DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

FINAL

Integrated Feasibility Report and Environmental Assessment

Loíza, Puerto Rico

SECTION 14 STUDY

(PWI # 455357)

May 2018

US Army Corps of Engineers®

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SOUTH ATLANTIC DIVISION
60 FORSYTH STREET SW, ROOM 10M15
ATLANTA, GA 30303-8801

REPLY TO ATTENTION OF

CESAD-CG

25 May 2018

MEMORANDUM FOR Commander, Jacksonville District (CESAJ-PD)

SUBJECT: Approval of the Integrated Feasibility Report (IFR) and Environmental Assessment (EA) for the Loiza, Puerto Rico Continuing Authorities Program (CAP) Section 14

1. References:

a. Memorandum, CESAD-PDP, 12 April 2018, Draft Integrated Feasibility Report and Environmental Assessment (EA) for the Loiza, Puerto Rico, Continuing Authorities Program (CAP) Section 14.

b. Memorandum, CESAJ-PD, 14 March 2018, Draft Integrated Feasibility Report and Environmental Assessment (EA) for the Loiza, Puerto Rico, Continuing Authorities Program (CAP) Section 14.

2. The South Atlantic Division (SAD) reviewed the report and integrated EA. SAD concurs with the District's findings and recommendations. All review comments including legal and policy reviews (reference 1a above) were satisfactorily resolved. The report is hereby approved and the Finding of No Significant Impact (FONSI) may be executed by the District Commander.

3. Point of contact for this action is Ms. Kenitra Stewart at (404) 562-5229.

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DIANA M. HOLLAND
Brigadier General, USA
Commanding

US Army Corps of Engineers
JACKSONVILLE DISTRICT

FINDING OF NO SIGNIFICANT IMPACT

MUNICIPALITY OF LOÍZA, PUERTO RICO
CONTINUING AUTHORITIES PROGRAM, SECTION 14 PROJECT
INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT

The U.S. Army Corps of Engineers, Jacksonville District (Corps), has conducted an environmental assessment in accordance with the National Environmental Policy Act of 1969, as amended. The Corps assessed the effects of the following actions in the Final Integrated Feasibility Report and Environmental Assessment (IFR/EA), dated April 2018 for the Loíza Section 14 Continuing Authorities Program (CAP) project in Puerto Rico. The final recommendation is contained in the IFR/EA and is incorporated herein by reference. The Recommended Plan consists of the following:

- Placement of a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, head start public school, and community center is recommended to provide emergency shoreline protection at Loíza;
- Elevation of the revetment crest would be 12.0-ft Puerto Rico Vertical Datum of 2002 (PRVD02);
- The remaining sidewalk may need to be demolished due to existing damages and replaced with the over-wash protection zone, which consists of high performance turf reinforcement mat keyed in between the existing road and revetment.

In addition to the "no action" alternative, relocation and the Recommended Plan were also evaluated. The Recommended Plan meets the objectives of the study to provide emergency shoreline protection through the construction of a revetment along approximately 1,050 feet of shoreline at Loíza. This alternative provides a resilient solution to the continued erosion that threatens the existing public infrastructure. Additionally, the Recommended Plan is economically justified because the costs to relocate the public road, head start school, and community center are higher than the Recommended Plan costs. There is not a locally preferred plan.

All practicable means to avoid and minimize adverse environmental effects have been incorporated into the recommended plan. Environmental commitments as detailed in the IFR/EA will be implemented to minimize impacts.

The Puerto Rico Planning Board has concluded that the proposed Section 14 project is consistent with the Puerto Rico Coastal Zone Management Program and its associated statutes. A water quality certification pursuant to section 401 of the Clean Water Act will be obtained from the Commonwealth of Puerto Rico prior to construction. All conditions of the water quality certification will be implemented in order to minimize adverse impacts to water quality.

Pursuant to section 7 of the Endangered Species Act of 1973, as amended, coordination with the US Fish and Wildlife Service has been completed.

Pursuant to section 106 of the National Historic Preservation Act of 1966, as amended, the Puerto Rico State Historic Preservation Officer concurred with the Corps determination of no effect to historic properties.

Public review of the draft IFR/EA was completed on April 13, 2018. All comments submitted during the public comment period were responded to in the Final IFR/EA, Appendix D3.

Technical, environmental, economic, and cost-effectiveness criteria used in the formulation of alternative plans were those specified in the Water Resource Council's 1983 Economic and Environmental Principles for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in the evaluation of the alternatives. Based on these reports, the reviews by other Federal, State and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not significantly affect the human environment; therefore, preparation of an Environmental Impact Statement is not required.

Date: 22 JUN 2018

Jason A. Kirk
Colonel, U.S. Army
District Commander

Executive Summary

This report is in response to a request from the Department of Natural and Environmental Resources, Commonwealth of Puerto Rico that the U.S. Army Corps of Engineers provide assistance in addressing shoreline critical erosion problems at Loíza. Erosion in this area is threatening critical infrastructure, including a public road, a public school, and a community center, along approximately 1,050 feet of shoreline. The erosion at Loíza was further exacerbated by impacts from Hurricane Irma and Hurricane Maria. The road is at an immediate critical need for protection as the 2017 hurricanes caused further shoreline erosion right up to the public road, causing to be at partial failure.

The study shows that construction of a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, Head Start public school, and community center is recommended to provide emergency shoreline protection at Loíza. The elevation of the revetment crest would be 10.0-ft Puerto Rico Vertical Datum of 2002 (PRVD02). Due to existing public sidewalk damage, the remaining sidewalk may need to be demolished and replaced with the over-wash protection zone. If needed, the over-wash protection zone would consist of high performance turf reinforcement mat keyed in between the existing road and revetment. Construction will take an estimated 11 months at an estimated FY19 total cost of $6,318,000.

ES-1 Cost Allocation of the Recommended Plan (Revetment)

Project First Costs FY 19 (October 01, 2018) Price Levels Revetment (1,050 feet of the Loiza Shoreline)			
	Total Cost[1]	Federal	Non-Federal
Revetment Costs	Section 14	65%	35%
Bank Stabilization	$3,922,000	$2,549,000	$1,373,000
Lands and Damages[2]	$70,000	$46,000	$24,000
Planning, Engineering, and Design	$708,000	$460,000	$248,000
Construction Management	$363,000	$236,000	$127,000
Total Project Costs	$5,063,000	$3,291,000	$1,772,000
Section 1032 of WRRDA 14 Waiver	-	$455,000	($455,000)
Total Cost Allocation[3]	$5,063,000	$3,746,000	$1,317,000

1. The Total Project Cost Summary can be found in the Cost Appendix C.
2. Lands and Damages are all administrative costs.
3. Total cost allocation includes the WRRDA 14 Section 1032 waiver which added Puerto Rico as a territory eligible for a $455,000 waiver of non-Federal cost sharing.

LOÍZA, PUERTO RICO
FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

TABLE OF CONTENTS

1.0 STUDY INFORMATION* 1

1.1 INFORMATION 1
1.2 STUDY AUTHORITY 1
1.3 PURPOSE AND SCOPE 1
1.4 PRIOR REPORTS AND STUDIES 4
1.5 LOCATION AND GENERAL DESCRIPTION 5
1.5.1 Location 5
1.5.2 General 5

2.0 EXISTING CONDITIONS* 7

2.1 GENERAL CONDITIONS 7
2.2 NATURAL ENVIRONMENT (AFFECTED ENVIRONMENT) 7
2.2.1 Vegetation 7
2.2.2 Fish and Wildlife Resources (Other than Threatened and Endangered Species) 8
2.2.3 Threatened, Endangered, and Protected Species 8
2.2.4 Air Quality 13
2.2.5 Water Quality 14
2.2.6 Hazardous, Toxic, and Radioactive Waste 14
2.2.7 Noise 15
2.2.8 Aesthetic and Recreational Resources 15
2.2.9 Cultural Resources 15
2.2.10 Human Health and Safety 19
2.2.11 Socioeconomics 19

3.0 FUTURE WITHOUT-PROJECT CONDITIONS 20

3.1 GENERAL CONDITIONS 22
3.2 NATURAL ENVIRONMENT* 22
3.2.1 Vegetation 22
3.2.2 Fish and Wildlife Resources (Other than Threatened and Endangered Species) 22
3.2.3 Threatened, Endangered, and Protected Species 22
3.2.4 Air Quality 22
3.2.5 Water Quality 22
3.2.6 HTRW 22
3.2.7 Noise 22
3.2.8 Aesthetic and Recreational Resources 23
3.2.9 Cultural Resources 23
3.2.10 Human Health and Safety 23
3.2.11 Socioeconomics 23

4.0 PROBLEMS AND OPPORTUNITIES 24

4.1 PLANNING OBJECTIVES AND CONSTRAINTS 26
4.2 SCOPING AND ISSUES* 27
4.3 PERMITS AND LICENSES * 27

5.0 FORMULATION AND EVALUATION OF ALTERNATIVE PLANS* 28

5.1 PLAN FORMULATION RATIONALE 28
5.2 MANAGEMENT MEASURES 29

5.3 Issues and Basis for Choice 29
5.4 Preliminary Array of Alternatives 29
5.5 Evaluation of Alternative Plans 31
5.6 Plan Selection 34

6.0 RECOMMENDED PLAN 35

6.1 Description of the Recommended Plan 35
6.2 Cost Allocation 36
6.2.1 Federal Responsibility 36
6.2.2 Non-Federal Responsibility 36
6.3 Real Estate 37

7.0 EFFECTS OF THE RECOMMENDED PLAN (PROPOSED ACTION)* 39

7.1 General Conditions 39
7.2 Natural Environment (Affected Environment) 39
7.2.1 Vegetation 39
7.2.2 Fish and Wildlife Resources (Other than Threatened and Endangered Species) 40
7.2.3 Threatened, Endangered, and Protected Species 40
7.2.4 Air Quality 41
7.2.5 Water Quality 42
7.2.6 HTRW 42
7.2.7 Noise 42
7.2.8 Aesthetic and Recreational Resources 42
7.2.9 Cultural Resources 42
7.2.10 Human Health and Safety 43
7.2.11 Socioeconomics 43
7.2.12 Cumulative Impacts 43
7.2.13 Unavoidable Adverse Environmental Effects 46

8.0 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS* 47

8.1 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 47
8.1.1 Public and Agency Coordination 47
8.1.2 Comments Received and Responses 47
8.2 ENVIRONMENTAL COMMITMENTS 48
8.2.1 Protection of Fish and Wildlife Resources 48
8.2.2 Endangered Species Protection 48
8.2.3 Water Quality 48
8.2.4 Cultural Resources 48
8.2.5 Protection of Migratory Birds 48
8.2.6 Protection of Nesting Sea Turtles 49
8.3 ENVIRONMENTAL COMPLIANCE 49
8.3.1 Clean Air Act of 1972 (42 U.S.C. §7401 et. seq.) 49
8.3.2 Clean Water Act of 1972 (33 U.S.C. §1251 et. seq.) 49
8.3.3 Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990 (16 U.S.C. §3501 et. seq.) 49
8.3.4 Coastal Zone Management Act of 1972 (16 U.S.C. §1451 et. seq.) 49
8.3.5 Estuary Protection Act of 1968 (16 U.S.C. §§1221-26) 49
8.3.6 Farmland Protection Policy Act of 1981 (7 U.S.C. §4201 et. seq.) 50
8.3.7 Rivers and Harbors Act of 1899 (33 USC §401 et. seq.) 50
8.3.8 Submerged Lands Act of 1953 (43 U.S.C. § 1312 Et. seq.) 50
8.3.9 Wild and Scenic River Act of 1968 (28 U.S.C. §1271 et. seq.) 50
8.3.11 Fish and Wildlife Coordination Act of 1958 (16 U.S.C. §§661-665; 665a; 666; 666a-666c) 50
8.3.13 Migratory Bird Treaty Act (16 U.S.C. §§703-712) and Migratory Bird Conservation Act (16 U.S.C. §§715-715d, 715e, 715f-715r) 50
8.3.14 Magnuson-Stevens Fishery Conservation and Management Act of 1976, As Amended (16 U.S.C. §801 et. seq.) 51

8.3.15 Anadromous Fish Conservation Act (16 U.S.C. §§757A-757G)..... 51
8.3.16 Marine Mammal Protection Act of 1972 (16 U.S.C. §1361 et. seq.)..... 51
8.3.17 Marine Protection, Research, and Sanctuaries Act (33 U.S.C. §1401 et. seq.)..... 51
8.3.18 National Historic Preservation Act of 1966 (INTER ALIA)..... 51
8.3.19 Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. §4601 et. seq.)..... 51
8.4 EXECUTIVE ORDER (E.O.) COMPLIANCE..... 51
8.4.1 E.O. 11988, Flood Plain Management..... 51
8.4.2 E.O. 11990, Protection of Wetlands..... 52
8.4.3 E.O. 12898, Environmental Justice..... 52
8.4.4 E.O. 13045, Disparate Risks Involving Children..... 52
8.4.5 E.O. 13089, Coral Reef Protection..... 53
8.4.6 E.O. 13112, Invasive Species..... 53
8.4.7 E.O. 13186, Migratory Birds..... 53

9.0 RECOMMENDATIONS..... 54

10. BIBILIOGRAPHY..... 58

*Environmental Assessment Chapters

APPENDICES

APPENDIX A: ENGINEERING
APPENDIX B: REAL ESTATE PLAN
APPENDIX C: COST APPENDIX
APPENDIX D: ENVIRONMENTAL
D-1: ENVIRONMENTAL CORRESPONDENCE
D-2: 2015 SPBO
D-3: PUBLIC AND AGENCY NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) REVIEW COMMENTS AND USACE RESPONSES
APPENDIX E: PERTINENT CORRESPONDENCE

LIST OF TABLES

ES-1 Cost Allocation of the Recommended Plan (Revetment).....i
Table 1: Threatened and Endangered Species in the Project Area.....9
Table 2: Summary of the environmental effects associated with the alternative plans. 32
Table 3: Economic Justification of Recommended Plan (Revetment).....34
Table 4: Cost Allocation for the Recommended Plan 37
Table 5: Past, present, and reasonably foreseeable actions and plans affecting the Project area.....44
Table 6: Summary of cumulative effects.....44

LIST OF FIGURES

Figure 1: Study Area of Loíza, Puerto Rico 3
Figure 2: Shoreline Damage in the Study Area at Loíza Pre-Hurricane Irma 3
Figure 3: Shoreline Damage in the Study Area at Loíza Post-Hurricanes Irma and Maria 2017.....4
Figure 4: Location Map of Loíza, Puerto Rico.....5
Figure 5: Historical storms within 100 miles of Loíza, P.R. 6
Figure 6: Vegetation found in and around the Project area.....8
Figure 7: Green sea turtle NMFS DCH.....10
Figure 8: Hawksbill sea turtle NMFS DCH.....11
Figure 9: Leatherback sea turtle NMFS DCH.....12
Figure 10: Loggerhead sea turtle NMFS DCH.....13
Figure 11: Kodak Rahola, Inc. and Project site locations. 15
Figure 12: Location of the Loíza CAP Section 14 Area of Potential Effects.....17
Figure 13: Southeast view of beach area.....18
Figure 14: Southwest view of the community center, northeast façade.....18
Figure 15: Northwest view of the school, east façade.....19
Figure 16: Progression of erosion at Loíza 21
Figure 17: Loíza Shoreline Erosion Progression at Head Start Public School.....24
Figure 18: Loíza Shoreline Erosion at the Community Center.....25
Figure 19: Loíza Eroded Dune at the Public Road.....25
Figure 20: Loíza Public Road Failure.....26
Figure 21: Measures as shown in PR-CCC Publication Adaptation Strategies 2005 30
Figure 22: Recommended Plan – Revetment Alternative.....35
Figure 23: Real Estate Map.....38

LOÍZA, PUERTO RICO
FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

1.0 STUDY INFORMATION*

1.1 Information

At the request of the Department of Natural and Environmental Resources, Commonwealth of Puerto Rico, the U.S. Army Corps of Engineers (USACE) conducted a study along a portion of the shoreline of Loíza. The shoreline located in the study area is approximately 1,050 feet. The Loíza shoreline is severely eroded; chronic erosion has already impacted and continues to threaten impacts to public infrastructure and facilities, including a Head Start public school, community center, and a public roadway, **Figure 1**.

1.2 Study Authority

Authority and funds for this report were provided by Section 14 of the Flood Control Act of 1946, Public Law 79-526 (33 U.S.C. 701r); as amended by Section 27 of the Water Resources and Development Act (WRDA) 1974, Public Law 93-251; Section 915(c)of WRDA 1986, Public Law 99-662; Section 2023 of WRDA 2007, Public Law 110-114; and Section 1030(i) of the Water Resources Reform and Development Act (WRRDA) 2014, Public Law 113-121 and reads as follows:

> The Secretary of the Army is hereby authorized to allot from any appropriations heretofore or hereafter made for flood control, not to exceed $20,000,000 per year, for the construction, repair, restoration, and modification of emergency streambank and shoreline protection works to prevent damage to highways, bridge approaches, and public works, churches, hospitals, schools, and other nonprofit public services, when in the opinion of the Chief of Engineers such work is advisable: Provided, that not more than $5,000,000 shall be allotted for this purpose at any single locality from the appropriations for any one fiscal year.

1.3 Purpose and Scope

This report is in response to a request from the Puerto Rico Department of Natural and Environmental Resources (DNER) that the U.S. Army Corps of Engineers provide assistance in addressing shoreline erosion problems along the coast of Loíza. Hurricane and coastal storm damages along the Loíza shoreline, including erosion causing receding shorelines, threatens infrastructure such as a public road, public buildings, commercial businesses, a public school, public parkland, private homes, and recreational beach access. It also contributes to public safety hazards. Existing infrastructure located along large portions of the study area contribute to increased erosion of unprotected properties, create public safety hazards from loose construction

debris and weakened existing structures and, in some cases, fail to protect the property they front. A number of these structures are located directly along the shoreline and have suffered damage from coastal storms.

Loíza is located on Puerto Rico's northern Atlantic Coast, approximately 16 miles east of San Juan, **Figure 1**. The study area includes a community center, a Head Start public school, and a public roadway with a combined shoreline frontage of approximately 1,050 feet within the Municipality of Loíza, Puerto Rico; **Figure 1**. Loíza is an economically disadvantaged community, with nearly 50% of the population living in poverty[1].

Section 14 of the Flood Control Act of 1946, as amended, provides for implementation of projects to protect public facilities and facilities owned by non-profit organizations that are used to provide public services that are open to all on equal terms. USACE site visits in 2010, 2013, 2015, 2016, and 2017 show continued erosion of the shoreline and structural damages to the public facilities in the study area. Despite efforts to maintain the facilities, the public community center is cracking and the earthen foundation beneath the building has eroded. The community center is temporarily displaced due to these unsafe conditions; the population must travel to Rio Grande to use their community center until the shoreline is stabilized. The public school is a Head Start school called Parcela Suarez. It is the only preschool center for the entire community. Similar to the community center, local efforts to provide shoreline protection were unsuccessful. The resulting damages and safety concerns forced the municipality to recently temporarily displace the students at the school. Currently, the children are sent to a provisional community school, Piñones, approximately 30 minutes away. These temporary displacements of the public facilities are not an adequate or permanent solution, and the municipality would like to return operations to this site pending implementation of emergency shoreline protection measures. Additionally, there is a critical roadway in the study area. A portion of this road has already failed, however, the critical portions of the road are still operational. Should these portions also fail, it will leave no option for residents living adjacent to this roadway to access the connecting roads. Further, should the road fail, the homes adjacent to the road will likely be impacted by the continued erosion by cutting off access. See **Figure 2.**

The shoreline in this area generally erodes in winter months with some accretion of sand in the summer months. The facilities were maintained and efforts have been made to address the erosion; materials, such as rock and debris, have been used to attempt to slow erosion, however these attempts have not been successful.

This area has been further threatened with the recent hurricanes Irma and Maria which made landfall in September 2017. The hurricanes brought further erosion to Loíza and created an immediate threat to the public road. Emergency shoreline protection is needed to prevent the road from further failing due to the continued and exacerbated erosion made worse by the recent storm event, **Figure 3**.

[1] www.census.gov

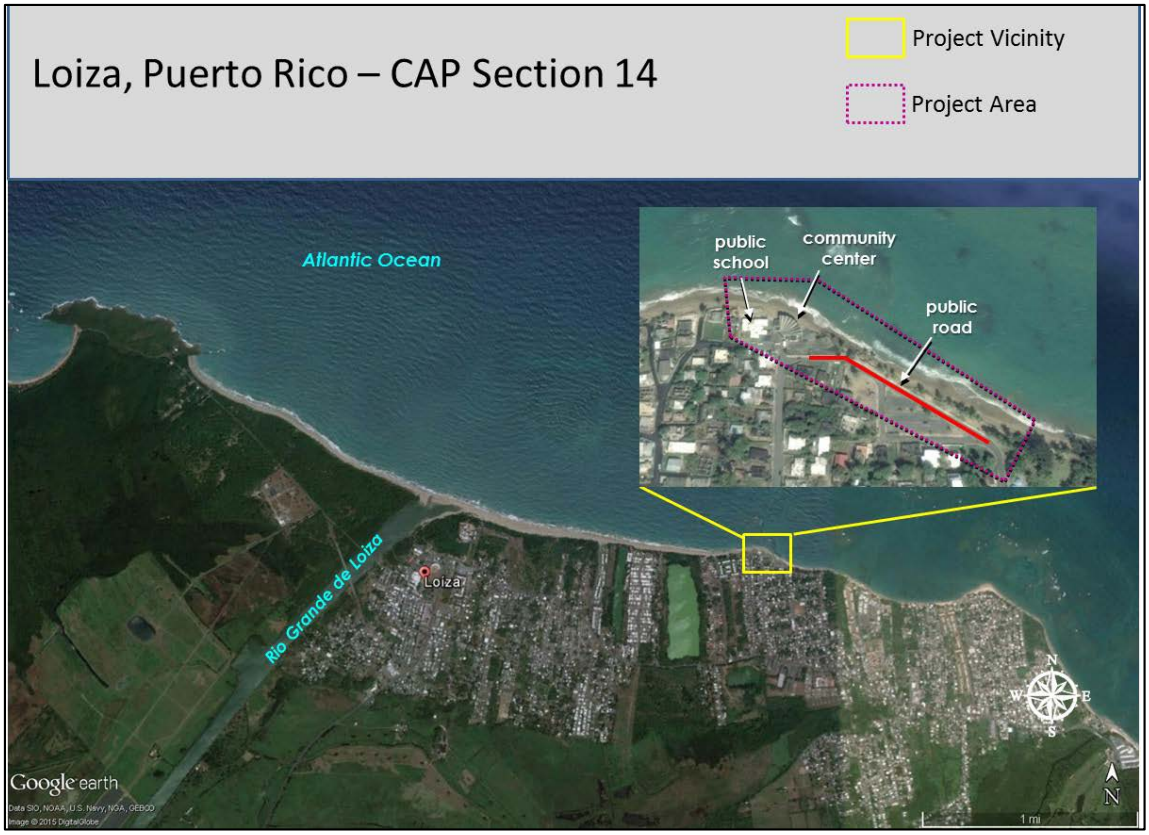

Figure 1: Study Area of Loíza, Puerto Rico

Figure 2: Shoreline Damage in the Study Area at Loíza Pre-Hurricane Irma

Figure 3: Shoreline Damage in the Study Area at Loíza Post-Hurricanes Irma and Maria 2017

1.4 Prior Reports and Studies

A trip report was prepared in 2010 under the Section 22, WRDA 1974 (P.L. 93-251), as amended. The Section 22 authority allows the USACE to cooperate with Puerto Rico by providing technical assistance to support Commonwealth preparation of comprehensive water and related land resources development plans. Assistance was given on the basis of Puerto Rico's request. Based on a letter from the Municipality of Loíza, the DNER requested assistance from the USACE in investigating hurricane and storm damage reduction alternatives for the Loíza shoreline on February 1, 2010. The trip report verified a need for coastal storm damage reduction alternatives and recommended beach nourishment and limited construction/improvement of revetments by the DNER. Other prior reports and studies in the region include:

- Kaye, C. Shoreline Features and Quaternary Shoreline Change Puerto Rico, United States Department of the Interior, 1959.
- Morelock, J., "Shoreline of Puerto Rico," Coastal Zone Management Program, Department of Natural Resources, San Juan, 44 p, 1978.
- Morelock, J., 1984. Coastal erosion in Puerto Rico: Shore and Beach, v. 52, no. 1, pp. 18-27.
- Morelock, J., M. Hernandez-Avila, M. L. Schwartz and D. M. Hatfield, 1985. Net shore-drift on the north coast of Puerto Rico: Shore and Beach, v. 53, no. 4, pp. 16-21.

