project Cost	\$44,962,000	\$24,608,300	\$20,353,700
<i>*Non-Federal Administrative Costs and Relocation of Dune Walkovers for LERRD will be included in the Total Project Cost and credited against the Non-Federal sponsor's responsibility.</i>			

Equivalent Annual Costs and Benefits. A summary of the average annual costs and benefits for the Recommended Plan is provided in **Table 3**. The benefit cost ratio was calculated for the current discount rate of 3.5%. The economic storm damage reduction benefits of the plan are generated by reductions in erosion damages. Most of the benefits are associated with reductions to armor damage along the A1A revetment. Incidental recreation benefits were calculated using the Unit Day Value (UDV) method, as described in EGM 09-03 and in Appendix E of ER 1105-2-100. Traffic re-routing benefits are based on the ‘benefit foregone’ of no longer having the road in place when it is damaged by erosion.

TABLE 3: ECONOMIC SUMMARY OF THE RECOMMENDED PLAN

Economic Summary (FY 14 Price Level, 50 -Year Period of Analysis, 3.5% Discount Rate)	
Initial Construction	\$14,114,220
1st Renourishment	\$7,589,733
2nd Renourishment	\$7,589,733
3rd Renourishment	\$7,589,733
4th Renourishment	\$7,503,633
Total First Cost	\$44,387,052
Interest During Construction (IDC)	\$163,000
Total Investment Cost	\$44,550,052
Average Annual Investment Cost	\$1,229,000
Annual OMRR&R	\$10,000
Total Average Annual Cost	\$1,239,000
Average Annual Storm Damage Reduction Benefits	\$2,159,000
Average Annual Recreation Benefits	\$72,000
Average Annual Traffic Re-route Benefits	\$176,000
Average Annual Total Benefits	\$2,407,000
Average Annual Net Benefits	\$1,168,000
Benefit Cost Ratio (3.5 % discount rate)	1.9
Benefit Cost Ratio (7 % discount rate)*	1.09

**Per Executive Order 12893*

Note: Costs are shown in FY14 (October 2013) price levels.

Project Implementation. USACE is responsible for budgeting for the Federal share of future Federal construction projects. Federal funding is subject to budgetary constraints inherent in the formation of the national civil works budget in a given fiscal year. USACE would perform the necessary preconstruction engineering and design (PED) needed prior to construction. USACE would meet requirements for the use of Federal lands at the borrow area, obtain water quality certification, coordinate with the state as required by the Coastal Zone Management Act, and construct the project. Cost sharing of PED, initial construction, and periodic nourishment will be in accordance with WRDA 1986, as amended, subject to the availability of appropriations.

The non-federal project sponsor would provide an up-front cash contribution for initial construction costs of the proposed project. The amount of the non-federal up-front cash contribution would be based on cost sharing principles reflecting shoreline use, ownership and public access in existence at the time of construction. The non-federal sponsor shall provide the entire cost of all material placed on or seaward of undeveloped lands and developed private lands (which are inaccessible to the public). The non-federal sponsor shall provide lands, easements,

and rights-of-way and bear a portion of the administrative costs associated with land requirements. Other general non-federal responsibilities, such as continuing public use of the project beach for which benefits are claimed in the economic justification of the project, and controlling water pollution to safeguard the health of bathers, must also be assumed by the non-federal sponsor before the project can be constructed. The non-federal project sponsor will be responsible for all costs of operation, maintenance, repair, rehabilitation and replacement of project features.

Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R). By Public Law 84-826 dated 1956 (beach nourishment), periodic nourishment is considered construction and not maintenance, and therefore is cost shared. The Recommended Plan involves initial construction and periodic nourishment of a dune and sacrificial beach, and is technically “beach nourishment.” The operations, maintenance, repair, rehabilitation, and replacement (OMRR&R) anticipated for this project includes semiannual beach profile surveys, aerial photography, and an annual monitoring report. Other OMRR&R items may include revegetating the dune beach tilling although it is not anticipated that these actions will be needed for this project. The operations and maintenance will also include the draft items of local cooperation. These items entail publicizing floodplain information, ensuring continued conditions of public ownership and use of the shore, performing surveillance of the beach, and any specific directions prescribed by the government. Based on the size and scope of the recommended plan and the cost of similar activities for similar activities, the annual costs for maintenance, repair, replacement and rehabilitation (OMRR&R), including beachfill monitoring over the 50 year project, are estimated to be \$10,000. Operations and maintenance is borne 100% by the non-federal sponsor and is detailed in the Project Partnership Agreement (PPA). An Operations and Maintenance Manual will be completed by USACE and provided to the sponsor following completion of initial construction.

Key Social and Environmental Factors. There are no major controversial issues associated with this project. In addition to being economically justified based on NED benefits, the recommended plan will also yield incidental benefits under the EQ and OSE accounts. The recommended plan will increase the availability of dune habitat over the future without project and provide protection for an important hurricane evacuation route.

Stakeholder Perspectives and Differences. To ensure that the public and Federal, tribal, state, and local agencies were kept informed about progress on technical analyses and policy issues, public meetings were held throughout the study period. A scoping letter was mailed to all Federal, state, and local agencies; local libraries; and all abutting property owners on 26 August 2008. A public scoping meeting was held in Bunnell, Flagler County, Florida on 25 October 2011 in fulfillment of NEPA requirements at which a diversity of views were presented including those for and against a coastal storm damage reduction project. Notification of the Draft Integrated Feasibility Study and Environmental Assessment for public review and comment was issued on 17 January 2014. A public workshop on the Draft Integrated Feasibility Study and Environmental Assessment was held in Bunnell, Florida on 5 February 2014. Comments and questions on the Draft Integrated Feasibility Study and Environmental Assessment from the resource agencies were received from 17 January 2014 through 15 March 2014. The Bureau of Ocean Energy Management (BOEM) was the only Federal agency to

submit comments. Comments were received from state agencies including the Florida Fish and Wildlife Conservation Commission (FWC), the Florida Department of Environmental Protection (FDEP), and the Florida Department of Transportation (FDOT).

Environmental Compliance. The NEPA document for this project is an Environmental Assessment (EA). The Draft EA was coordinated with the Draft Feasibility Study as an integrated document. All public comments were incorporated into the Final Report. A Finding of No Significant Impact (FONSI) has been included in the report submittal package.

Certification of Peer, Agency, Cost and Legal Review.

IEPR Exclusion Approved	20 May 2013
ATR Certification	13 June 2014
Cost Certification	6 June 2014
Legal Review Certification	10 June 2014