- US Army Corps of Engineers (USACE), Jacksonville District, Puerto Nuevo Beach – Vega Baja, Puerto Rico – Section 103 – Hurricane and Storm Damage Reduction Study, 2006
- US Army Corps of Engineers (USACE), Jacksonville District, Boca Vieja Bay, Toa Baja, Puerto Rico Trip Report, 2011

1.5 Location and General Description

1.5.1 Location

Loíza is located on Puerto Rico's northern Atlantic Coast, approximately 16 miles east of San Juan, **Figure 4**. The study area includes a community center, public school, and public road, with a combined shoreline frontage of approximately 1,050 feet within the Municipality of Loíza, Puerto Rico, **Figure 1**.

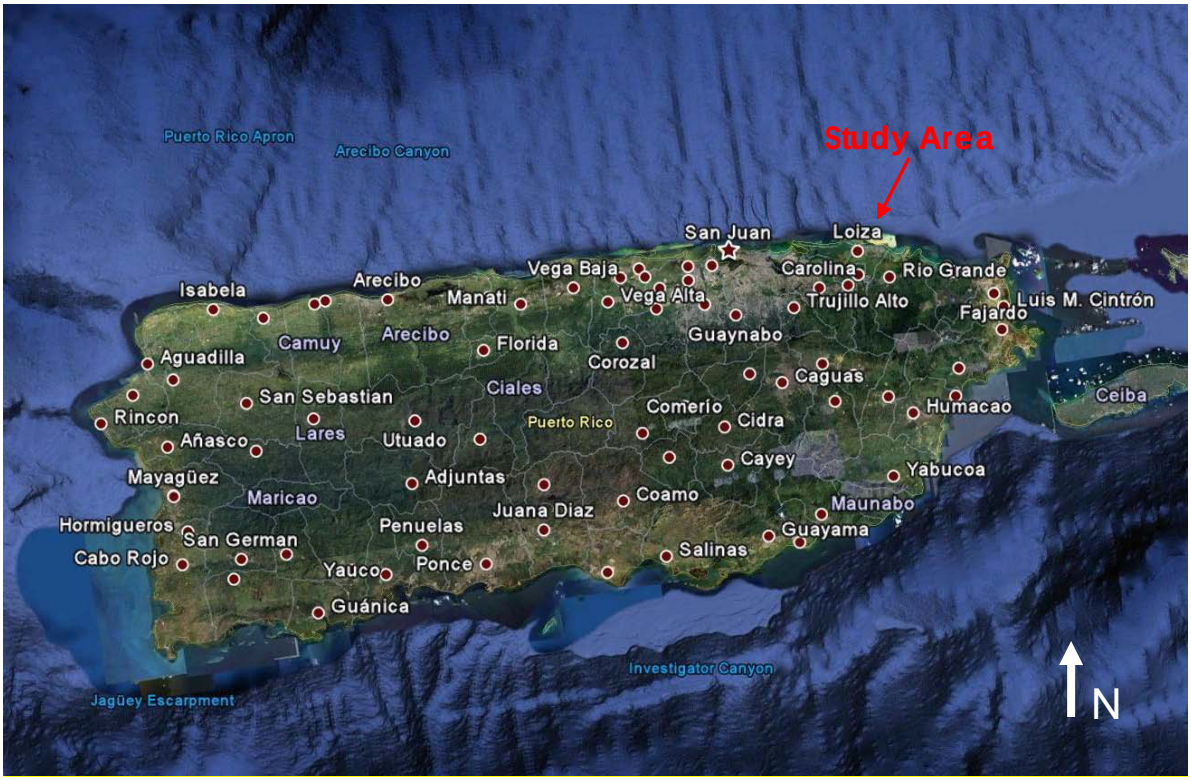

Figure 4: Location Map of Loíza, Puerto Rico

1.5.2 General

Loíza is mainly impacted by waves generated by eastern trade winds. In addition to wind-generated waves, Puerto Rico lies within a corridor of frequent hurricane activity – also generating significant wave events. Records from the National Hurricane Center indicate that Puerto Rico is subject to some degree of hurricane or tropical storm activity almost every year. **Figure 5** shows the tracks of hurricanes and tropical storms that have passed within a 100 nautical mile (nm) radius of Loíza over a 100-year period of record. This record includes a total of 56 tropical storms and

hurricanes which equates to an average of one storm passing within 100 miles of San Juan every 1.8 years. Many of these storms were major storms, defined as Category 3 to Category 5. The strong winds from these storms generate large waves that can impact any of the island's shorelines including the study area. Most recently in September 2017, the island was directly hit by Category 4 hurricanes Irma and Maria.

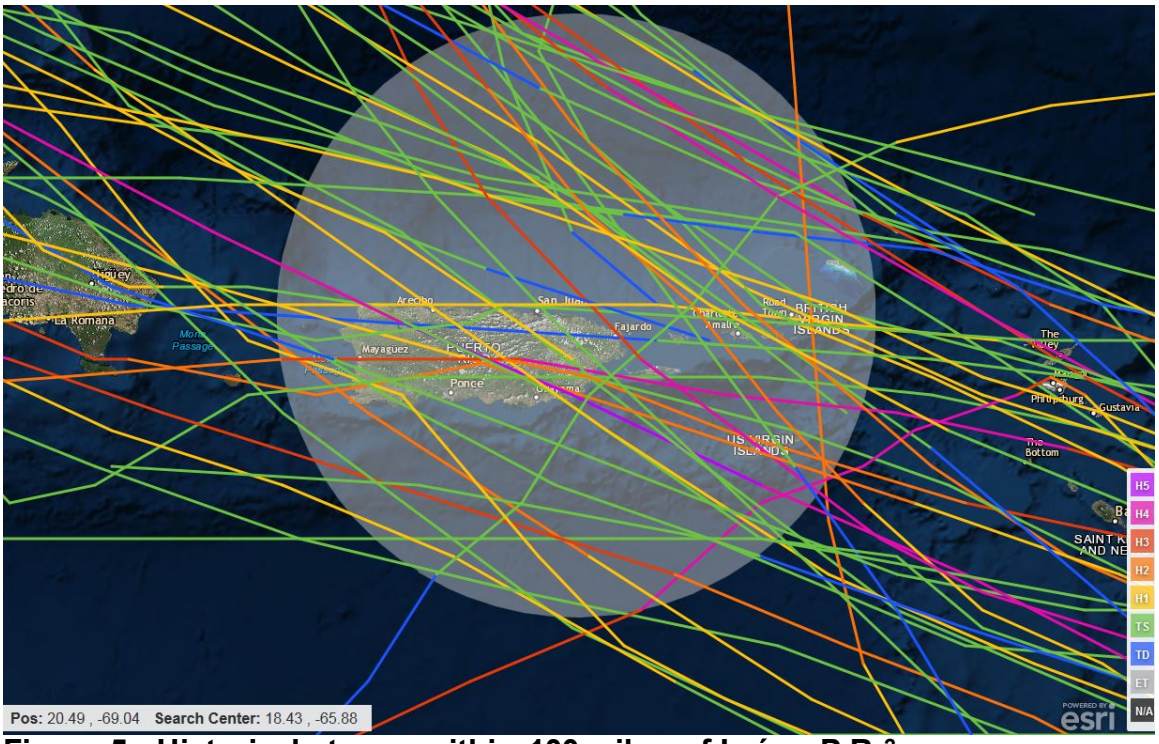

Figure 5: Historical storms within 100 miles of Loíza, P.R.[2]

Large storm waves impact the study area periodically, either from direct hurricane strikes, near-misses, or distant storm swells. Structural alternatives should be designed to withstand the maximum depth-limited wave heights possible at the structure's location. See **Engineering Appendix A**. As previously stated; the island was very recently (September 2017) directly hit by two Category 4 hurricanes, Irma and Maria.

[2] Source: NOAA https://coast.noaa.gov/hurricanes/

2.0 EXISTING CONDITIONS*

2.1 General Conditions

There are a number of contributing factors controlling the coastal processes along the northern shoreline of Puerto Rico. The natural factors include winds, tides, currents, waves, and storm events. See **Engineering Appendix A Section 3** for more information on these erosive forces, as well as detailed analyses on Sea Level Rise and Climate Change.

2.2 Natural Environment (Affected Environment)

This section describes the environmental resources that are relevant to the decision to be made. It does not describe the entire existing environment, but only those environmental resources that would affect, or that would be affected by, the alternatives if they were implemented.

2.2.1 Vegetation

In February 2017 and March 2018, the USACE Project biologist conducted a visual inspection of the Project area to assess existing conditions of the natural environment. Vegetation located within the Project area consisted of palm trees and unidentified species of vine and grass. Vegetation was found in the community center's parking lot and along the road, adjacent to the shoreline (see **Figure 6**). No sea grasses have been documented in the project vicinity likely due to high wave energy and turbid water conditions. Palm trees located along the beach are failing and falling into the water due to the ongoing erosion.

Figure 6: Vegetation found in and around the Project area

2.2.2 Fish and Wildlife Resources (Other than Threatened and Endangered Species)

A number of seabirds and shorebirds may occur in and around the Project area, including a number of species considered birds of conservation concern by the Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§703-712). Within the municipality of Loíza, 82 bird species have been reported to eBird.org in the past year, including multiple species of terns, plovers, and egrets. Although these species use sandy beaches for foraging and/or nesting and, therefore, could occur near the Project area, the Project area itself is eroded and not suitable for nesting. In addition to birds, coastal benthic organisms, such as sand burrowing fauna and crabs, are a common occurrence and are likely present in the Project area.

2.2.3 Threatened, Endangered, and Protected Species

The list of endangered and threatened species (**Table 1**) developed for this environmental assessment (EA) were compiled from the Caribbean Endangered Species Map provided by the

U.S. Fish and Wildlife Service (USFWS) Caribbean Ecological Services Field Office. Based on information in the species map, USACE believes the following species have the potential to be in or near the Project area:

Table 1: Threatened and Endangered Species in the Project Area

Common Name	Scientific Name	Listing Status
Green sea turtle – North Atlantic distinct population segment	*Chelonia mydas*	Threatened
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened
Puerto Rican boa	*Epicrates inornatus*	Endangered

Green Sea Turtle (*Chelonia mydas*)

The green sea turtle weighs approximately 440 pounds and lives in tropical and subtropical waters. Green turtles occupy three habitat types: high energy oceanic beaches, convergence zones in the pelagic habitat, and benthic feeding grounds in the relatively shallow, protected waters. Green sea turtles forage in pastures of seagrasses and/or algae, but small green turtles can also be found over coral reefs, worm reefs, and rocky bottoms. Females deposit eggs on high energy beaches, usually on islands, where a deep nest cavity can be dug above the high water line. Hatchlings leave the beach and move in the open ocean. The two largest nesting populations are found at Tortuguero in Costa Rica and Raine Island in the Great Barrier Reef. Much smaller nesting locations occur in over 80 countries, including Puerto Rico. The beach at the Project site is highly eroded (**Figure 13**). Based on the existing conditions, it is unlikely that this section of the beach is currently used for nesting activity. Any nests at the Project site's beach would be lost to the high tide. In March 2015, the USFWS and National Marine Fisheries Service (NMFS) proposed to list 11 distinct population segments (DPS) of green sea turtles as either endangered or threatened under the Endangered Species Act (ESA) (80 Fed. Reg. 15271 (March 23, 2015)). On April 6, 2016, they finalized the listing of the 11 DPSs, eight as threatened and three as endangered (81 Fed. Reg. 20058). The analysis conducted by Seminoff et al. (2015) for the North Atlantic DPS is incorporated by reference and will not be repeated here. The NMFS published green sea turtle designated critical habitat (DCH) in 1998 for coastal waters surrounding Culebra Island, Puerto Rico. The Project area is not located in or near DCH (**Figure 7**).

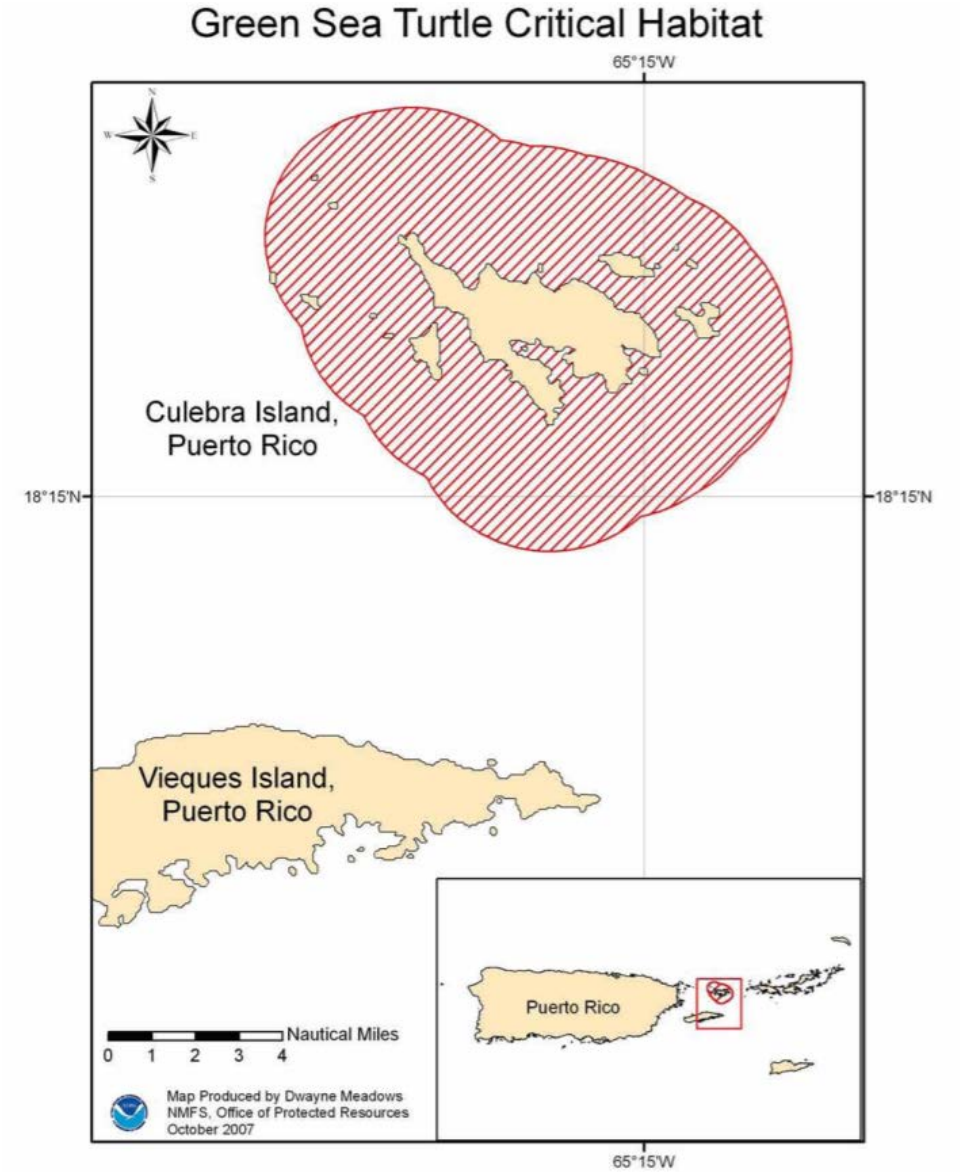

Figure 7: Green sea turtle NMFS DCH.

Hawksbill Sea Turtle (*Eretmochelys imbricata*)

The hawksbill sea turtle is a small to medium-sized marine turtle weighing up to 176 pounds. The hawksbill lives in tropical and subtropical waters of the Atlantic, Pacific, and Indian Oceans. Hawksbill turtles use different habitat types at different stages of their life cycle. Post hatchlings take shelter in the weed lines that accumulate at convergence zones. Coral reefs are the foraging habitat of juveniles, subadults, and adults. They are also known to inhabit mangrove-fringed bays and estuaries. Hawksbills feed predominantly on sponges and nest on low and high-energy beaches, frequently sharing the high-energy beaches with green sea turtles. Nests are typically placed under vegetation and can be found on beaches throughout Puerto Rico. Few hawksbill sea turtle nests have been documented in the area of Loíza (USFWS, email communication, 16 Jan 2018). The beach at the Project site is highly eroded (**Figure 13**). Based on the existing conditions, it is unlikely that this section of the beach is currently used for nesting activity. Any

nests at the Project site's beach would be lost to the high tide. NMFS published hawksbill sea turtle DCH in 1998 for coastal waters surrounding Mona and Monito Islands in Puerto Rico. The Project area is not located in or near DCH (**Figure 8**).

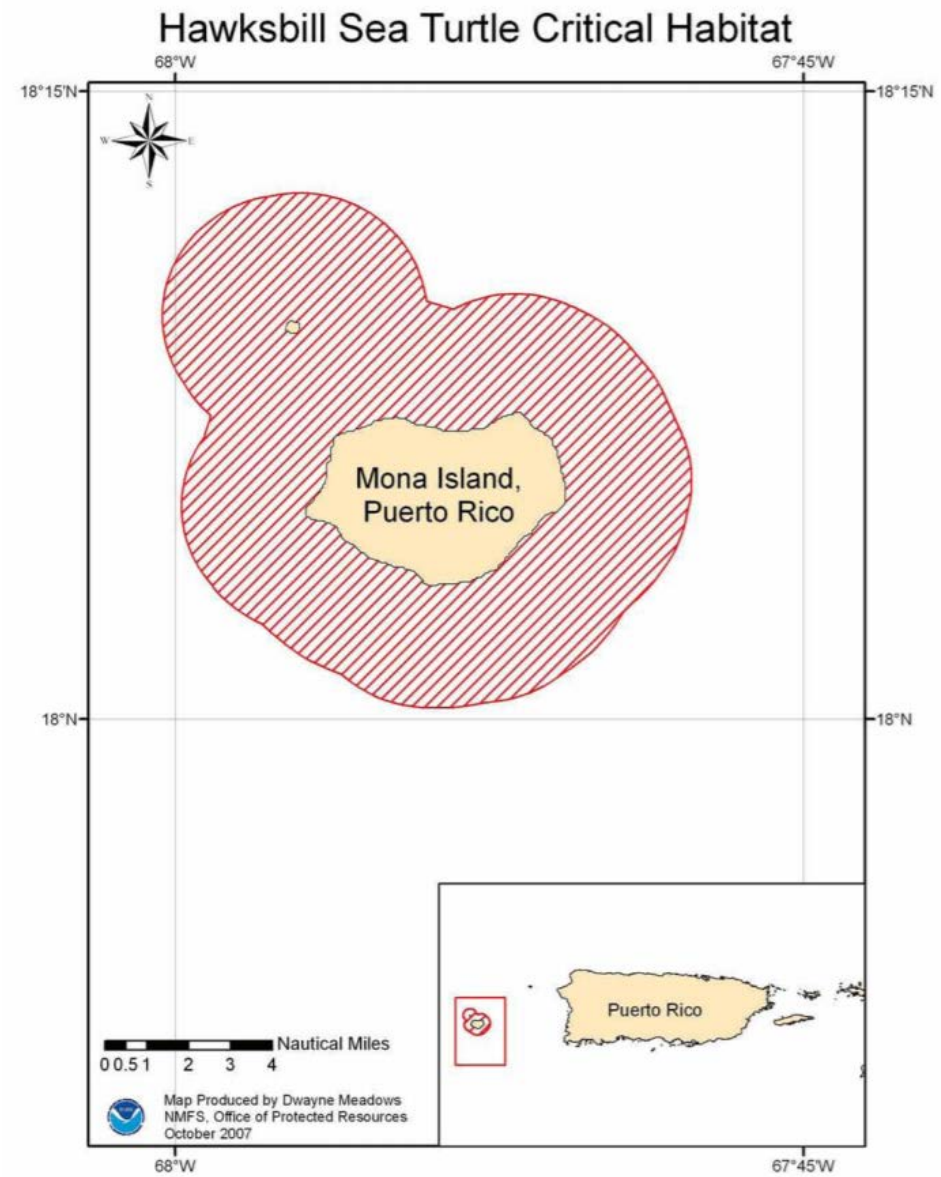

Figure 8: Hawksbill sea turtle NMFS DCH.

<u>Leatherback Sea Turtle (*Dermochelys coriacea*)</u>

Leatherbacks have the widest distribution and are the largest and deepest diving of all sea turtle species. Adults can reach four to eight feet in length and can weigh from 500 to 2,000 pounds. The carapace is a rubber-like texture, hence the name "leatherback". Leatherbacks typically feed on jellyfish, but are also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. Nesting grounds are distributed worldwide on beaches in the tropics and subtropics. In Puerto Rico, the main nesting areas are on the main island at Fajardo and on the island of Culebra. A range of 20-60 leatherback sea turtle nests have been

documented in the area of Loíza (USFWS, email communication, 16 Jan 2018). The beach at the Project site is highly eroded (**Figure 13**). Based on the existing conditions, it is unlikely that this section of the beach is currently used for nesting activity. Any nests at the Project site's beach would be lost to the high tide. NMFS published leatherback sea turtle DCH in 1998 for coastal waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands and again in 2012 for waters on the U.S. west coast. The Project area is not located in or near DCH (**Figure 9**).

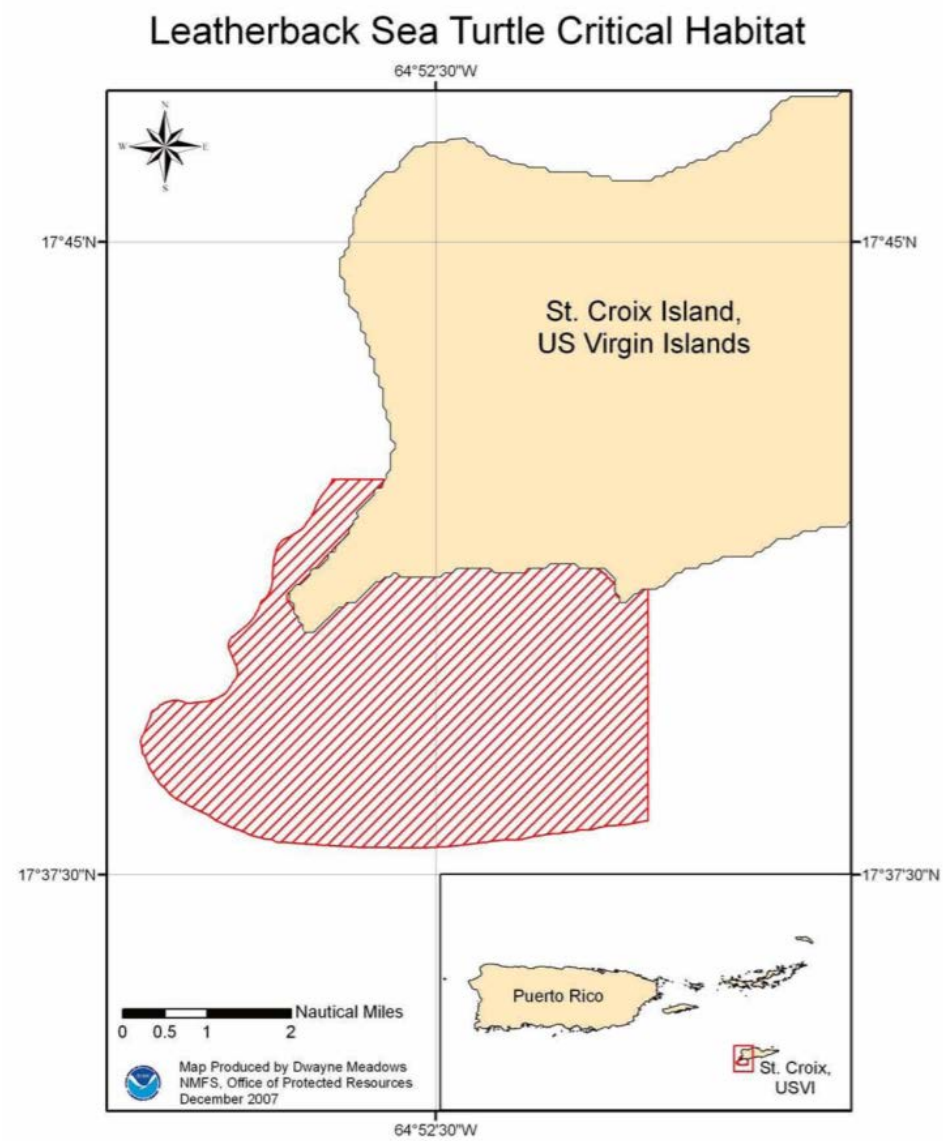

Figure 9: Leatherback sea turtle NMFS DCH.

<u>Loggerhead Sea Turtle (*Caretta caretta*)</u>

Loggerhead sea turtles inhabit the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Females select high-energy beaches on barrier strands adjacent to continental land masses for nesting. Steeply sloped beaches with gradually sloped offshore approaches are favored. After leaving the beach, hatchlings swim directly offshore and eventually are found along drift lines. They migrate to the near-shore and estuarine waters

along the continental margins and utilize those areas as the developmental habitat for the subadult stage. Loggerheads are predators of benthic invertebrates. NMFS published loggerhead sea turtle DCH in 2014 for waters in the northwest Atlantic. The Project area is not located in or near DCH (**Figure 10**).

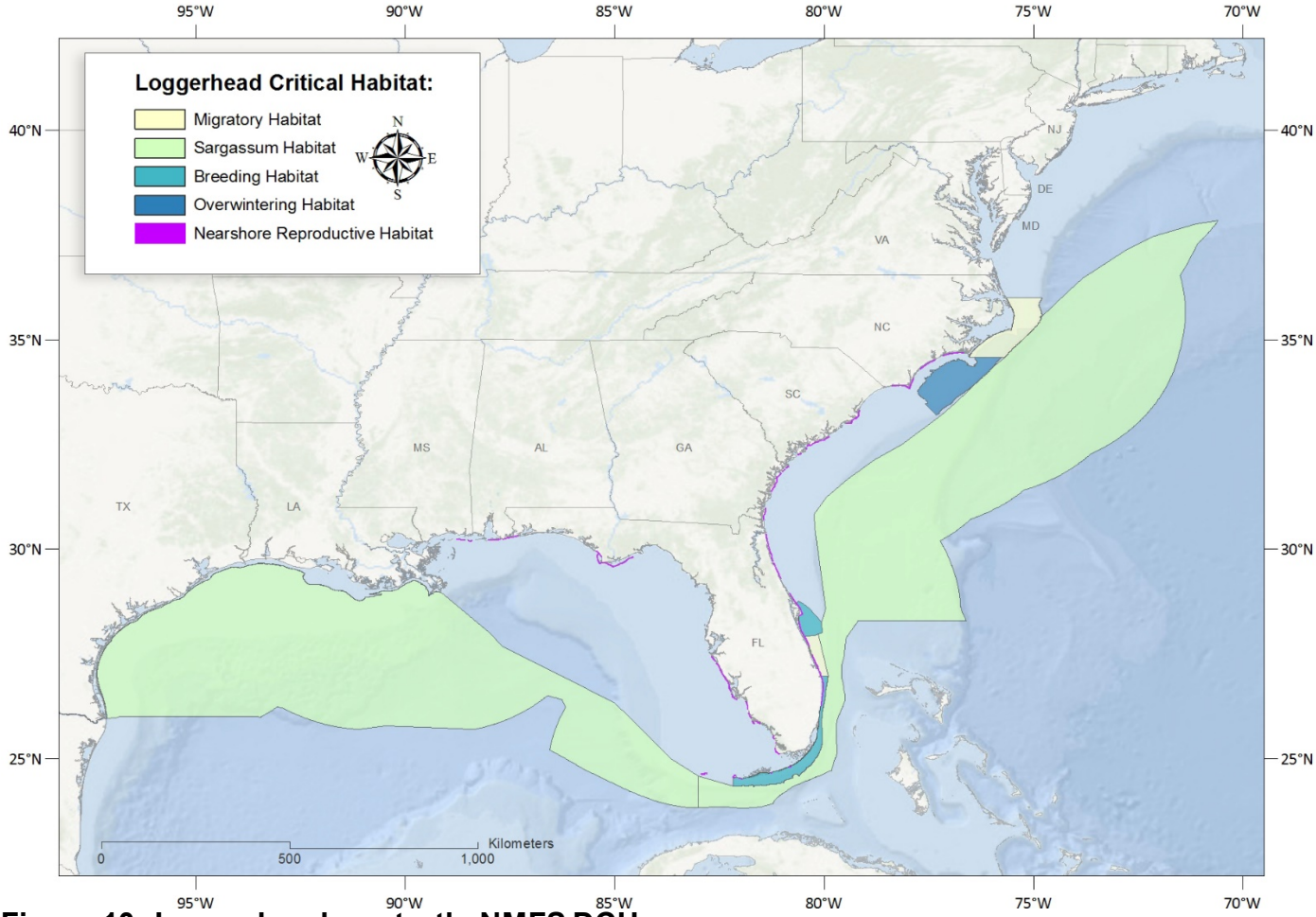

Figure 10: Loggerhead sea turtle NMFS DCH.

<u>Puerto Rican Boa (*Epicrates inornatus*)</u>
The Puerto Rican boa was listed as endangered in 1970 (35 FR 13519). It is the largest snake in Puerto Rico, averaging a length of 6 ½ feet. The color can be variable but typically ranges dark browns, grays, and blacks with a series of spots or black bars and a blackish belly. This boa is unique to Puerto Rico and is widespread in its distribution across the island. The species is abundant in protected and inaccessible areas. It can be found in a variety of habitats and is arboreal and terrestrial. Sub-adults and adults' diet consists of birds, small mammals, and lizards. The Puerto Rican boa is non-poisonous and generally harmless unless provoked. No DCH has been identified for the Puerto Rican boa.

2.2.4 Air Quality

The Clean Air Act, as amended, requires Federal actions to conform to an approved Commonwealth implementation plan designed to achieve or maintain an attainment designation

for air pollutants as defined by the National Ambient Air Quality Standard (NAAQS). The NAAQS were designed to protect public health and welfare. The criteria pollutants include carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter ($PM_{2.5}$ and PM_{10}), VOC, and lead (Pb). The General Conformity Rule (40 CFR Parts 51 and 93) implements these requirements for actions occurring in air quality nonattainment areas.

The Project is located in the Air Quality Control Region (AQCR) known as Puerto Rico AQCR (40 CFR 81.77). The Project area is in attainment for all the NAAQS.

2.2.5 Water Quality

The Project site is located landward and on the Loíza shoreline. Although the Recommended Plan does not involve in-water construction, the movement of sand on the beach and ongoing erosion contributes to turbid water conditions in the project area. Storm events also contribute to degradation in the water quality through increased erosion and turbidity.

2.2.6 Hazardous, Toxic, and Radioactive Waste

According to data on the U.S. Environmental Protection Agency's (USEPA) hazardous, toxic, and radioactive waste (HTRW) website, the Resource Conservation and Recovery Act (RCRA) information system lists one facility, Kodak Rahola, Inc., within a 1 mile radius of the Project site as having reported hazardous waste of unspecified activity. The RCRA information system allows RCRA staff to track notification, permit, compliance, and corrective action activities. All generators and treatment, storage, and disposal facilities who handle hazardous waste are required to report activities at least once every two years to support the creation of the Biennial Report. No information has been updated for this facility since April 14, 2015. No hazardous waste was listed as being generated or managed at this site. No known spills were listed. No sites were listed as part of a Superfund site. Kodak Rahola, Inc. is approximately 525 feet from the community center.

Figure 11: Kodak Rahola, Inc. and Project site locations.

2.2.7 Noise

Noise in the Project area is created by sources commonly found in human environments. Natural sources of ambient noise include weather, e.g. rain and thunder, waves and surf, and wildlife. Anthropogenic noise could include commercial and residential vehicles and vessels.

2.2.8 Aesthetic and Recreational Resources

Aesthetic and recreational resources in the Project area consist of natural shoreline, residential homes, a community center, and a Head Start school. Beach recreation, which includes pedestrian access to the beach, fishing, and swimming, is limited due to the shoreline erosion. The community center and Head Start school were forced to relocate services due to human health and safety concerns caused by the continued wind and wave erosion of the shoreline.

2.2.9 Cultural Resources

The Municipality of Loíza has a rich and diverse history dating from the Archaic Period (ca. 2000 BC – AD 200), through the Ceramic Period (AD 200 – 1500), and to the Contact and Historic Periods (AD 1500 – 1900). The Puerto Rico State Historic Preservation Office (SHPO) site files were queried to identify known cultural resources in and near the Project area (Puerto Rico SHPO 2017). This database provides information such as archaeological sites, historic structures, and historic properties listed on the National Register, and other data useful in considering potential impacts to cultural resources. No cultural resources have been identified within the area of potential effects (APE) as identified within **Figure 12**; however, four archaeological sites are located within 1 mile of the Project area. These sites consist of an Archaic period midden (LZ100034), two multicomponent sites characterized by a Saladoid series occupation and later

Historic period occupations (LZ100027 and LZ100039), and a multicomponent site characterized by an Ostoinoid series occupation and a later Historic Period occupation (LZ100033).

In February 2017, the USACE Project archaeologist conducted a visual reconnaissance of the study area to identify historic properties within the APE. The archaeologist examined the ground surface and inspected the erosional profile of the beach for cultural resources (**Figure 13**). Additionally, a historic building survey was undertaken within the APE and historic aerials were reviewed for pertinent information regarding the construction date of buildings within, or adjacent to, the APE. As a result of the cultural resources assessment, no archaeological materials were identified within the APE. All structures identified within the APE were constructed after 1977, including the Centro Comunal Parcelas Suarez and the public school (**Figures 14 and 15**). These structures were built between 1977 and 1978 during the administration of the first Mayor of Loíza, Gabriel Santo Lopez as part of the "Proyecto Pesquero Parcelas Suarez". Although these structures demonstrate unique design characteristics, specifically the scallop-shaped roof of the Centro Comunal Parcelas Suarez, they have not achieved significance within the past 50 years to be considered eligible for the National Register of Historic Places (NRHP) as defined by 36 CFR 60.4 [a-d].

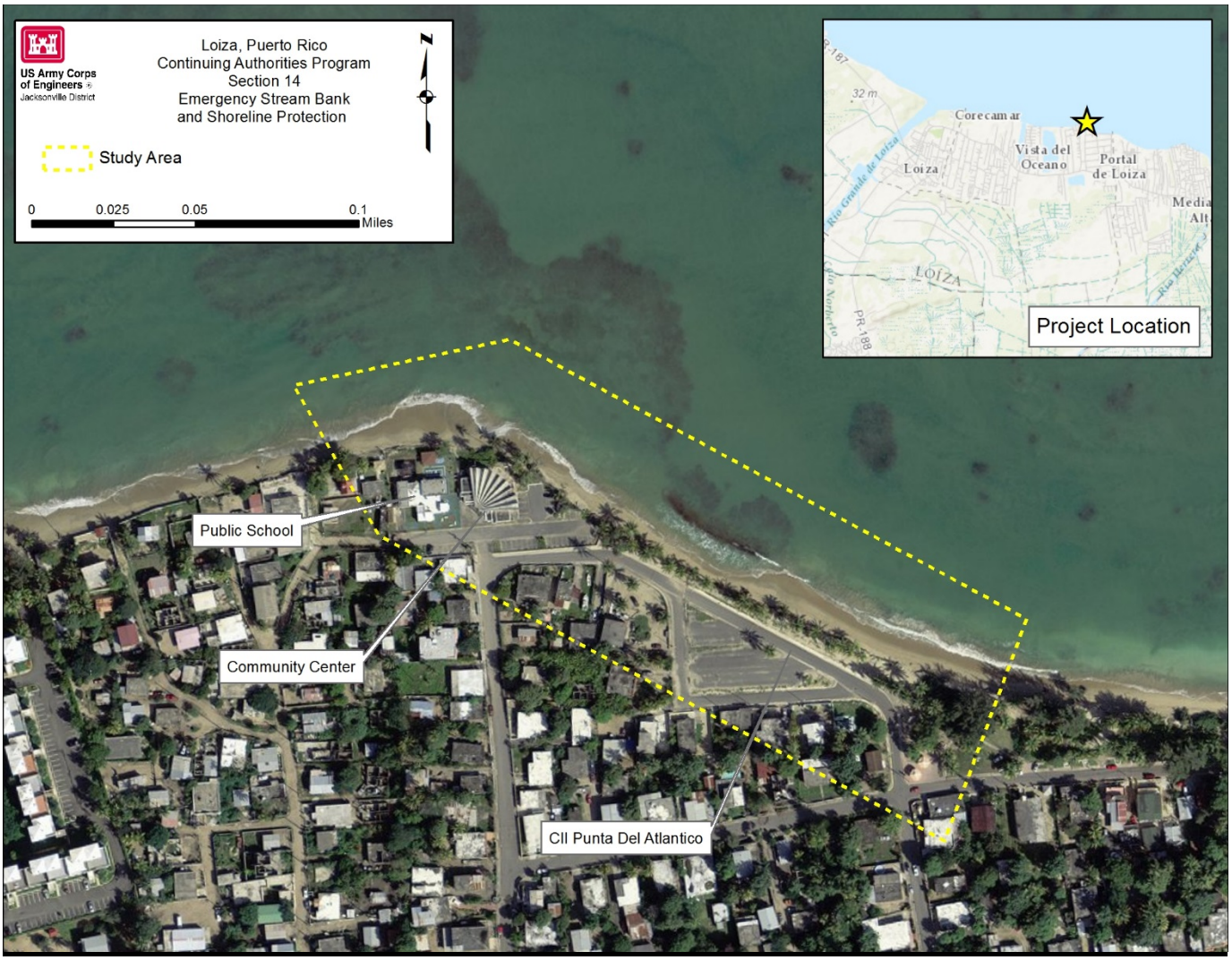

Figure 12: Location of the Loíza CAP Section 14 Area of Potential Effects.

Figure 13: Southeast view of beach area.

Figure 14: Southwest view of the community center, northeast façade.

Figure 15: Northwest view of the school, east façade.

2.2.10 Human Health and Safety

The relocation of services offered at the community center and Head Start school was necessary to eliminate human health and safety risks introduced by the continuous shoreline erosion. Storm events in this area have exacerbated the erosion and resulted in damages to properties and roads, further increasing the risk to human health and safety.

2.2.11 Socioeconomics

The population of Loíza, according to the 2016 census data (www.census.gov), is estimated to be 26,583. The population is approximately 64.3 percent African American. The median household income was approximately $18,718. Any individual with total income less than an amount deemed to be sufficient to purchase basic needs of food, shelter, clothing, and other essential goods and services is classified as poor. The amount of income necessary to purchase these basic needs is the poverty line or threshold and is set by the Office of Management and Budget. According to the 2015 American Community Survey (ACS), approximately 47.7 percent of the population of Loíza is living in poverty.

3.0 FUTURE WITHOUT-PROJECT CONDITIONS

The future without-project condition, as defined by ER 1105-2-100, is the most likely condition expected to exist in the future in the absence of the proposed water resources Project as discussed in Section 6. The shoreline of the study area is open to wave attack from the North Atlantic. During storms in the North Atlantic, north winds blowing over the water surface for hundreds of miles produce wind set-up and large waves which expend considerable energy on the study area shoreline. The preponderance of the coastal flooding, shoreline erosion, and generally all of the roadway, structural, and property damage along the shoreline of the study area are a direct result of such storms.

It is assumed that without this Project, the Loíza shoreline will continue to erode and recede due to wind, waves, and tides amplified during storms and hurricane events. Currently much of the public infrastructure at Loíza is temporarily displaced due to the existing conditions of the shoreline; without a Project these conditions are expected to worsen. Additionally the roadway is partially not functional. Under the future without-Project condition, the road would continue to be threatened and may be fully lost.

There are a number of contributing factors controlling the coastal processes along the northern shoreline of Puerto Rico. The natural factors include winds, waves, tides and currents, and storm events. The role of each of these factors and their contribution to the problem associated with the shoreline of Loíza is described in Section 4 of **Engineering Appendix A**. The beach rock along the north coast of Puerto Rico forms a relatively continuous barrier which protects the shore. Behind this protection, lagoons, tombolos, and other depositional features have formed. This protection is being breached and removed by the natural force of the waves. This has upset the established equilibrium and caused retreat of the shore and erosion of the beaches. This process has large implications at the study site. A comparison of LiDAR elevations from 2004 and 2016 shows the extent of shoreline recession at the Project site, as illustrated in Figure 1-5 of **Engineering Appendix A**. Under the future without-Project condition, erosion will continue to threaten the shoreline at Loíza.

Figure 16: Progression of erosion at Loíza

3.1 General Conditions

Damages resulting from winds, waves, tides, and storm events will continue to degrade structures and roads if the Recommended Plan is not implemented.

3.2 Natural Environment*

3.2.1 Vegetation

No significant change is expected to occur to vegetation if the Recommended Plan is not implemented, however, continued shoreline erosion may reduce the already limited amount of habitat available for vegetation growth. Without the Recommended Plan, palm trees located along the shoreline will continue to fail and fall.

3.2.2 Fish and Wildlife Resources (Other than Threatened and Endangered Species)

Without the implementation of the Recommended Plan shoreline erosion will continue to reduce to the available foraging/nesting habitat used by shorebirds.

3.2.3 Threatened, Endangered, and Protected Species

Without the implementation of the Recommended Plan shoreline erosion will continue to reduce to the available habitat used by nesting sea turtles.

3.2.4 Air Quality

Air quality conditions would remain the same if the Recommended Plan is not implemented.

3.2.5 Water Quality

Without implementation of the Recommended Plan, turbid water quality conditions will continue due to the ongoing erosion and storm event impacts.

3.2.6 HTRW

HTRW conditions would remain the same if the Recommended Plan is not implemented.

3.2.7 Noise

Noise levels in the Project area would remain the same if the Recommended Plan is not implemented.

3.2.8 Aesthetic and Recreational Resources

Aesthetic resources in the Project area will continue to degrade as the features along the shoreline experience continued erosion. Beach recreation would become non-existent if shoreline erosion continues. It is possible that the road and/or structures currently damaged by wave and wind exposure would need to be relocated or demolished. Structures currently landward of the road may begin to experience wave and/or wind damage.

3.2.9 Cultural Resources

Although no cultural resources or historic properties would be affected if the Recommended Plan is not implemented, structures in the Project area will continue to degrade as the features along the shoreline experience continued erosion. The community center and the public school demonstrate unique design characteristics which may make these structures eligible for listing in the NRHP within ten years. It is possible that structures currently damaged by wave and wind exposure would need to be relocated or demolished as a result of the No Action Alternative.

3.2.10 Human Health and Safety

It is probable that the road and/or structures currently damaged by wave and wind exposure would need to be relocated. Structures currently landward of the road may eventually experience wave and/or wind damage. The risk of impacts to human health and safety without a project will continue due to ongoing erosion of the shoreline.

3.2.11 Socioeconomics

Socioeconomic conditions in the Project area would be impacted if the Recommended Plan is not implemented. Some people may relocate which could have negative impacts on the socioeconomics of the area. Additionally there is approximately $7.9 million in infrastructure costs that would need to be relocated, as discussed further in Section 5.

4.0 PROBLEMS AND OPPORTUNITIES

Hurricane and coastal storm damages include persistent erosion along the Loíza shoreline threatening infrastructure and beach access for recreation, as well as contributing to public safety hazards. Infrastructure is located along the study area, including commercial businesses, residential homes, roads, a Head Start public school, public parkland, a public community center, and public beach access points. A number of structures are located directly along the shoreline and have suffered damage from coastal storms. Existing shore protection structures, referred to in this report as coastal or shoreline "armor," range from seawalls, to large stone revetments, to dumped concrete and other debris. Much of the material used is inadequate to provide significant protection. Many existing shore protection structures are failing due to age, as well as inadequate construction methods and/or materials. Construction debris and various gradations of stone are scattered in many locations providing minimal shoreline protection. These protection measures were insufficient to provide adequate protection of the infrastructure. These measures may contribute to the increased erosion of unprotected properties, create public safety hazards, and, in some cases, fail to protect the property they front. The opportunity exists to provide storm damage reduction along the shoreline in the study area of Loíza.

Critical infrastructure along the Loíza shoreline include a Head Start school, community center, and a public roadway. See **Figures 17-19**.

Figure 17: Loíza Shoreline Erosion Progression at Head Start Public School

Figure 18: Loíza Shoreline Erosion at the Community Center

Figure 19: Loíza Eroded Dune at the Public Road

The roadway has failed in a portion of the study area. As shown in **Figure 20** below, the portion in red has failed, leaving only one option for evacuation, as outlined in the area in green. Should this

portion fail as well, there will be no means for residents living adjacent to this roadway to access the adjacent roads.

Figure 20: Loíza Public Road Failure

Additionally, should this road fail, the erosion is likely to impact homes adjacent to the road. The remaining road is further threatened by the recent storm events, Category 4 Hurricanes Irma and Maria, which now puts the road at an urgent threat of failure; see **Figure 3**.

4.1 Planning Objectives and Constraints

The Federal objective, as stated in the Principles and Guidelines (P&G), is to contribute to national economic development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements.

The U.S. Army Corps of Engineers carefully considers and seeks to balance the environmental and development needs of the nation in full compliance with the National Environmental Policy Act of 1969 (NEPA) and other laws provided by Congress and the Executive Branch.

Project objective:

- Critical shoreline erosion at Loíza is threatening permanent loss of public services/facilities; the Project objective is to provide emergency shoreline protection to the Loíza shoreline consisting of approximately 1,050 feet.

Project constraints:

- There may be endangered and threatened species that exist within the Project footprint, the vicinity of the rock quarry, or in the transit routes to and from the rock mining site and Project area. Based on the current condition of the beach, it is not likely that this area of

the beach is used by sea turtles for nesting. However, if sea turtles are encountered, impacts to endangered species will be avoided to the extent possible. Although revetment construction activities will occur in an area where the Puerto Rican boa is not likely to be present, mining of the rock and transit from the mine to the Project's site may occur in areas where Puerto Rican boas could be present. By utilizing the USFWS developed standard conditions, potential effects to the snake can be minimized. Any potential impacts will be consistent with applicable laws and consultation under the ESA.

- Adverse effects on environmental resources that exist in the study area will be avoided, minimized, or mitigated for.

4.2 Scoping and Issues*

Under the requirements of Section 102 of the NEPA, this proposed Project constitutes a major Federal action and an EA is therefore required. This EA, integrated with the Feasibility Report, has been prepared pursuant to NEPA and its implementing regulations. The following issues were identified to be relevant to the proposed action and appropriate for detailed evaluation: vegetation; fish and wildlife resources; threatened, endangered, and protected species; air quality; water quality; hazardous, toxic, and radioactive wastes; noise; aesthetic and recreational resources; cultural resources; human health and safety; and socioeconomics. The existing conditions (Section 2), the future-without-Project conditions (No Action Alternative; Section 3), and the Recommended Plan (Section 7) were evaluated based on their effects on these issues. A summary of the effects of the other alternatives considered is included in **Table 2.**

A Notice of Availability for this integrated report and Draft EA, and the proposed Finding of No Significant Impact (FONSI), was coordinated with pertinent agencies and interested stakeholders for review and comment from March 12, 2018 to April 13, 2018. All agency coordination letters are included in **Environmental Appendix D-1**. Comments on the proposed FONSI and the integrated Feasibility Report are included in **Environmental Appendix D-3** of this Final report, along with USACE responses to any questions/comments submitted during the comment period.

4.3 Permits and Licenses *

This Project will be performed in compliance with applicable Commonwealth of Puerto Rico's laws and regulations. In compliance with the Coastal Zone Management Act (CZMA), a Federal Consistency Determination (FCD) is included in **Environmental Appendix D-1** and was submitted to the Commonwealth of Puerto Rico for their concurrence on March 13, 2018. As part of the FCD evaluation, a public notice was issued for the project on April 23, 2018 by the Puerto Rico Planning Board (PRPB). PRPB accepted comments from the public and consulted agencies for 15 days. In a letter signed June 7, 2018, PRPB concluded that the proposed project is consistent with the Puerto Rico Coastal Zone Management Program and its associated statutes. FCD concurrence, comments received by PRPB, and USACE responses to those comments are included in **Environmental Appendix D-1** of this Final report. The Corps will obtain a Water Quality Certification under Section 401 of the CWA from the Commonwealth of Puerto Rico.

5.0 FORMULATION AND EVALUATION OF ALTERNATIVE PLANS*

Preliminary plans were formulated by combining management measures. Each plan was formulated in consideration of the following 4 criteria described in the Principles and Guidelines (P&G):

- Completeness: The extent to which the plan provides and accounts for all necessary investments or actions to ensure realization of the planning objectives
- Effectiveness: The extent to which the plan contributes to achieving the planning objectives
- Efficiency: The extent to which the plan is the most cost-effective means of addressing the specified problems and realizing the specified opportunities, consistent with protecting the nation's environment
- Acceptability: Workability and viability of the alternative plan with respect to acceptance by Federal and non-Federal entities and the public, and compatibility with existing laws, regulations, and public policies

5.1 Plan Formulation Rationale

Step 3 of the Planning Process as described in ER 1105-2-100 is "Formulation of Alternative Plans."

1. Alternative plans are formulated to identify ways of achieving planning objectives within the Project constraints, in order to solve the problems and realize the opportunities listed in Step 1 of the Planning Process which is to "Specify Problems and Opportunities."
2. Structural and non-structural management measures are identified and combined with other management measures to form alternative plans.
3. Planners will keep focus on complete plan(s) while doing individual tasks, to ensure their plans address the problems of the planning area.

In accordance with this policy, alternative plans were formulated for the Loíza study and evaluated on the basis of providing emergency shoreline protection per Section 14 of the 1946 Flood Control Act, as amended.

5.2 Management Measures

A management measure is a feature or activity that can be implemented at a specific geographic site to address one or more planning objectives. Management measures are used to create plans and can be categorized as structural or non-structural; **Figure 21.**

1) The following non-structural management measures were identified to provide emergency shoreline protection at Loíza:

a) Adaptation by elevation of the infrastructure
b) No Action

2) The following structural management measures were identified to meet the objectives (as defined in Section 4.0) of providing emergency shoreline protection at Loíza.

a) Energy dissipation protection measures

a-1) Breakwater

a-2) Jetties

a-3) Spurs

a-4) Riprap

a-5) Armoring

b) Beach nourishment
c) Vegetated dunes
d) Groins
e) Beam berm
f) Revetment

5.3 Issues and Basis for Choice

The planning objectives previously discussed were used to screen the preliminary alternatives. The non-structural measure, adaptation by elevation of the infrastructure, is cost prohibitive and not carried forward. The no-action measure is not recommended; it is carried forward for comparison purposes as the future without-Project condition.

5.4 Preliminary Array of Alternatives

The shoreline in this study area is approximately 1,050 feet. Construction of adequate emergency shoreline protection for this length of shoreline is possible within the current funding limits of the Continuing Authorities Program (CAP) Section 14 authority using the structural measures that were combined to form the following alternatives. Section 14 of the 1946 Flood Control Act, as amended, allows for Federal participation up to $5,000,000.

S-1) Energy dissipation protection (breakwater) or structures such as jetties, spurs, riprap, or armoring.
S-2) Beach nourishment with select construction of vegetated dunes.
S-3) Beach nourishment in conjunction with groins to stabilize nourishment.
S-4) Vegetated dune construction with minimal beach berm.
S-5) Revetment construction.

The No Action alternative is carried forward for comparison purposes as the without-Project condition.

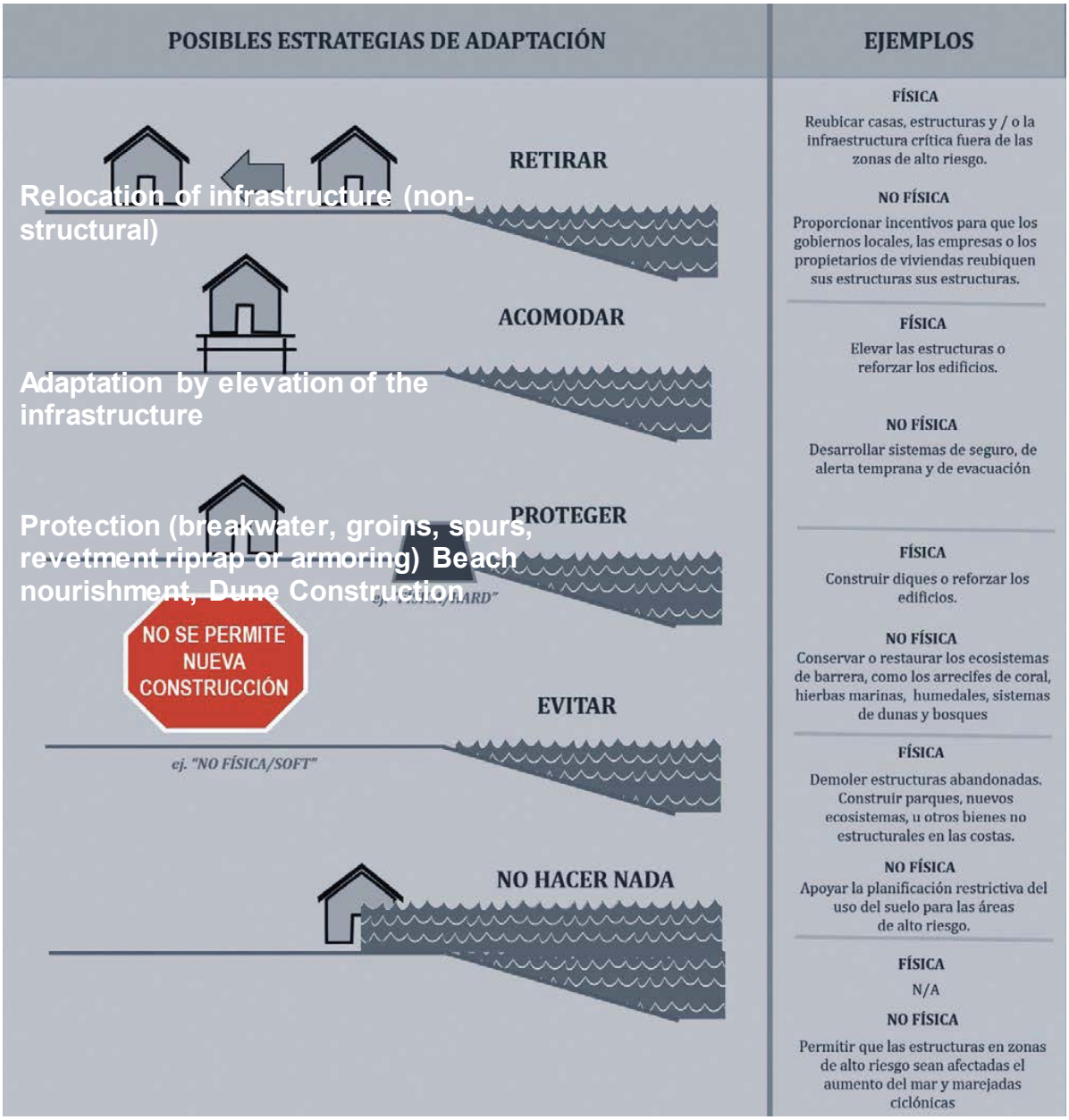

Figure 21: Measures as shown in PR-CCC Publication Adaptation Strategies 2005

5.5 Evaluation of Alternative Plans

The non-structural alternative, adaptation by elevation of infrastructure, is too costly and not carried forward. The structural alternatives were evaluated on their ability to meet the study objectives. The following structural alternatives were eliminated from further consideration:

S-1) Energy dissipation protection (breakwater) or structures such as jetties, spurs, riprap, or armoring: This alternative was eliminated from further evaluation as follows: the use of an emerged breakwater may create water quality issues and impacts to the nearshore circulation; a wide-crested submerged breakwater would need to be very large to be effective in this area and such would be cost prohibitive as there is no inlet near Loíza. The use of jetties is not carried forward; a groin on its own would not meet the study objective of providing emergency shore protection, and riprap or armoring is further explored in the form of a revetment in S-5.

S-2) Beach nourishment with select construction of vegetated dunes: This alternative was eliminated from further evaluation due to the historic performance of dunes in the study area. Due to the conditions at Loíza, the beach and dunes have historically eroded. This alternative would not provide a sustainable solution for resilient shoreline protection at Loíza, see **Engineering Appendix A**.

S-3) Beach nourishment in conjunction with groins to stabilize nourishment: This alternative was eliminated from further evaluation as it would not provide a sustainable solution for resilient shoreline protection at Loíza.

S-4) Vegetated dune construction with minimal beach berm: This alternative was eliminated from further evaluation as it would not provide a sustainable solution for resilient shoreline protection at Loíza.

S-5) Revetment: This meets the study objectives to provide emergency shoreline protection. This alternative provides a resilient solution to the erosion at Loíza. The Revetment Alternative is carried forward for further evaluation. The no-action alternative is not recommended but is carried forward for comparison purposes.

Table 2 provides a summary of the environmental effects associated with each of the alternative plans.

Table 2: Summary of the environmental effects associated with the alternative plans.

	No Action	Energy dissipation protection or structures S-1	Beach nourishment with vegetated dunes S-2	Beach nourishment with groins S-3	Vegetated dune construction with minimal beach berm S-4	Revetment S-5
Vegetation	Continued loss of vegetation due to ongoing erosion and storm damages	No effect	Short-term increase in dune vegetation	Short-term increase in dune vegetation	Short-term Increase in dune vegetation	Loss of vegetation in the revetment footprint
Fish and Wildlife Resources	Continued loss of habitat due to ongoing erosion and storm damages	Potential increase in benthic habitat on the submerged rock structures	Short-term increase in beach and dune habitat for nesting shorebirds	Short-term increase in beach habitat for nesting shorebirds	Short-term increase in beach and dune habitat for nesting shorebirds	No effect
Threatened, Endangered, and Protected Species	Continued loss of habitat due to ongoing erosion and storm damages	Potential adverse effect to sea turtle hatchlings if structures impede movement to open water	Short-term increase in habitat for nesting sea turtles	Short-term increase in habitat for nesting sea turtles	Short-term increase in habitat for nesting sea turtles	No effect
Air Quality	No effect	No effect	No effect	No effect	No effect	No effect
Water Quality	No effect	Temporary turbidity impacts during construction	Temporary turbidity impacts during construction	Temporary turbidity impacts during construction	Temporary turbidity impacts during construction	No effect
HTRW	No effect	No effect	No effect	No effect	No effect	No effect
Noise	No effect	Temporary increase in noise during Project construction	Temporary increase in noise during Project construction	Temporary increase in noise during Project construction	Temporary increase in noise during Project construction	Temporary increase in noise during Project construction
Aesthetic and Recreational Resources	Continued loss of shoreline due to erosion and storm damages	Potential for the creation of habitat that could result in recreational snorkeling or diving opportunities	Short-term increase in beach habitat available for recreation	Short-term increase in beach habitat available for recreation	Short-term increase in beach habitat available for recreation	Aesthetic improvement in comparison to the eroding shoreline
Cultural Resources	Potential loss of the community center and head start school, which will be potentially eligible for the	No effect	No effect	No effect	No effect	No effect

	National Register of Historic Places when the buildings are 50 years old					
Human Health and Safety	Ongoing increase in hazardous structural conditions due to the continued damages to and potential loss of structures	In-water structures are hazards to navigation and some recreation activities	Short-term protection to nearby structures reduces hazards created by storm damages and ongoing erosion	Short-term protection to nearby structures reduces hazards created by storm damages and ongoing erosion	Short-term protection to nearby structures reduces hazards created by storm damages and ongoing erosion	Permanent protection to nearby structures reduces hazards created by storm damages and ongoing erosion
Socio-economics	Continued damages and possibly loss of structures due to ongoing erosion and storm damages	Short-term protection to nearby structures	Short-term protection to nearby structures	Short-term protection to nearby structures	Short-term protection to nearby structures	Permanent protection to nearby structures

5.6 Plan Selection

The alternative that meets the objectives of the study to provide emergency shoreline protection is to build a revetment along the 1,050 feet of shoreline at Loíza. This alternative provides a resilient solution to the continued erosion that threatens public infrastructure along the Loíza shoreline. The Sponsor's interest in a more "natural" dune would not be sustainable, and therefore could not be incorporated into the design. The shoreline was further impacted by the recent Category 4 Hurricanes Irma and Maria, which further eroded the shoreline up to the public roadway.

Economic Justification

The formulation and justification of CAP Section 14 projects, following a finding of eligibility, and given the narrow geographic focus, low cost of these projects, and the imminent threat to the facilities, is to focus on the least cost alternative solution. The least cost alternative plan is considered to be justified if the total costs of the proposed alternative is less than the cost to relocate the threatened facility. The relocation costs to relocate the public road, Head Start school, and community center are more than the Recommended Plan to construct a revetment at Loíza. Due to significant damage caused by Hurricane Maria to the community center, the relocation costs without the community center were also computed. As shown in **Table 3** below, the Project is economically justified, with or without the community center.

Table 3: Economic Justification of Recommended Plan (Revetment)

Relocation Costs	$7,965,000
TSP (Revetment) Construction Costs	$5,063,000
Economic Justification	**$2,902,000**

**Relocation Costs without community center = $7,666,000 (Economic Justification = $2,603,000)*

6.0 RECOMMENDED PLAN

6.1 Description of the Recommended Plan

The Recommended Plan consists of placing a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, Head Start public school, and community center. This is recommended to provide emergency shoreline protection at Loíza. The elevation of the revetment crest would be 10.0-ft PRVD02. Due to existing public sidewalk damage, the remaining sidewalk may need to be demolished and replaced with the over-wash protection zone. The over-wash protection zone would consist of high performance turf reinforcement mat (HPTRM) keyed in between the existing road and revetment. See **Engineering Appendix A**.

Figure 22: Recommended Plan – Revetment Alternative

6.2 Cost Allocation

Projects implemented under this authority have the same project cost sharing requirements as structural flood damage reduction projects implemented under specific congressional authorization. The non-Federal Sponsor is responsible for a minimum of 35 percent of total project costs to a maximum of 50 percent of total Project costs during the design and implementation period. Since the Project is located in Puerto Rico, the Sponsor is entitled to a $455,000 reduction in its required share pursuant to Section 1156 of the Water Resources Development Act of 1986, Public Law 99-662 (33 USC 2310), as amended. The non-Federal Sponsor must pay 5 percent of total project costs in cash, provide all lands, easements, rights-of-way, relocations, and disposal areas (LERRDs) required for the project, perform necessary non-Federal audits and investigations necessary to identify the existence and extent of hazardous substances on LERRDs required for the project. If the value of the non-Federal Sponsor's contributions listed above is less than 35 percent of total project costs, the non-Federal Sponsor must pay additional cash so that its contributions equal 35 percent of total project costs. OMRR&R is a 100% non-Federal responsibility.

6.2.1 Federal Responsibility

The U. S. Army Corps of Engineers is responsible for budgeting for the Federal share of construction costs. Federal funding is subject to budgetary constraints inherent in the formation of the national civil works budget for a given fiscal year. The Federal share of the work is limited to $5,000,000 under Section 14 of the Flood Control Act of 1946, as amended. USACE would obtain all necessary authorizations and would construct the Project.

6.2.2 Non-Federal Responsibility

The following summarizes some of the key non-Federal Project sponsor responsibilities. The non-Federal Project Sponsor shall provide all LERRDs necessary for initial construction and maintenance of the Project. The non-Federal Project Sponsor shall provide contributions which shall equal 35 percent of the Project costs, plus any amount that exceeds $5,000,000. The Federal expenditure limit for Section 14 projects are $5,000,000. The non-Federal Project Sponsor's total contribution cost is estimated at $1,317,000, which includes the $455,000 waiver.

The non-Federal Project Sponsor shall enter into a Project Partnership Agreement with the Federal Government. In accordance with the terms of the PPA, the non-Federal Sponsor must provide all LERRD required for the Project, perform necessary non-Federal audits, and perform investigations necessary to identify the existence and extent of hazardous substances on LER required for the Project, and shall assume full financial responsibility for all necessary cleanup and response costs of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulated materials.

The non-Federal Project Sponsor shall participate in and comply with applicable Federal floodplain management and flood insurance programs. The non-Federal Project Sponsor shall at least once a year and after storm events perform surveillance of the revetment to determine the condition of the revetment design section and provide the results of such surveillance to the

Federal Government. The non-Federal Project Sponsor shall hold and save the United States free from all damages arising from the initial construction, operation, maintenance, repair, replacement, and rehabilitation of the Project and any Project-related betterments.

Table 4: Cost Allocation for the Recommended Plan

Project First Costs FY 19 (October 01, 2018) Price Levels Revetment (1,050 feet of the Loiza Shoreline)			
	Total Cost[1]	Federal	Non-Federal
Revetment Costs	Section 14	65%	35%
Bank Stabilization	$3,922,000	$2,549,000	$1,373,000
Lands and Damages[2]	$70,000	$46,000	$24,000
Planning, Engineering, and Design	$708,000	$460,000	$248,000
Construction Management	$363,000	$236,000	$127,000
Total Project Costs	$5,063,000	$3,291,000	$1,772,000
Section 1032 of WRRDA 14 Waiver	-	$455,000	($455,000)
Total Cost Allocation[3]	$5,063,000	$3,746,000	$1,317,000

1. The Total Project Cost Summary can be found in the Cost Appendix C.
2. Lands and Damages are all administrative costs.
3. Total cost allocation includes the WRRDA 14 Section 1032 waiver which added Puerto Rico as a territory eligible for a $455,000 waiver of non-Federal cost sharing.

6.3 Real Estate

Construction of a stone revetment will take place along the beach. The revetment will be approximately 1,050 feet long with a top elevation of 10.0 feet PRVD02 and building an over-wash protection zone that would consist of high performance mat (HPTRM) keyed in between the existing road and revetment. The non-Federal sponsor will acquire the lands via a bank protection easement and certify that these lands are available for construction, operations and maintenance for the revetment. Construction/ replacement of approximately 220 feet of public road connecting to the beach road will take place. Access for the public road is available via its inherent public access. A staging area of approximately 4,356 square feet of land has been identified. The non-Federal sponsor will certify the availability of the staging area via a temporary work area easement. Access will be provided via public access roads. Construction is estimated to take approximately 11 months. No borrow or disposal areas are required for construction of the subject project.

A perpetual and assignable easement and right-of-way in, on, over and across the land hereinafter described for the location, construction, operation, maintenance, alteration, repair, rehabilitation and replacement of a bank protection works, and for the placement of stone, riprap and other materials for the protection of the bank against erosion; together with the continuing right to trim, cut, fell, remove and dispose therefrom all trees, underbrush, obstructions, and other vegetation; and to remove and dispose of structures or obstructions within the limits of the right-of-way; and to place thereon dredged, excavated or other fill material, to shape and grade said land

to desired slopes and contour, and to prevent erosion by structural and vegetative methods and to do any other work necessary and incident to the project; together with the right of ingress and egress for such work; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however to existing easements for public roads and highways, public utilities, railroads and pipelines. See **Figure 23** and **Appendix B Real Estate** for more information.

Figure 23: Real Estate Map

7.0 EFFECTS OF THE RECOMMENDED PLAN (PROPOSED ACTION)*

This chapter of the integrated report identifies and evaluates the anticipated environmental effects and/or benefits associated with the Recommended Plan (Proposed Action).

The terms “impact” and “effect” are used interchangeably in this chapter. Impacts may be discussed as positive or negative and/or significant or minor, as appropriate to the condition or resource. Positive impacts occur when an action results in a beneficial change to the resource, whereas negative impacts occur when an action results in a detrimental change to the resource. Significant impacts occur when an action substantially changes or affects the resource. A minor impact occurs when an action causes impact, but the resource is not substantially changed. Impacts are also discussed as temporary as well as short and long-term, and are associated with relative time frames as the direct result of the action. In this case, temporary refers to an impact only during the period of construction. Short-term describes the impact as continuing for 1-3 years post construction, whereas long-term describes impacts that are permanent or would be expected to remain for many years. This chapter is organized by resource area following the same sequence as in Section 2.

The Recommended Plan is the alternative, as described in Section 5.4 that meets the objectives of this study. Therefore, this is the only alternative discussed in this effects section. The effects of the No Action Alternative are described in Section 3, and a summary of the environmental effects associated with the other alternatives evaluated is included in Section 5.5 (see **Table 2**).

7.1 General Conditions

Implementation of the Recommended Plan will provide emergency shoreline protection at the Project site. The constructed Project will provide protection from winds, waves, tides, and storm events to structures and roads adjacent to and landward of the revetment. As discussed in Section 1.2 of the EN Appendix, the Project area experiences seasonal migration of beach planform, causing sand to shift to the west in the summer, and east in the winter due to the easterly trade winds that occur in summer. From a geomorphic standpoint, it is considered to be a "leaky" closed system that loses some amount of sand each year. Construction of this revetment will provide shoreline stabilization, thereby minimizing the erosional effects during the seasonal shift of the beach planform. The revetment itself will stabilize the shoreline without impounding sediment transport to both the east and west because it is shore-parallel in its orientation which allows sand to be transported freely to adjacent beaches.

7.2 Natural Environment (Affected Environment)

7.2.1 Vegetation

Construction of the Recommended Plan will impact vegetation within the Project footprint. Vegetation, such as palm trees, will be removed from the Project footprint. Due to the ongoing erosion and recent storm events in the project area, the existing palm trees that will be impacted

by the project are already failing and falling into the water. Other vegetation, such as grasses, are also poor quality due to the erosion impacts. Repopulation of viable habitat within the impacted area will occur though migration of vegetation from adjacent habitat.

7.2.2 Fish and Wildlife Resources (Other than Threatened and Endangered Species)

In-water work is not a component of the Recommended Plan, therefore, impacts to fish are not expected. The Recommended Plan may result in temporary impacts to wildlife during construction due to noise and/or construction activities; however, these impacts are expected to be minor and will cease with the completion of construction. There is sufficient habitat in the Project vicinity that can be used by wildlife that may be displaced during construction. Truck haul operations will occur on urban roads, which are likely already avoided by wildlife. In addition, wildlife will be able to relocate during construction operations to avoid any physical impacts.

MIGRATORY BIRDS

Migratory birds may pass through and use areas in or adjacent to the Project area. The Project area itself is eroded and not suitable for nesting, however, there may be some interruption of foraging and resting activities for birds. This effect would be short-term and limited to the immediate area of construction activities. There is sufficient habitat in the Project vicinity that can be used by birds that may be displaced during construction. In addition, USACE, in conjunction with the USFWS, has developed guidelines to avoid and monitor potential effects to shorebirds. USACE has developed a suite of contractual specifications for contractors to implement during construction where migratory birds may be present. The contractor will keep all construction activities under surveillance, management, and control to prevent effects to migratory birds. The contractor may be held responsible for harming or harassing the birds, their eggs, or their nests present in the site as a result of the construction activities.

7.2.3 Threatened, Endangered, and Protected Species

In accordance with Section 7 of the ESA, USACE initiated consultation with USFWS on February 1, 2018 for the following species:

- Green sea turtle (*Chelonia mydas*);
- Hawksbill sea turtle (*Eretmochelys imbricata*);
- Leatherback sea turtle *(Demochelys coriacea*);
- Loggerhead sea turtle (*Caretta caretta*);
- Puerto Rican boa (*Epicrates inornatus*).

Sea Turtles

The Project is not within or adjacent to any DCH; therefore, no DCH will be affected by the Project. No in-water work is required to construct this Project; however, portions of the construction will occur on and adjacent to the shoreline, which may affect nesting sea turtle habitat. As mentioned in Section 7.1 of this Report, construction of the revetment will provide shoreline stabilization, which would be beneficial to nesting sea turtle habitat. Although the 2015 Statewide Programmatic Biological Opinion (SPBO) was developed for projects in Florida and does not apply to Puerto Rico projects, USACE proposed several conservation measures in the draft IFR/EA and in the initial consultation request to USFWS to minimize potential impacts to sea

turtle species. (The 2015 SPBO is included in this Integrated Feasibility Report and Environmental Assessment (IFR/EA) appendices as Appendix D-2, for reference.)

In a letter dated March 14, 2018, USFWS stated that "Although Puerto Rico Department of Natural and Environmental Resources (DNER) has records of sea turtles nesting along beach areas of Loíza, there are no records of sea turtle nesting in the area of the proposed project. The developed nature of the coastline and residential lighting are no conducive to successful sea turtle nesting habitat making the beach not suitable for sea turtle nesting."

Puerto Rican Boa

A rock mining site for the Project has not yet been identified. Although revetment construction activities will occur in an area where the Puerto Rican boa (*Epicrates inornatus*) is not likely to be present, mining of the rock and transit from the mine to the Project's site may occur in areas where Puerto Rican boas could be present. USACE determined by utilizing the USFWS developed standard conditions, potential effects to the snake can be minimized.

USFWS Concurrence

In a letter dated March 14, 2018, USFWS concurred with the USACE determination that the Project may affect, but is not likely to adversely affect the above listed sea turtle species. In an email dated April 17, 2018, USFWS concurred with the USACE determination that the Project may affect, but is not likely to adversely affect the Puerto Rican boa if the Project uses an existing quarry with no expansion and incorporates the Puerto Rican boa standard conditions provided in their February 7, 2018 email. USFWS also stated that if the project uses a new quarry or expands an existing quarry a second consultation should be initiated to assess potential impacts to listed plants and reassess potential impacts to the Puerto Rican boa. USFWS reviewed the USACE proposed reasonable and prudent measures (RPMs) and the implementing terms and conditions (T&Cs) provided in the draft IFR/EA and initial consultation request. USFWS provided the following comments and recommendations for incorporation into the Project:

1) RPM A15 – Construction equipment and materials should be stored off the beach. There is an empty lot adjacent to the coastal road that can serve as a staging area for the project.
2) RPM A16 and T&C A15 Deal with lighting on the beach. Conversations with COE personnel during the site visit indicated that night time construction activities probably would not occur. If so the appropriate sea turtle friendly lights should be utilized.
3) The source of the rock revetment material will be an existing quarry. If there is a need to expand an existing quarry, consultation should be re-initiated.

7.2.4 Air Quality

Temporary increases in air pollution from construction vehicles and equipment will likely occur during Project construction, however, the impacts to air quality are anticipated to be localized and negligible, lasting only until construction is complete. The Project will not construct any new sources of air pollution. The contractor will be required to comply with the applicable air pollution standards of the Commonwealth of Puerto Rico and all Federal emission and performance laws and standards, including the USEPA NAAQS.

7.2.5 Water Quality

No in-water work will be required to construct this Project, however, portions of the construction will occur on and adjacent to the shoreline. Temporary, minor turbidity impacts caused by runoff from construction may occur. Construction equipment may release negligible amounts of pollutants, including oils and grease. Best management practices will be used to limit the possibility of negative effects. Detailed pollution control plans will be developed during the design phase. These temporary impacts would cease with completion of the construction and return to existing or better conditions. Implementation of the Recommended Plan will help stabilize the beach system and reduce erosion rates along the Project's shoreline.

7.2.6 HTRW

No new sources of contaminants or hazardous waste will be introduced to the area due to this Project.

7.2.7 Noise

The Recommended Plan would result in minor, short term, local increases in noise production during the construction phase of the Project. The noise would result from the use of heavy machinery. Construction crews would be required to comply with all applicable laws regarding noise, including any potential time of day restrictions and maximum decibel levels. All noise impacts associated with the Proposed Action would cease with completion of construction.

7.2.8 Aesthetic and Recreational Resources

The presence of heavy equipment that would be used during construction is likely uncommon and members of the public may consider such equipment to be "unsightly." Construction of the revetment is a permanent change to the shoreline aesthetics. The shoreline viewshed will be modified to have an obstructed view due to the placement of the revetment.

7.2.9 Cultural Resources

Based on a cultural resources background review and field assessment, the USACE has determined that the Recommended Plan will have no effect on cultural resources or historic properties listed or eligible for listing in the NRHP. Construction of the Recommended Plan will protect the structures landward of the revetment by minimizing the potential for future erosion. In accordance with Section 106 of the NHPA, as amended (16 USC 470) and its implementing regulations (36 CFR 800), consultation on the Recommended Plan was initiated by letter on September 20, 2017 with the Puerto Rico SHPO. The SHPO concurred with the USACE's determination of no historic properties affected in a letter dated October 6, 2017 (**Environmental Appendix D-1**).

7.2.10 Human Health and Safety

Construction of the Recommended Plan will protect the shoreline and structures landward of the revetment, reducing risk to human health and safety. Protection from shoreline erosion would allow for structural rehabilitation and the eventual reopening of the Head Start school and community center.

7.2.11 Socioeconomics

There is no evidence currently available to suggest that the socioeconomic conditions in Puerto Rico and the Municipality of Loíza, as described in the existing conditions, will vary significantly due to the implementation of the Recommended Plan. As with the previous section, protection from the shoreline erosion would allow for structural rehabilitation and the eventual reopening of the Head Start school and community center.

7.2.12 Cumulative Impacts

Cumulative effects are defined in 40 CFR §1508.7 as those effects that result from "...the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time."

Past, present, and reasonably foreseeable actions and plans are summarized below in **Table 5**. Section 1.4 of the IFR/EA contains more details on Federal studies and reports completed in/around the Project's vicinity. Other actions, such as the placement of sandbags to protect infrastructure from shoreline erosion, have been completed through local efforts (i.e. government agencies, private entities, etc.). It is expected that the general public, Puerto Rico, and local governments could have permitted activities in or around the Project area. Federal activities are evaluated under NEPA directly for each Project. Other projects that take place in-water or would impact wetlands are evaluated under a permit issued by USACE Regulatory Division.

In general, if more shoreline protection projects are completed in this area, over time, a natural linkage between projects may occur, which would decrease erosion and risk to infrastructure. The projects may result in the protection and/or creation of suitable habitat for plant species and foraging opportunities for birds and other wildlife. The construction of this Project's revetment, when considered with past projects in the area and potential future projects, has no significant cumulative impact on the environmental conditions of the Project area. A summary of cumulative effects on environmental factors from past, present, and reasonably foreseeable actions and plans is provided in **Table 6**.

Table 5: Past, present, and reasonably foreseeable actions and plans affecting the Project area.

Past Actions/Authorized Plans	Current Actions and Operating Plans	Reasonably Foreseeable Future Actions and Plans
- Local efforts to protect school and community center foundation through the placement of sandbags	- No known actions or operating plans	- Local government and/or private entity shoreline protection efforts

Table 6: Summary of cumulative effects.

Vegetation	
Past Actions	Construction of residential and commercial/public infrastructure has decreased the amount of vegetation in the area.
Present Actions	No known present actions are occurring in the Project vicinity.
Recommended Plan	The Recommended Plan will result in loss of vegetation within the revetment footprint. Reduced wind and wave activity landward of the revetment may enable new vegetation growth.
Future Actions	Similar to the Recommended Plan, construction of shoreline protection efforts may result in a loss of vegetation within the Project(s) footprint, but these projects may result in the protection or creation of new habitat for vegetation growth.
Cumulative Effect	No significant cumulative effects to vegetation in the area are anticipated.
Fish and Wildlife Resources	
Past Actions	Construction of residential and commercial/public infrastructure has decreased the amount of habitat available for wildlife use in the area.
Present Actions	No known present actions are occurring in the Project vicinity.
Recommended Plan	In-water work is not a component of the Recommended Plan, therefore, impacts to fish are not expected. The Recommended Plan may result in temporary impacts to wildlife during construction due to noise and/or construction activities; however, these impacts are expected to be minor and will cease with the completion of construction.
Future Actions	Similar to the Recommended Plan, implementation of shoreline protection projects may result in temporary impacts to wildlife due to noise and/or construction activities; however, these impacts would likely cease with completion of construction.
Cumulative Effect	No significant cumulative effects to fish and wildlife resources in the area are anticipated.
Threatened and Endangered Species	
Past Actions	Construction of residential and commercial/public infrastructure has decreased the amount of habitat available for threatened and endangered species use in the area.

Present Actions	No known present actions are occurring in the Project vicinity.
Recommended Plan	Portions of the construction will occur on and adjacent to the shoreline, which may affect, but is not likely to adversely affect nesting sea turtles. (Detailed discussion of the effect determinations are included in Section 7.7.3.)
Future Actions	Any Federal and/or Commonwealth projects implemented will follow required regulations to maintain and protect threatened and endangered species and their habitats within the area.
Cumulative Effect	No significant cumulative effects to threatened and endangered species in the area are anticipated.
Water Quality	
Past Actions	Ongoing erosion and storm event effects have likely contributed to degradation of water quality.
Present Actions	No known present actions are occurring in the Project vicinity.
Recommended Plan	No in-water work is required as a component of the Recommended Plan. Temporary, minor turbidity impacts caused by runoff from construction may occur. Construction equipment may release negligible amounts of pollutants, including oils and grease. Best management practices will be used to limit the possibility of adverse effects, and detailed pollution control plans will be developed during the design phase.
Future Actions	Construction of shoreline protection projects can temporarily elevate localized levels of suspended solids and turbidity. Projects implemented would maintain and meet regulated water quality standards within the area.
Cumulative Effect	Ongoing erosion and storm event effects on water quality are unlikely to be eliminated; however, implementation of the Recommended Plan will reduce erosion rates. USACE is committed to ensuring that projects will not result in violations of water quality standards.
Aesthetic and Recreational Resources	
Past Actions	Loss of aesthetic appeal due to the eroding shoreline and sandbag placement for protection of the shoreline and infrastructure.
Present Actions	No known present actions are occurring in the Project vicinity.
Recommended Plan	The Recommended Plan will be an aesthetic improvement when compared to the eroding shoreline and placement of sandbags for infrastructure protection.
Future Actions	Construction of shoreline protection projects may result in the protection and/or creation of beach habitat, which would improve the area's aesthetic and recreational resources.
Cumulative Effect	Improved aesthetics and recreational resources may be anticipated when considering the cumulative effects of projects in this area.
Cultural Resources	

Past Actions	Ongoing erosion and storm event effects have added to the degradation of structures that may be eligible for listing in the NRHP within ten years.
Present Actions	No known present actions are occurring in the Project vicinity.
Recommended Plan	Construction of the Recommended Plan will protect the structures landward of the revetment by minimizing the potential for future erosion.
Future Actions	Construction of shoreline protection projects may result in the protection of structures landward of the revetment by minimizing the potential for future erosion.
Cumulative Effect	Ongoing erosion and storm event effects on cultural resources are unlikely to be eliminated; however, implementation of the Recommended Plan will reduce erosion rates and protect cultural resources that may be eligible in the future for listing in the NRHP.

7.2.13 Unavoidable Adverse Environmental Effects

Migratory birds and other wildlife may be affected by the construction activities through avoidance of nesting or foraging areas during construction due to noise and/or construction activities. These effects are expected to be minor and will cease with the completion of construction. Vegetation within the Project footprint will be covered; however, repopulation of viable habitat within the impacted area will occur though the migration of vegetation from adjacent habitat. Palm trees located along the shoreline will continue to fail and fall into the water without the Recommended Plan.

8.0 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS*

8.1 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

Under the requirements of Section 102 of NEPA, this proposed Project constitutes a major Federal action and an EA is therefore required. This EA, integrated with the Feasibility Report, has been prepared pursuant to NEPA and its implementing regulations. A Notice of Availability for the integrated report and proposed FONSI was coordinated with pertinent agencies and interested stakeholders for review and comment. The Project will be in compliance with the NEPA of 1969, as amended, 42 U.S.C. 4321, *et seq*. P.L. 91-190.

8.1.1 Public and Agency Coordination

Consistent with NEPA regulations and guidance, a Notice of Availability of the draft report and proposed FONSI was distributed to the following list of recipients:

- NOAA-NMFS
- USACE
- USCG
- USEPA
- USFWS
- Municipality of Loíza
- Puerto Rico Department of Natural and Environmental Resources
- Puerto Rican Culture Institute
- Puerto Rico Economic Development Department
- Puerto Rico Environmental Quality Board
- Puerto Rico Fire Department
- Puerto Rico Health Department
- Puerto Rico National Guard
- Puerto Rico Permits Management Agency
- Puerto Rico Planning Board
- Puerto Rico Public Service Commission
- Puerto Rico State Historic Preservation Office

All agency coordination letters are included in **Environmental Appendix D-1**.

8.1.2 Comments Received and Responses

Comments on the proposed FONSI and report and USACE responses are included in **Environmental Appendix D-3** with the signed FONSI and final report. In addition to the NEPA public review, PRPB issued a separate public notice for the Project and accepted comments from the public and consulted agencies for 15 days as part of the Project's CZMA's FCD evaluation. Comments received by PRPB and USACE responses to those comments are included in **Environmental Appendix D-1** of this Final report.

8.2 ENVIRONMENTAL COMMITMENTS

USACE, and its contractors, commit to avoiding, minimizing, or mitigating for adverse effects during construction activities by including the following commitments in the contract specifications:

8.2.1 Protection of Fish and Wildlife Resources

The Contractor will keep construction activities under surveillance, management, and control to minimize interference with and disturbance and damage to fish and wildlife. Species that require specific attention, along with measures for their protection, will be listed in the Contractor's Environmental Protection Plan (EPP) prior to the beginning of construction.

8.2.2 Endangered Species Protection

USACE and contractors commit to avoiding, minimizing, or mitigating for adverse effects to listed species during construction activities. USACE will include in the Project specifications USFWS standard conditions for the Puerto Rican boa. Although the 2015 SPBO was developed for projects in Florida and does not apply to Puerto Rico projects, USACE is committing to apply the RPMs and T&Cs listed for sea turtle protection to this project, as applicable. The contractor will also include protection criteria for Endangered and Threatened species protections in their EPP.

8.2.3 Water Quality

The USACE contractor will prevent oil, fuel, or other hazardous substances from entering the air or water. This will be accomplished by design and procedural controls. All waste and refuse generated by Project construction would be removed and properly disposed of. The USACE contractor will implement a spill contingency plan for hazardous, toxic, or petroleum material.

8.2.4 Cultural Resources

An unexpected cultural resources finds clause has been included in the Project specifications. In the event that any archaeological resources are identified during construction, operations will be halted immediately within the area. Once reported, USACE staff will initiate coordination with the appropriate Federal and Commonwealth agencies to determine if archaeological investigation is required. Additional work in the area of discovery will be suspended at the site until all Federal and applicable Commonwealth regulations are met and USACE staff members provide further directive.

8.2.5 Protection of Migratory Birds

USACE will incorporate the standard migratory bird protection protocols into the Project plans and specifications and will require the contractor to abide by those requirements. USACE will also commit to list migratory bird protection requirements and conditions for the NFS to follow during O&M.

8.2.6 Protection of Nesting Sea Turtles

USACE will incorporate USACE commitments for sea turtle protection and applicable RMPs and T&Cs from the 2015 SPBO in the Project plans and specifications and will require the contractor to abide by those requirements to minimize impacts to nesting sea turtles to the maximum extent practicable.

8.3 ENVIRONMENTAL COMPLIANCE

8.3.1 Clean Air Act of 1972 (42 U.S.C. §7401 et. seq.)

The Project is located in the AQCR known as Puerto Rico AQCR. The Project area is in attainment for all the NAAQS. The Project will not create any new sources of air pollution and it will be performed in compliance with Puerto Rico's air quality standards. This Project is in compliance with the Act.

8.3.2 Clean Water Act of 1972 (33 U.S.C. §1251 et. seq.)

No in-water work will be required to construct this Project, however, construction will occur on and adjacent to the shoreline. Construction equipment may release negligible amounts of pollutants, including oils and grease. Best management practices will be used to limit the possibility of negative effects. Detailed pollution control plans will be developed during the design phase. This Project will be in compliance with the Act.

8.3.3 Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990 (16 U.S.C. §3501 et. seq.)

There are no designated coastal barrier resources in the Project area that would be affected by this Project. The closest coastal barrier resource act (CBRA) unit (#PR-87, Punta Vacia Talega) is over 2 miles to the west of the Project area. These acts are not applicable.

8.3.4 Coastal Zone Management Act of 1972 (16 U.S.C. §1451 et. seq.)

In compliance with the CZMA, a FCD is included in **Environmental Appendix D-1** and was submitted to the Commonwealth of Puerto Rico for their concurrence on March 13, 2018. As part of the FCD evaluation, a public notice was issued for the project on April 23, 2018 by the PRPB. PRPB accepted comments from the public and consulted agencies for 15 days. In a letter signed June 7, 2018, PRPB concluded that the proposed project is consistent with the Puerto Rico Coastal Zone Management Program and its associated statutes. FCD concurrence, comments received by PRPB, and USACE responses to those comments are included in **Environmental Appendix D-1** of this Final report. The Project is in compliance with the Act.

8.3.5 Estuary Protection Act of 1968 (16 U.S.C. §§1221-26)

No designated estuary would be affected by Project activities. This Act is not applicable.

8.3.6 Farmland Protection Policy Act of 1981 (7 U.S.C. §4201 et. seq.)

No prime or unique farmland would be impacted by implementation of this Project. This Act is not applicable.

8.3.7 Rivers and Harbors Act of 1899 (33 USC §401 et. seq.)

No in-water work will be required to construct this Project. This Act is not applicable.

8.3.8 Submerged Lands Act of 1953 (43 U.S.C. § 1312 Et. seq.)

No submerged lands would be impacted by implementation of this Project. This Act is not applicable.

8.3.9 Wild and Scenic River Act of 1968 (28 U.S.C. §1271 et. seq.)

No designated Wild and Scenic river reaches would be affected by Project related activities. This Act is not applicable.

8.3.10 Endangered Species Act of 1973 (16 U.S.C. §1531 et. seq.)

Pursuant to Section 7 of the Act, consultation was initiated on February 1, 2018. This Project is fully coordinated under the ESA and USACE will comply with all substantive and procedural requirements of the Act before and during construction. USACE has concluded the Project may affect, but is not likely to adversely affect (MANLAA) listed species and it will not affect any designated critical habitat (DCH). USFWS concurred with the USACE determination that the project may affect, but is not likely to adversely affect listed species in a letter dated March 14, 2018 and via email dated April 17, 2018. Consultation documents for this Project are located in the **Environmental Appendix D-1**. The Project is in compliance with the Act.

8.3.11 Fish and Wildlife Coordination Act of 1958 (16 U.S.C. §§661-665; 665a; 666; 666a-666c)

A memorandum for the record was submitted to USFWS on February 1, 2018 documenting an agreement between USACE and USFWS to use the NEPA review and ESA consultation processes to complete coordination responsibilities under the Fish and Wildlife Coordination Act. This agreement will avoid duplicate analysis and documentation as authorized under 40 CFR section 1500.4 (k), 1502.25, 1506.4, and is consistent with the Presidential Executive Order for Improving Regulation and Regulatory Review, released January 18, 2011. USFWS signed the memorandum for the record on February 1, 2018. The Project is in compliance with the Act.

8.3.13 Migratory Bird Treaty Act (16 U.S.C. §§703-712) and Migratory Bird Conservation Act (16 U.S.C. §§715-715d, 715e, 715f-715r)

The Project plans and specifications will include migratory bird protection measures for construction activities. If nesting activities occur within the construction area, appropriate buffers will be placed

around nests to ensure their protection. The Project is coordinated with USFWS and will be in compliance with these acts.

8.3.14 Magnuson-Stevens Fishery Conservation and Management Act of 1976, As Amended (16 U.S.C. §801 et. seq.)

No in-water work will be required to construct this Project. This Act is not applicable.

8.3.15 Anadromous Fish Conservation Act (16 U.S.C. §§757A-757G)

No in-water work will be required to construct this Project. This Act is not applicable.

8.3.16 Marine Mammal Protection Act of 1972 (16 U.S.C. §1361 et. seq.)

No in-water work will be required to construct this Project. This Act is not applicable.

8.3.17 Marine Protection, Research, and Sanctuaries Act (33 U.S.C. §1401 et. seq.)

No in-water work will be required to construct this Project. This Act is not applicable.

8.3.18 National Historic Preservation Act of 1966 (INTER ALIA)

The Proposed Action is in compliance with Section 106 of the NHPA, as amended (PL 89-665). As part of the requirements and consultation process contained within the NHPA implementing regulations of 36 CFR 800, this Project is also in compliance through ongoing consultation with the Archaeological and Historic Preservation Act, as amended (PL 93-29) and the Archeological Resources Protection Act (PL 96-95). Consultation with the Puerto Rico SHPO was initiated by letter on September 20, 2017. The SHPO concurred with the USACE's determination of no historic properties affected in a letter dated October 6, 2017 (**Environmental Appendix D-1**). The Proposed Action is in compliance with this Act.

8.3.19 Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. §4601 et. seq.)

This Project does not involve real property acquisition and/or displacement of property owners or tenants. The Act is not applicable to this Project.

8.4 EXECUTIVE ORDER (E.O.) COMPLIANCE

8.4.1 E.O. 11988, Flood Plain Management

To comply with E.O. 11988, the policy of USACE is to formulate projects that, to the extent possible, avoid or minimize adverse effects associated with the use of the floodplain and avoid inducing development in the floodplain unless there is no practicable alternative. Activities associated with this Project have been designed to the extent possible to avoid and minimize effects associated with the use of the floodplain, which is defined by E.O. 11988 as an "area which

has a one percent or greater chance of flooding in any given year." The Project is in compliance with the Order.

8.4.2 E.O. 11990, Protection of Wetlands

This Project will not affect any wetlands. The Project is in compliance with the Order.

8.4.3 E.O. 12898, Environmental Justice

The goal of environmental justice is to ensure that all Americans are afforded the same degree of protection from environmental and health hazards and have equal access to the decision-making process to maintain a healthy environment in which to live, learn, and work. On February 11, 1994, President Bill Clinton issued E.O. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," to focus Federal agencies' attention on the environmental and human health conditions in minority and/or low-income communities with the goal of achieving environmental justice. The E.O. directs Federal agencies to make environmental justice part of their mission to the greatest extent practicable and as permitted by law.

With respect to each Federal agency's environmental justice program, the E.O. mandates objectives in the following areas: (1) identify disproportionately high and adverse human health or environmental effects on minority and low income populations; (2) coordinate research and data collection; (3) conduct public meetings; and (4) develop interagency model projects.

Objective (1) is applicable to this Project; the population of Loíza, according to the 2016 census data (www.census.gov), is estimated to be 26,583 with approximately 64.3 percent African American. According to the 2015 ACS approximately 47.7 percent of the population of Loíza is living in poverty.

While the project is located in a low-income area, the project will not have a disproportionate and high adverse impact to the community because the structures are temporarily unable to be used and the road has partially failed because of the erosion of the shoreline. The Recommended Plan provides a benefit to Loíza by constructing an emergency shoreline protection Project. The Project is in compliance with the Order.

8.4.4 E.O. 13045, Disparate Risks Involving Children

This E.O. mandates that each Federal agency make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

The proposed action does not adversely affect children disproportionately from other members of the population and would not increase environmental health or safety risks to children. The Recommended Plan provides a benefit to Loíza by constructing an emergency shoreline

protection Project to aid in protection of the Head Start school. The Project is in compliance with the Order.

8.4.5 E.O. 13089, Coral Reef Protection

No in-water work will be required to construct this Project; therefore, no coral reefs or hardbottoms will be impacted. The Project is in compliance with the Order.

8.4.6 E.O. 13112, Invasive Species

No new or invasive species will be introduced to the area due to this Project. The non-Federal Sponsor would be responsible for invasive species control following Project completion. The Project is in compliance with the Order.

8.4.7 E.O. 13186, Migratory Birds

This E.O. requires, among other things, a Memorandum of Understanding (MOU) between the Federal Agency and the USFWS concerning migratory birds. Neither the Department of Defense MOU nor the USACE's Draft MOU clearly address migratory birds on lands not owned or controlled by USACE. For many USACE civil works projects, the real estate interests are provided by the non-Federal Sponsor. Control and ownership of the Project lands remain with a non-Federal interest. Measures to avoid the destruction of migratory birds and their eggs or hatchlings are described in a section above on the MBTA. USACE will include standard migratory bird protection requirements in the Project plans and specifications and will require the contractor to abide by those requirements. USACE will also commit to list migratory bird protection requirements and conditions for the NFS to follow during O&M. The Project is in compliance with the Order.

9.0 RECOMMENDATIONS

I have given consideration to all significant aspects in the overall public interest, including engineering feasibility, economic, social, cost and risk analysis, and environmental effects. The Recommended Plan described in this final report provides the optimum solution for emergency shoreline protection within the study area that can be developed within the framework of the formulation concepts. Implementation of the Recommended Plan for the Loíza, Puerto Rico, CAP Section 14 Project is recommended at this time, with such modification as the Commander, South Atlantic Division, U.S. Army Corps of Engineers (SAD), deems advisable at their discretion.

I recommend that the plan selected herein for shore protection of Loíza, Puerto Rico be authorized for implementation as a Federal Project, with such modifications as in the discretion of the Chief of Engineers may be advisable. Under Section 14 of the Flood Control Act of 1946 as amended, total Federal expenditures are estimated at $3,746,000. Non-Federal expenditures are estimated at $1,317,000.

Recommendations for provision of Federal participation in the Recommended Plan described in this report would require the Project Sponsor to enter into a written Project Partnership Agreement, as required by Section 221 of the Flood Control Act of 1970 Public Law 91-611, as amended, to provide local partnership satisfactory to the Secretary of the Army. Such local cooperation shall provide the following non-Federal responsibilities:

a. Provide 35 percent, but not to exceed 50 percent, of total Project costs assigned to hurricane and storm damage reduction, plus 100 percent of Project costs that exceed the U.S. Army Corps of Engineers (USACE) maximum Federal expenditure limit as further specified below:

(1) Enter into an agreement which provides, 35 percent, but not to exceed 50 percent, of total Project costs during the design and implementation phase, plus 100 percent of the Project costs that exceed the USACE maximum Federal expenditure limit of $5,000,000 as defined in Section 14, and the Non-Federal Sponsor shall provide a minimum contribution of funds equal to 5 percent of total Project costs;

(2) Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material, perform or ensure the performance of any relocations, and construct improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material that the Federal Government to be required or to be necessary for the initial construction, operation, and maintenance of the Project;

b. For so long as the Project remains authorized, the non-Federal Sponsor will operate, maintain, and repair the completed Project, or functional portion of the Project, at no cost to the Federal Government, in a manner compatible with the Project's purposes and in accordance with applicable Federal and Puerto Rico 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 inspection, 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, mitigation, operation, maintenance, repair, replacement, and rehabilitation of the Project and any Project related betterments, except for damages due to the fault or negligence of the United States or its contractors;

e. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the Project in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Partnership Agreements to Commonwealth 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, operation, and maintenance of the Project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

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

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

i. If applicable, comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for the initial construction, 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 the said Act;

j. Comply with all applicable Federal and Puerto Rico laws and regulations, including, but not limited to Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army," and all applicable Federal labor standards 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. Provide the non-Federal share of that portion of the costs of data recovery activities associated with historic preservation that are in excess of 1% of the total amount authorized to be appropriated for the Project in accordance with the cost sharing provisions of the agreement;

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

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

n. 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;

o. Recognize and support the requirements of Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources Project or separable element thereof, until the non-Federal Sponsor has entered into a written agreement to furnish its required cooperation for the Project or separable element;

p. 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 sponsor 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 the PPA, and implement the plan no later than one year after project construction is complete.

The recommendations contained herein reflect the information available at this time and current U.S. Army Corps of Engineers 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 higher authority as proposals for project modification and/or implementation funding. The recommendations herein for provision of for the Loíza, Puerto Rico, CAP Section 14 Project do not include any provisions for work which would result in any new Federal expenditures or financial assistance prohibited by the Coastal Barrier Resources Act (Public Law 97-348); nor were funds obligated in past years for this project for purposes prohibited by this Act.

Jason A. Kirk, P.E.
Colonel, U.S. Army
District Commander

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Continuing Authorities Program

Section 14 Project

Engineering Appendix

for

Loíza (14) Emergency Streambank and Shoreline Protection Project

Integrated Feasibility Report

and Environmental Assessment

Loíza, Puerto Rico

20 April 2018

Prepared By:

US Army Corps of Engineers ®
Jacksonville District
Engineering

Contents

1.0 Background 1
1.1 Location 1
1.2 Problem Statement 2
1.3 Objective 4
2.0 Alternatives 4
2.1 Alternative S-1. 4
2.2 Alternative S-2. 5
2.3 Alternative S-3. 5
2.4 Alternative S-4. 5
2.5 Alternative S-5. 5
2.6 Selected Alternative. 5
3.0 Pertinent Data 7
4.0 Coastal Armoring Analysis and Design 8
4.1 Natural Forces 8
4.2 Protective Revetment Design 11
4.2.1 Revetment Elevation 11
4.2.2 Revetment Stone Size 13
4.2.3 With-Project Risk 15
4.3 Sea Level Change 15
4.3.1 SLC Impacts to Infrastructure and Project Adaptability 21
4.3.2 SLC Conclusion 23
4.4 Climate Change Analysis 23
4.4.1 Phase I: Relevant Current Climate and Climate Change. 24
4.4.2 Phase II: Projected Changes to Watershed Hydrology and Assessment of Vulnerability to Climate Change. 25
5.0 Geology and Geotechnical Analysis 28
5.1 Geology Background 28
5.1.1 Regional Geology 28
5.1.2 Local Geology 28
5.2 Native Beach 28

5.3 Potential Sand sources 29
5.3.1 The Mouth of the Loíza River 29
5.3.2 Concretos de Puerto Rico, Inc. 29
5.4 Potential Rock Quarries 29
5.4.1 Empresas Ortiz Brunet, Inc. 29
5.4.2 Cantera Carraízo, Inc. 30
5.4.3 LPC&D, Inc. 30
5.4.4 Oriental Sand & Gravel, Inc. 30
5.5 Geotechnical Evaluation 30
5.5.1 Stability Analyses 31
5.5.2 Stone Protection Design 34
5.6 Design Phase Recommendations 41
5.6.1 Subsurface Investigations 41
5.6.2 Seismic 41
6.0 Civil Design 42
6.1 Revetment Sections 42
6.2 Real Estate 42
6.3 Relocations 43
7.0 Structural Requirements 43
8.0 Electrical and Mechanical Requirements 44
9.0 Hazardous, Toxic, and Radioactive Waste (HTRW) 44
10.0 Construction Procedures and Water Control Plan 44
10.1 Design and Implementation (D&I) Data 44
10.2 Construction Techniques 45
11.0 Operation and Maintenance 45
12.0 Schedule for Design and Construction 45
13.0 References 46

LIST OF TABLES

Table 4-1: Tidal Datums: San Juan, PR 9
Table 4-2 - Calculated Total Water Level 10
Table 4-3 - Preliminary Revetment Design – 10-Year Event, 1 on 2.5 side slope 12
Table 4-4 - Preliminary Revetment Design – 10-Year Event, 1 on 3 side slope 13
Table 4-5 - Granite Stone Sizes for 1V:2.5H 14
Table 4-6 - Granite Stone Sizes for 1V:3H 14
Table 4-7 - Qualitative Sea Level Rise Matrix 22
Table 5-1 - Sand Source and Rock Quarry Locations 30
Table 5-2 - Armor Stone Gradation 36
Table 5-3 - Bedding Stone Gradation (ASTM D 6092 R20) 38
Table 5-4 - Foundation Soil Material Description 39
Table 5-5 - Geotextile Material Properties 40

LIST OF FIGURES

Figure 1-1 - Location Map 1
Figure 1-2 - Location Map Inset 2
Figure 1-3 - Structures at Risk in Project Area. 3
Figure 1-4 - Undermined Public Road in Project Area 3
Figure 1-5 – 2004 and 2016 Shoreline Comparison at Loíza 4
Figure 2-1 – Selected Alternative 6
Figure 2-2 – Typical Revetment Cross Sections 7
Figure 4-1 - Gauge 9755371 at San Juan Harbor. 16
Figure 4-2 - Relative Sea Level Change Projections for San Juan, PR 17
Figure 4-3 - Estimated Relative Sea Level Change Projections for San Juan, PR 17
Figure 4-4 - Present day MHHW for Loíza, PR 18
Figure 4-5 - One foot of sea level rise. (Scenario III) 19
Figure 4-6 - Two feet of sea level rise. (Scenario III) 19
Figure 4-7 - Six feet of sea level rise. (Scenario III) 20

Figure 4-8 - Zoom in to six feet of SLC (Scenario III). 20

Figure 4-9 - Observed Change in Very Heavy Precipitation 26

Figure 4-10 - Changes in Consecutive Dry Days 27

Figure 4-11 - Observed Increase in Frost-Free Season Length 27

Figure 5-1 – Photograph showing scarping, undermining, and loss of roadway along the beach near Calle 2, looking toward the southeast (08 Feb 2017) 31

Figure 5-2 – Photograph showing scarping along Calle Punta Del Atlantico, looking toward the east (11 Aug 2017) 32

Figure 5-3 - Scarping at the foundation level of the community center, looking northwest (11 Aug 2016) 32

Figure 5-4 - Undermining of the foundation of the community center, looking northwest (13 Sep 2017) 33

Figure 5-5 - Conceptual Armor Template 34

Figure 5-6 - Design Gradation from Piñones 36

Figure 5-7 - Stone Gradation Comparison 37

Figure 5-8 - Bedding Stone Gradation Comparison 38

Figure 6-1 - Access Roads, Staging and Storage Areas 43

ATTACHMENTS

ATTACHMENT 1 – Geotechnical Exploration Final Report

TABLE OF ACRONYMS

ACES	Automated Coastal Engineering System
ADCIRC	Numerical model for storm surge value prediction
AOS	Apparent Opening Size
ASTM	American Society for Testing Materials
CAP	Continuing Authorities Program
CERC	Coastal Engineering Research Center
cfs	Cubic feet per second
CONUS	Continental United States
DI	Design and Implementation
ECB	Engineering and Construction Bulletin
EM	Engineer Manual
ETL	Engineer Technical Letter
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIS	Flood Insurance Study
HPTRM	High Performance Turf Reinforcement Mat
HUC	Hydrologic Unit Code
in	Inches
lb	Pounds
lf	Linear feet
LiDAR	Light Detection and Ranging
MHHW	Mean Higher-High Water
MLLW	Mean Lower-Low Water
MLW	Mean Low Water

mm	Millimeters
MSL	Mean Sea Level
NESDIS	National Environmental Satellite, Data and Information Service
NOAA	National Oceanic and Atmospheric Administration
POR	Period of Record
PRCCC	Puerto Rico Climate Change Council
PRVD02	Puerto Rico Vertical Datum 02
SLC	Sea Level Change
SLR	Sea Level Rise
STWAVE	Numerical model for storm surge value prediction
UPR	University of Puerto Rico
USACE	U. S. Army Corps of Engineers
USGS	U. S. Geological Survey
VA	Vulnerability Assessment
WIS	Wave Information Study
WISWAVE	Numerical hindcast model

Executive Summary

This appendix documents all engineering analyses and design tasks that were performed for the Loíza, Puerto Rico Final Integrated Feasibility Report. The Continuing Authorities Program (CAP) Project is authorized by Section 14 of the Emergency Streambank and Shoreline Protection, Flood Control Act of 1946, as amended. This engineering appendix includes alternatives evaluated, engineering analysis summaries, and the preliminary design. The Cost Appendix is provided as a separate appendix. This document meets all requirements in Appendix C of ER 1110-2-1150.

1.0 Background

1.1 Location

The Municipality of Loíza, Puerto Rico, is an economically disadvantaged community located on Puerto Rico's northern Atlantic Coast, approximately 16 miles east of San Juan, as shown in Figure 1-1. The study area includes approximately 1,050 feet of shoreline within the Municipality of Loíza, which fronts a public school (A), a community center (B), and a public roadway (C), as shown in Figure 1-2.

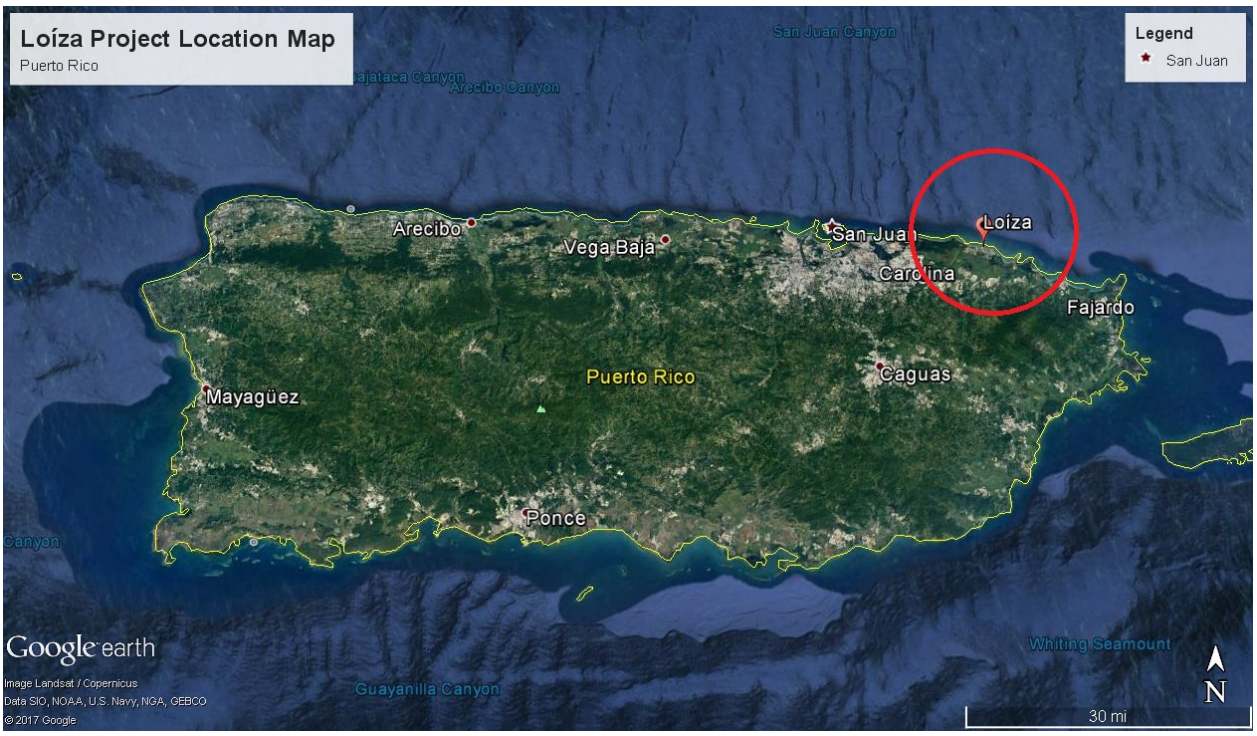


Figure 1-1 - Location Map

Figure 1-2 - Location Map Inset

1.2 Problem Statement

Coastal erosion is causing a receding shoreline that is threatening the permanent loss of public facilities. Increased erosion beneath unprotected, aging infrastructure has resulted in weakened foundations and loose construction debris, creating public safety hazards. The most threatened of the structures includes a public school, a public community center, and a public road (Calle Punta Del Atlantico), as shown in Figure 1-3. The resulting damages and safety concerns forced the Municipality to temporarily relocate the school operations to a safer inland location. However, this temporary location is not adequate, and the Municipality would like to return operations to the school site. In addition, recent partial erosion beneath Calle Punta Del Atlantico has rendered it impassible and limited access to the residences and cut off a public thoroughfare. Despite local efforts to slow the erosion by placing loose rock and concrete along the shoreline, the overall pattern has been continued erosion, as shown in Figure 1-4. A comparison of elevations from 2004 and 2016 shows the extent of shoreline recession at the Project site, as illustrated in Figure 1-5. Also noted through examining historic aerial photography, is the seasonal migration of beach erosion, likely a direct reflection of the seasonal shift in wave patterns. Normal cyclical ocean conditions cause the shoreline to protrude to the east in the summer, and west in the winter. However, sand is still lost from the system in the project

area, resulting in gradually smaller protrusions and larger beach loss over time. Thus, the problem is not ultimately the loss of beach (requiring shore protection), but rather unprotected infrastructure (requiring coastal protection).

Figure 1-3 - Structures at Risk in Project Area.

Figure 1-4 - Undermined Public Road in Project Area.

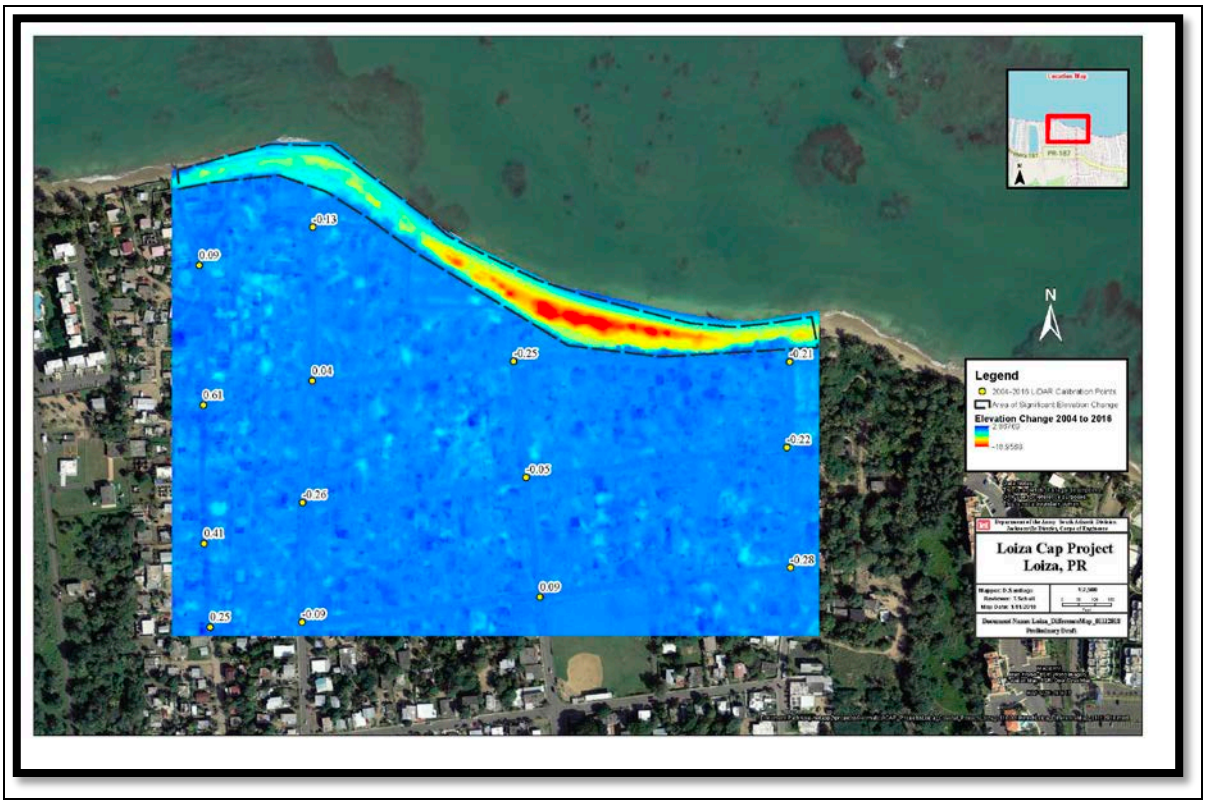


Figure 1-5 – 2004 and 2016 Shoreline Comparison at Loíza

1.3 Objective

The study objective is to provide emergency shoreline erosion protection to approximately 1,050 feet of Loíza shoreline in order to protect public facilities.

2.0 Alternatives

The team developed a preliminary array of five alternatives that would provide emergency shoreline protection within the project area, as discussed in the Main Report. Initial engineering analysis of the project area resulted in the selection of Alternative S-5, select revetment construction, being carried forward. The design was optimized (including different revetment heights and slopes) to ensure it will meet the erosion protection objective to the extent that the cost constraints of CAP would allow.

2.1 Alternative S-1.

Alternative S-1, *Energy dissipation protection (breakwater) or structures such as groins, spurs, rip-rap or armoring*, includes a range of measures constructed in the water to minimize erosional forces on the shoreline by either dissipating the wave energy or providing armoring. However, it was important to select a plan that would not require obtaining a permit. The acquisition of a permit to construct on the hardpan bottom in the

vicinity of a protected marine habitat, and the lack of precedent for a permit of this type in this area, will make a permit infeasible for an emergency shoreline stabilization project.

2.2 Alternative S-2.

Alternative S-2, *Beach nourishment with select construction of vegetated dunes,* includes construction of vegetated dunes that can reduce effects of erosional forces in two ways. The dunes act as a barrier between the erosional forces and the threatened infrastructure, and store a reservoir of sand to help reduce the rate of beach erosion. The vegetation on the dunes provides additional cohesive forces to the sand, increasing the dune's resistance to erosion. However, after multiple visits by the team, it was noted that a pre-existing dune had been washed away in less than one year between visits, showing that constructing any feature out of sand would not be sustainable.

2.3 Alternative S-3.

Alternative S-3, *Beach nourishment in conjunction with groins to stabilize nourishment*, combines the measures of energy dissipation and armoring with the addition of sand to the beach. This alternative includes the construction of a groin in the water as an energy dissipation measure to protect the re-nourished beach. However, as discussed in Alternative S-1, the team wants to avoid environmental impacts that would result from constructing groins in the water, and adding sand is not a sustainable solution to erosion.

2.4 Alternative S-4.

Alternative S-4, *Vegetated dune construction with minimal beach berm,* includes adding to the berm (or width of the beach) and construction of vegetated dunes. However, as discussed in Alternative S-2, adding sand is not a sustainable solution to erosion.

2.5 Alternative S-5.

Alternative S-5, *Select revetment construction*, involves constructing an armored protective barrier between the erosive forces and the threatened structures. This is the only solution that is both sustainable and will not require a permit.

2.6 Selected Alternative.

Optimization of Alternative S-5 resulted in a design consisting of construction of revetment, with an armored over-wash protection zone between the revetment and the public road.

This alternative involves placing a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, school, and community center. The elevation of the revetment crest would be 10.0-ft PRVD02. Due to existing public sidewalk damage, the remaining sidewalk may need to be demolished, and replaced with the over-wash protection zone. The over-wash protection zone would consist of either bedding stone, a

high performance turf reinforcement mat (HPTRM), or a combination of both, keyed in between the existing road and revetment. The selected alternative is shown in Figure 2-1, and the typical cross sections are shown in Figure 2-2 for the revetment adjacent to both the community center and the road. The design details are discussed in Section 4.2.1.

Figure 2-1 – Selected Alternative

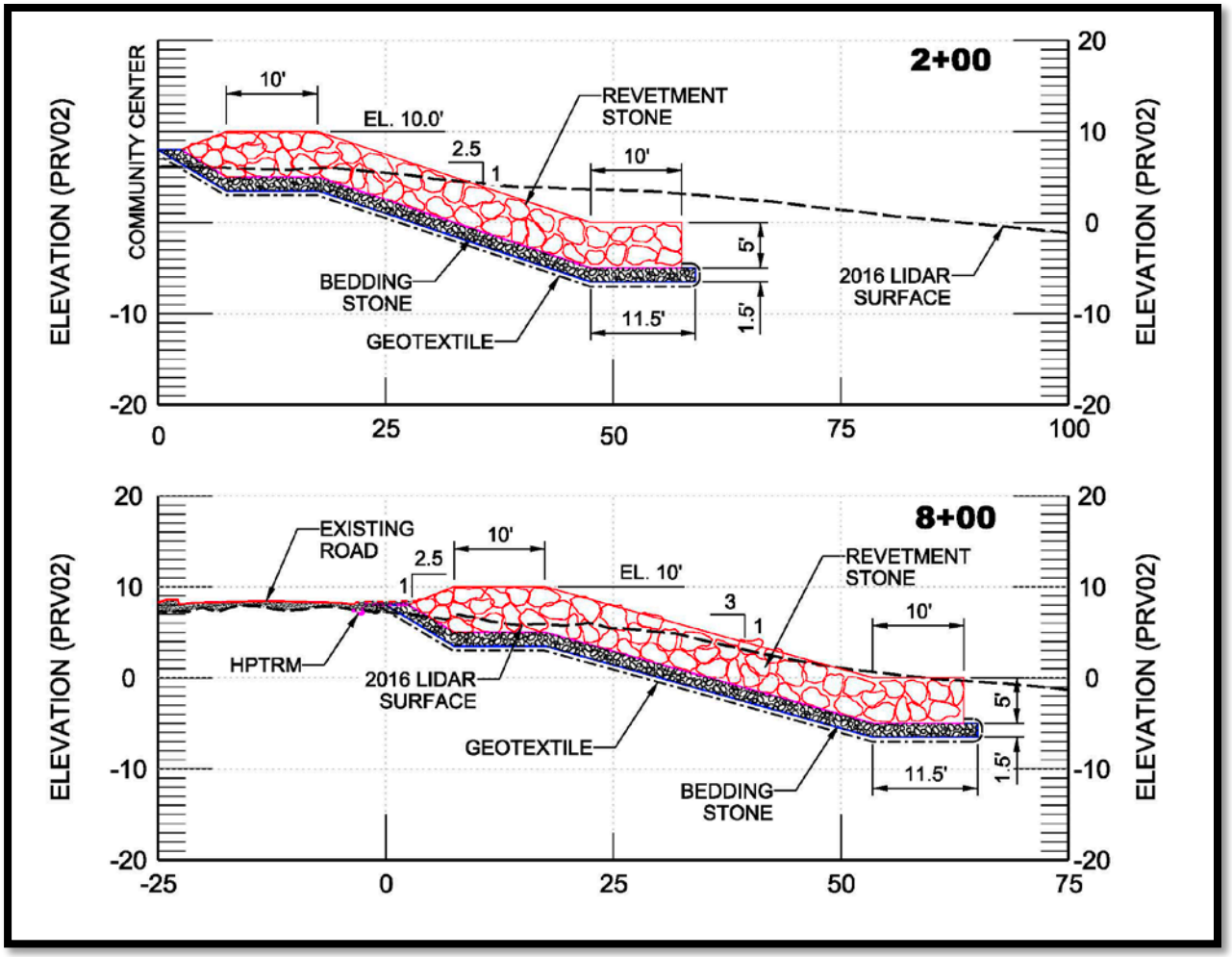


Figure 2-2 – Typical Revetment Cross Sections

3.0 Pertinent Data

Two sources of terrain data used for this study were collected in 2004 and in 2016 by a US Army Corps of Engineers (USACE) contractor using Light Detection and Ranging (LiDAR) and beach profile surveys were provided by the University of Puerto Rico (UPR). This information combined with aerial photography was utilized to layout, analyze, and compute quantities for the revetment and public road. The vertical datum in all data collected is PRVD02. A more current and comprehensive topographic survey will be acquired at the outset of the Design and Implementation (DI) phase to develop plans and specifications. This survey will provide the latest topographic features (erosion damage), easements, structures, utilities, and streets, etc.

In addition, wind data, tide elevations, and storm surge level data were all collected for the analysis. The references and use of this data is discussed in Section 4.1.

4.0 Coastal Armoring Analysis and Design

4.1 Natural Forces

There are a number of coastal processes causing the continued erosion along the northern shoreline of Puerto Rico. These natural factors include winds, waves, tides and currents, and storm events. Wave height, period and direction, in combination with tides and storm surge (the rise of the ocean surface above its astronomical tide level due to storm forces), are the most important factors influencing the behavior of the project beach erosion. Wind speed and direction directly impact wave height and wave frequency, which is why wind generated ocean waves are the primary cause of erosion within the study area. In order to determine the design still-water elevation for revetment and roadway design, an analysis was performed to determine the existing storm event wave setup within the project area using the Automated Coastal Engineering System (ACES) software package developed by the Coastal Engineering Research Center (CERC). Input data required to run ACES included deep-water significant wave height, deep-water significant wave period, storm surge values, and spring tide elevation. The following methodology was followed to calculate the input data, and ultimately the final elevation.

1. Wind data offshore of the project area was acquired from the USACE Wave Information Study (WIS) Program. Wind data from WIS Station #61019 for the period of record (POR) 1980 – 2014 was used to generate WIS hindcast data.
2. Significant wave height, and peak and mean wave period are generated using the numerical hindcast model WISWAVE (Hubertz, 1992). WISWAVE is driven by wind fields overlaying a bathymetric grid.
3. National Oceanic and Atmospheric Administration (NOAA) tables were referenced to obtain the spring tide elevations (NOAA 2017), which are the Mean Higher-High Water (MHHW) elevation of 0.81-ft and Mean Lower-Low Water (MLLW) elevation of -0.76-ft PRVD02 (NOAA 2017[1]). The tide elevations are shown in Table 4-1.

Table 4-1: Tidal Datums: San Juan, PR

Station: 9755371, San Juan, La Puntilla, San Juan Bay, PR **Status: Accepted (Oct 19 2011)** **Units: Feet**		
Tidal Datum	**Elevation (feet relative to:)**	
	MHW	PRVD02
Mean Higher-High Water (MHHW)	4.96	0.81
Mean High Water (MHW)	4.7	0.55
Mean Tide Level (MTL)	4.15	0
Mean Sea Level (MSL) – Puerto Rico Vertical Datum (PRVD02)	4.15	0
Mean Diurnal Tide Level (DTL)	4.17	0.02
Mean Low Water (MLW)	3.59	-0.56
Mean Lower-Low Water (MLLW)	3.39	-0.76

4. Storm surge levels were obtained from the Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for the Commonwealth of Puerto Rico and Municipalities (FEMA, 2009). The Study Site is at FIS Stillwater Location 136, between FIS transects 63 and 64. Storm surge values were predicted using ADCIRC and STWAVE numerical models (FEMA, 2009).
5. Deep-water significant wave height, deep-water wave period, spring tide elevations, and storm surge elevations were input into ACES to get the design still-water elevation for revetment and roadway design.

The resulting setup values for each storm event are presented in Table 4-2.

Table 4-2 - Calculated Total Water Level

storm return period	storm surge	storm surge + spring tide	deep-water significant wave height	deep-water wave period	setup across surfzone	storm surge + setup	storm surge + spring tide + setup
(YRS)	(FT, PRVD02)	(FT, PRVD02)	(FT)	(S)	(FT)	(FT, PRVD02)	(FT, PRVD02)
1	0.33	1.14	15.4	10.0	2.91	3.24	4.05
2	0.66	1.47	18.7	11.0	3.01	3.67	4.48
5	1.20	2.01	24.6	12.7	3.21	4.41	5.22
10	1.64	2.45	27.9	13.5	3.31	4.95	5.76
20	2.40	3.21	31.2	14.3	3.41	5.81	6.62
50	3.60	4.41	37.1	15.6	3.51	7.11	7.92
100	4.27	5.08	41.0	16.3	3.57	7.84	8.65

4.2 Protective Revetment Design

The primary problem areas are the shoreline fronting the public school, community center, and Calle Punta Del Atlantico. This area is most susceptible to storm surge and waves where continued erosion occurs. A revetment is proposed that would dissipate incoming wave energy to mitigate shoreline erosion in the region.

4.2.1 Revetment Elevation

The elevation of the proposed protective revetment is based on optimization of damage prevention and the project cost limit. Overtopping of the structure would be due to the combination of still water elevation and the effects of the waves expected to reach the revetment. The 10-year event design wave was chosen as the starting point for analysis based on the successful Piñones project nearby, which is similar to the Loíza project in size and scope (USACE 1996). Piñones is a CAP Section 103 project, located approximately eleven miles east of San Juan on the northern coast of Puerto Rico, that was studied in 1996 and constructed in 1998. The Piñones design included raising approximately 4,077 linear feet of Highway 187 and constructing rock revetment along the ocean side of the highway. Both the road centerline and revetment crest were constructed to elevation 10.0 feet above MSL. The revetment elevation is only overtopped by wave run-up when a wave height of 4.4 feet breaks on the revetment (USACE 1996). This equates to Loíza's depth limited 4.5-foot 10-year event wave height (starting with the 10-year still water level (SWL)), as discussed in the following paragraphs.

The design is the combination of a 10-year storm surge with spring tide elevation and wave setup (Table 4-2). Within the study area a maximum spring tide elevation of +0.81 feet MSL (PRVD02) has been observed, and the estimated storm surge for a 10-year event is 1.64 feet, resulting in a total depth of 2.45 feet during a 10-year event at spring high tide. The associated wave-setup is 3.31 feet. Therefore, the design SWL for revetment and roadway design is +5.76 feet PRVD02 (Mean Sea Level, MSL).

It does not matter if the offshore waves are the 10-yr storm or the 100-yr storm; once they pass over the nearshore reefs, they are depth limited. Since the analysis starting point was the 10-year SWL, the resulting wave from any size storm is the 10-year event wave. To determine the design wave height at the toe of the structure, the effects of the multiple parallel offshore reefs had to be considered. Review of the 2016 LIDAR data indicated an average depth over these reefs of about 43 feet and 8 feet, resulting in maximum water depths of 45.5 and 10.5 feet over these reefs during the 10-year event at high spring tide. Using the surf similarity parameter, which is the ratio of breaking wave height to water depth (Gamma = 0.78), the corresponding maximum wave height which could pass over the reefs without breaking would be about 35.2 and 8.3 feet, respectively. The waves would break on the natural slope from the nearshore reef, and continue to break from the nearshore reef to the toe of the structure. The structural design wave would therefore be

the depth limited wave at the toe of the structure where the 10-year event still water level is assumed to be +5.76 feet MSL (PRVD02). Assuming that the maximum breaking wave height is equal to 0.78 times the water depth, the 10-year event design wave would be 4.5 feet.

However, the material fronting the road is sand which is susceptible to erosion from the storm events. The recommended elevation of the toe of the revetment is 0.0 feet Mean Low Water (MLW) (0.56 feet PRVD02) to provide protection in the event of erosion of the fronting beach. Toe protection would require additional excavation down to approximately -6.0 feet PRVD02, resulting in a depth similar to the design wave height.

The Automated Coastal Engineering System (ACES) developed by the Coastal Engineering Research Center (CERC) was utilized to evaluate the wave run-up and overtopping on the proposed revetment. Various structure elevations were simulated with the system to optimize the revetment design. Input wave height was the depth limited 4.5-foot wave for the 10-year event which also was the maximum accepted prior to breaking by the ACES software. The side slopes of 1V on 2.5H and 1V on 3H were chosen as having the most optimized wave energy dissipation for the cost. The revetment adjacent to the public road is designed with the 1 on 3 slopes. The revetment fronting the community center and school is designed with the 1 on 2.5 slopes due to lack of space combined with the natural reflectivity of the head lands on which they are located. The structure crest elevation selected was +9.5 feet PRVD02 with an overtopping rate of less than 0.4 cubic feet of water per second per linear foot. To provide additional vertical space for a two stone layer, the recommended elevation of the revetment is +10.0 feet PRVD02. Table 4-3 and Table 4-4 show the final overtopping calculations for the revetment design.

Table 4-3 - Preliminary Revetment Design – 10-Year Event, 1 on 2.5 side slope

Case: elev 9_5 1 on 2_5

Wave Runup and Overtopping on Impermeable Structures

Wave type: Irregular Slope type: Rough
Rate estimate: Runup and Overtopping

Breaking criteria:	0.780				
Incident significant wave ht (Hi):	4.500	ft	Runup for significant waves (R):	6.523	ft
Peak wave period (T):	13.500		Onshore wind velocity (U):	0.000	ft/sec
COTAN of nearshore slope (cot phi):	100.000		Deepwater significant wave (Ho):	2.802	ft
Water depth at structure toe (ds):	5.800	ft	Relative height (ds/Ho):	2.070	
COTAN of structure slope (cot theta):	2.500		Wave steepness (Ho/gT^2):	0.000	
Structure height above toe (hs):	9.500	ft	Overtopping coef(alpha):	0.074	
Rough slope coefficient(a):	0.775		Overtopping coef(Q*o):	0.070	
Rough slope coefficient(b):	0.361		Overtopping rate (Q):	0.372	ft^3/s-ft

Table 4-4 - Preliminary Revetment Design – 10-Year Event, 1 on 3 side slope

Case: elev 9.5 1 on 3

Wave Runup and Overtopping on Impermeable Structures

Wave type: Irregular Slope type: Rough
Rate estimate: Runup and Overtopping

Breaking criteria:	0.780				
Incident significant wave ht (Hi):	4.500	ft	Runup for significant waves (R):	6.126	ft
Peak wave period (T):	13.500		Onshore wind velocity (U):	0.000	ft/sec
COTAN of nearshore slope (cot phi):	100.000		Deepwater significant wave (Ho):	2.802	ft
Water depth at structure toe (ds):	5.800	ft	Relative height (ds/Ho):	2.070	
COTAN of structure slope (cot theta):	3.000		Wave steepness (Ho/gT^2):	0.000	
Structure height above toe (hs):	9.500	ft	Overtopping coef(alpha):	0.076	
Rough slope coefficient(a):	0.775		Overtopping coef(Q*o):	0.070	
Rough slope coefficient(b):	0.361		Overtopping rate (Q):	0.326	$ft^3/s\text{-}ft$

4.2.2 Revetment Stone Size

Software contained within the ACES system was used to determine the proper size of armor and filter layer stone. The input parameters consisted of depth at the toe of the structure, depth limited design wave height, wave period, nearshore slope, structure slope, unit weight of rock, permeability of the structure, and acceptable damage level. Granite was selected due to its local availability.

To be conservative, the maximum wave height allowable by the ACES system of 5.1 feet at the toe of the structure was selected for stone sizing, instead of the calculated incident wave height of 4.5 feet. The next two tables show the resulting granite size for the two slopes. To mitigate for any erosion that the revetment might induce due to wave reflection, sand will front the structure. Additional information on the stone gradations for the underlayer, the bedding layer, and the sand can be found in the Geotechnical Section.

Table 4-5 - Granite Stone Sizes for 1V:2.5H

Case: Granite 1 on 2.5

Rubble Mound Revetment Design

Significant wave ht (Hs):	4.50	ft
Significant wave period (Ts):	13.50	sec
Cotan of nearshore slope (cot phi):	100.00	
Water depth at toe of revetment (ds):	5.80	ft
Cotan of structure slope (cot theta):	2.50	
Unit weight of rock (wr):	165.50	ft
Permeability coefficient (P):	0.10	
Damage level (S):	2.00	
Breaking criteria:	0.78	

Stone Size Gradation

Armor Layer			Filter Layer		
Thickness:	3.99731 ft		Thickness:	1.00000 ft	
% less than by weight	Weight	Dimension	% less than by weight	Weight	Dimension
	lb	ft		lb	ft
0 (min)	165.17	1.00	0 (min)	0.43	0.14
15	528.53	1.47	15	0.73	0.16
50	1321.33	2.00	50	2.45	0.25
85	2589.81	2.50	85	8.26	0.37
100 (max)	5285.34	3.17	100 (max)	13.90	0.44

Irregular wave runup (ft)

Expected maximum:	8.45	ft	Conservative:	10.63	ft
Surf Parameter:	4.82				
CERC Stability Number:	1.33		Dutch Stability Number:	1.42	

Table 4-6 - Granite Stone Sizes for 1V:3H

Case: Granite 1 on 3

Rubble Mound Revetment Design

Significant wave ht (Hs):	4.50	ft
Significant wave period (Ts):	13.50	sec
Cotan of nearshore slope (cot phi):	100.00	
Water depth at toe of revetment (ds):	5.80	ft
Cotan of structure slope (cot theta):	3.00	
Unit weight of rock (wr):	165.00	ft
Permeability coefficient (P):	0.10	
Damage level (S):	2.00	
Breaking criteria:	0.78	

Stone Size Gradation

Armor Layer			Filter Layer		
Thickness:	3.73457 ft		Thickness:	1.00000 ft	
% less than by weight	Weight	Dimension	% less than by weight	Weight	Dimension
	lb	ft		lb	ft
0 (min)	134.28	0.93	0 (min)	0.35	0.13
15	429.71	1.38	15	0.59	0.15
50	1074.27	1.87	50	1.99	0.23
85	2105.58	2.34	85	6.71	0.34
100 (max)	4297.10	2.96	100 (max)	11.30	0.41

Irregular wave runup (ft)

Expected maximum:	7.95	ft	Conservative:	10.00	ft
Surf Parameter:	4.02				
CERC Stability Number:	1.37		Dutch Stability Number:	1.53	

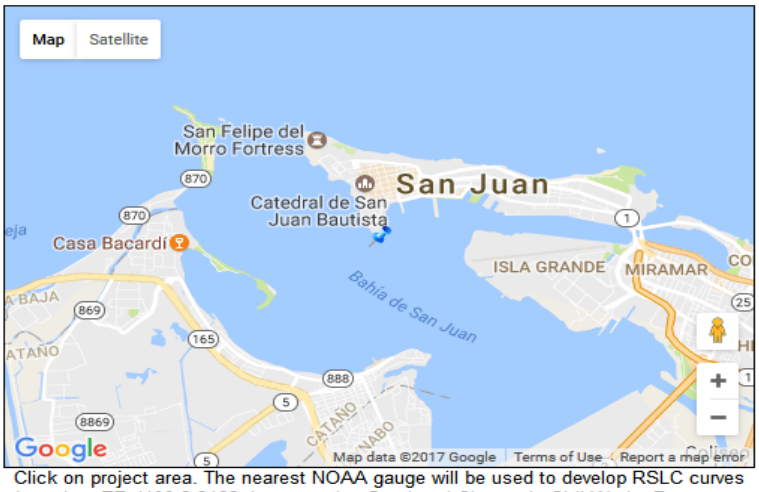
4.2.3 With-Project Risk

The design will meet the project objective of reducing continued erosion of the shoreline, thereby reducing the risk of infrastructure failure, including the road, Community Center, school, and eventually homes. The stone size can withstand waves from the 100-year storm. Therefore, the risk of erosion of the shoreline will be reduced from almost 100% chance to a residual risk of less than a 1% chance of occurring. The residual risk of the with-project conditions is a 10% chance that 0.4 cfs/lf will wash over the revetment into the developed area. This is an acceptable rate of overtopping based on a FEMA Coastal Flood Hazard Analysis (FEMA 2005) and Engineer Manual 1110-2-1100, Part VI, Coastal Engineering Manual (USACE 2011). The Loíza overwash rate of 0.4 cfs/lf equates to 37 Liters/s/m. Table VI-5-6 in the USACE coastal design guidance manual shows that the 37 liters/s/lf of overtopping at Loíza will not cause structural damage to the revetment (USACE 2011). Table 2 in FEMA's coastal flood hazard analysis report indicates that cfs/lf would be classified as "ponding" (AO zone) instead of a "velocity zone" by FEMA (FEMA 2005). The project will not transform or transfer risk.

4.3 Sea Level Change

ER 1100-2-8162, *Incorporating Sea Level Change (SLC) in Civil Works Programs*, provides regulations and guidance for incorporating direct and indirect physical effects of projected future sea level change to USACE Civil Works projects. These regulations apply to all USACE Civil Works activities and projects, both existing and proposed, across the project life cycle in managing, planning, engineering, designing, constructing, operating, and maintaining USACE projects and systems of projects. Consideration of potential relative sea level change is required in every USACE coastal activity as far inland as the estimated tidal influence, including studies that calculate backwater profiling with the ocean as the downstream boundary condition. Alternatives should be formulated and evaluated for the three possible rates of sea level change; low, intermediate, and high SLC. These should be applied to both with and with-out project conditions.

NOAA's Published low rate of SLC for San Juan, PR, Gage # 9755371, is +0.006824 feet per year, which is used to calculate the estimated amount of SLC in 2016. Figure 4-2 shows the estimated relative sea level changes for all three rates from 2018 to 2118, based on NOAA's published rates. The Corps Climate SLC curve calculator, found at http://www.corpsclimate.us/ccaceslcurves.cfm, was used to produce Figure 4-2. The graph shows the total estimated elevation increase in feet.



Click on project area. The nearest NOAA gauge will be used to develop RSLC curves based on ER 1100-2-8162, Incorporating Sea Level Change in Civil Works Programs, 31 Dec 2013 and NOAA Technical Report OAR CPO-1, Global Sea Level Rise Scenarios for the United States National Climate Assessment, Dec 2012
*** note - there may be factors other than proximity to consider when selecting a gauge ***

Compliant
Inactive
< 40yrs

Figure 4-1 - Gauge 9755371 at San Juan Harbor.

The project base year was specified as 2018, and the analysis projected out 100 years. Figure 4-2 and Figure 4-3 show the graphical representation of Relative Sea Level Elevation Change Projections and the Estimated Relative Sea Level Change Projections from 2018 to 2118, respectively, for the same U. S. Geological Survey (USGS) Gauge 9755371 for the three rates of projected sea level change. It is noted that Figure 4-2 shows the projected elevations over the next 100 years, whereas Figure 4-3 shows the estimated difference in feet. All values are expressed in feet relative to MSL (PRVD02).

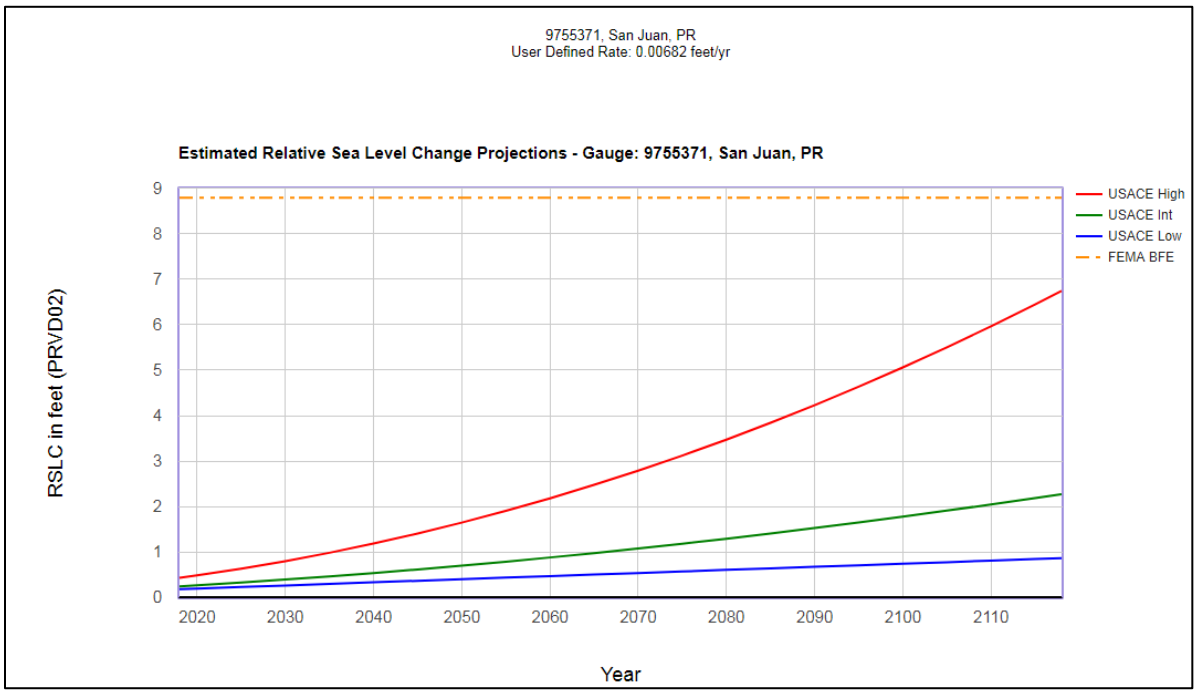


Figure 4-2 - Relative Sea Level Change Projections for San Juan, PR.

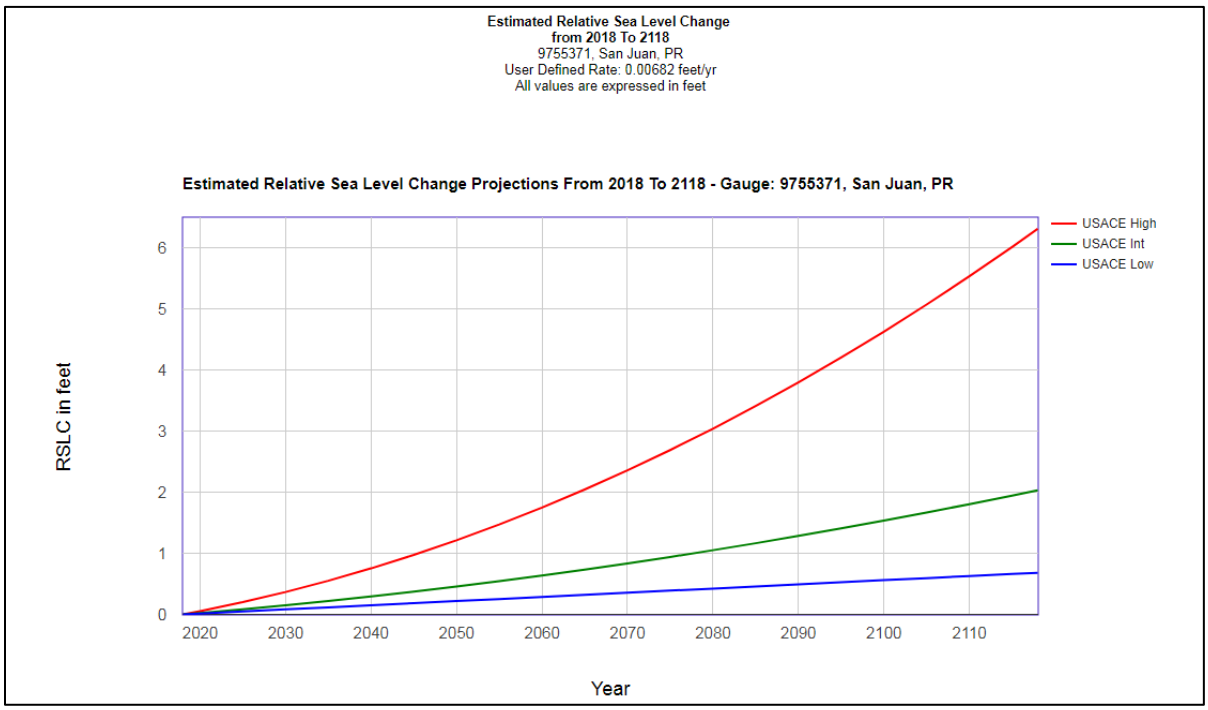


Figure 4-3 - Estimated Relative Sea Level Change Projections for San Juan, PR.

The total regional sea level rise predicted by the three scenarios (low, intermediate, and high) may have significant impact to the performance of the Loíza project. Potential impacts of rising sea level include overtopping of waterside structures, increased shoreline erosion, and flooding of low lying areas.

NOAA's "Sea Level Rise Viewer" (*https://coast.noaa.gov/digitalcoast/tools/slr*) was used to determine the impacts of SLC. Present day MHHW is shown in Figure 4-4, one-foot of sea level rise in Figure 4-5, two-feet of sea level rise in Figure 4-6, and six-feet of sea level rise in Figure 4-7. Figure 4-8 shows an inset of the project area inundation for six-feet of sea level rise. The only infrastructure inundated would be part of the public road as indicated by the arrow. No structures would be inundated.

Figure 4-4 - Present day MHHW for Loíza, PR

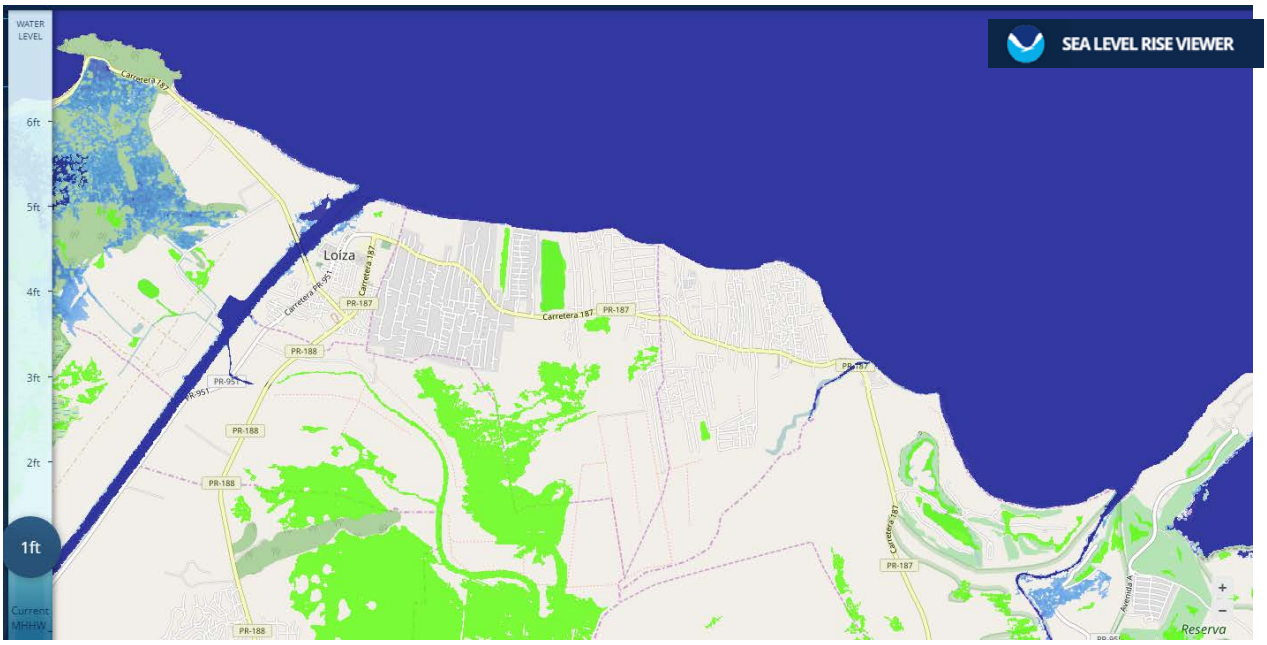


Figure 4-5 - One foot of sea level rise. (Scenario III)

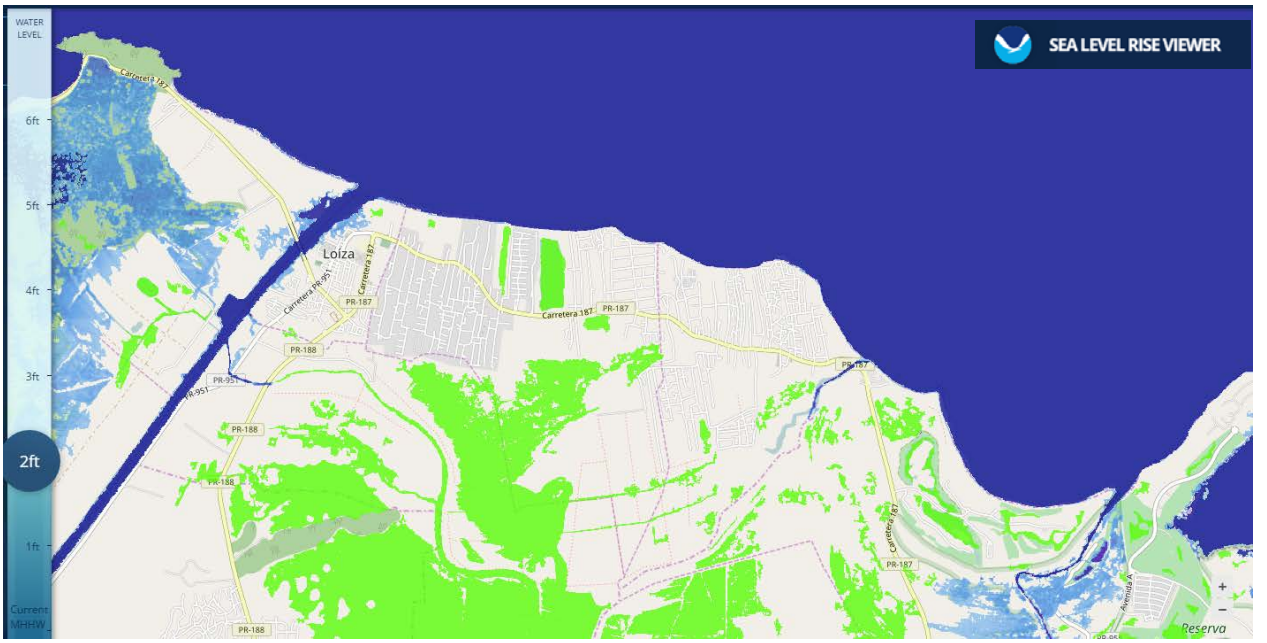


Figure 4-6 - Two feet of sea level rise. (Scenario III)

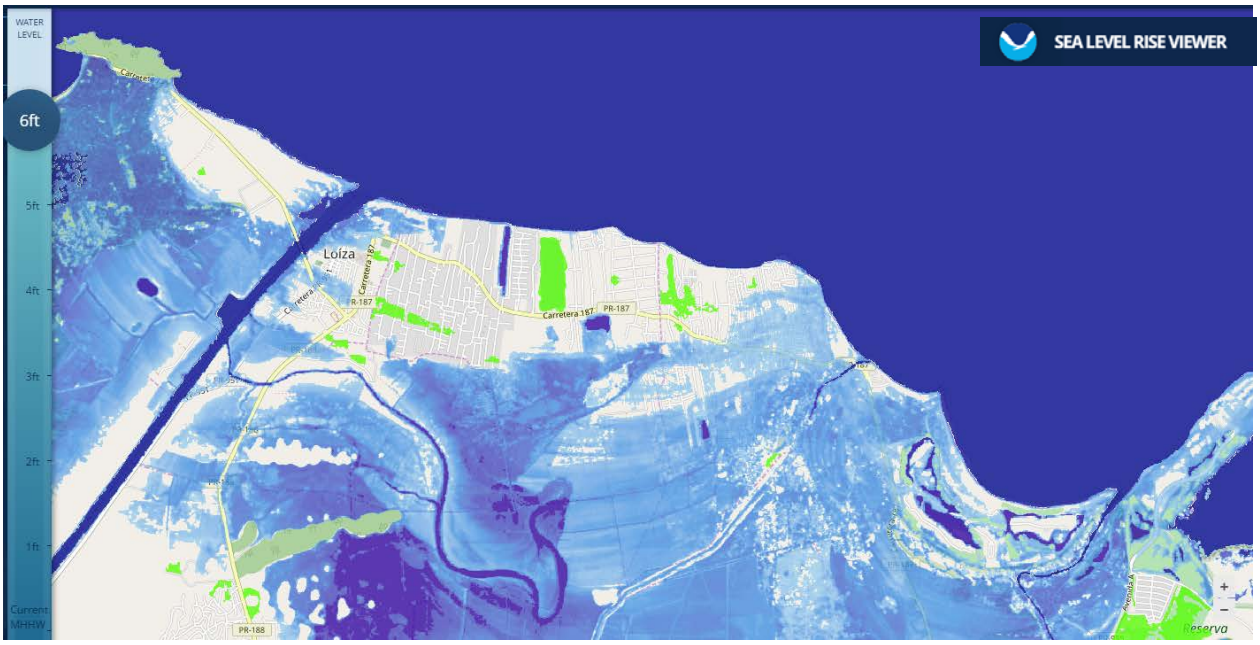


Figure 4-7 - Six feet of sea level rise. (Scenario III)

Figure 4-8 - Zoom in to six feet of SLC (Scenario III).

4.3.1 SLC Impacts to Infrastructure and Project Adaptability

Engineer Technical Letter (ETL) 1100-2-1, *Procedures to Evaluate Sea Level Change: Impacts, Responses, and Adaptation*, provides guidance for a qualitative analysis to determine the risk of potential SLC. In order to evaluate SLC impacts to infrastructure, critical resources, and the population residing in the study area, a qualitative matrix was developed in Table 4-6**,** which shows the resources on which the study area depends, and the vulnerability of each resource from potential SLC. Resources evaluated in the matrix were based on those identified by site visit and the Sponsor.

Table 4-7 - Qualitative Sea Level Rise Matrix

Critical Resources in Study Area	Density of Resource*	Resource and Risk Description	Risk from SLR*
Federal and local levees and Floodwalls	0	No levees or floodwalls located within the project area.	0
Federal and local pump stations, flood gates, drainage network, etc.	0	No Federal pump stations or flood gates are located within project area. Local drainage network will be inundated more often due to higher tailwater.	0
River, channel, lake exposure	0	No river, channel, or lake is located within the project area.	0
Potential area of impact	2	Project area that falls within the potential impact area includes all coastal areas below 6.0 ft.	1
Commercial and industrial infrastructure	0	No commercial or industrial infrastructure is located within the project area.	0
Transportation infrastructure	2	There are no bridges within the project area. Part of the public road will be inundated.	3
Utilities, sewage, communication networks	1	Utilities along coastal areas below elevation 6.0 ft will be inundated at all times, including sewer outlets and utility pole bases.	2
Private infrastructure	1	Private homes adjacent to the project area will not be inundated.	1
Evacuation routes	2	Part of a public road within the project area will be inundated, but other egress available.	3
Environmental and habitat areas	1	Beach habitat will be inundated.	3
Potential for impacts at adjacent navigation, coastal storm damage, or ecosystem projects	1	The coastal storm damage project will be overtopped more often. No adjacent navigation or ecosystem projects associated with this project.	3

*3 = high, 2 = medium, 1 = low, 0 = none.

Based on LiDAR data, upland elevations within the study area average approximately 8.0 ft-PRVD02. The dune system that fronts these uplands is either non-existent or quickly eroding, and also has an average elevation of 8.0 ft-PRVD02. The federal stone revetment feature of this project will be the only protection against further erosion of the shoreline, as well as a means for reducing inundation frequency due to over-wash from strom surge and wave setup. Although the public and private structures are not predicted to be inundated with a six-foot sea level rise alone, stakeholders should be aware of the risk of increased inundation frequency due to revetment over-wash with storm surge and setup, especially under the high SLC scenario.

4.3.2 SLC Conclusion

Sea level change is a growing concern in coastal regions of the United States and Puerto Rico. It is therefore necessary to ensure that coastal projects are adaptable to changing conditions. To maintain shoreline erosion protection level of this project's components, as well as reduce the frequency of flooding due to over-wash, the revetment structure can be retrofitted by increasing the height by adding larger stone.

4.4 Climate Change Analysis

The overarching USACE climate change policy document, *USACE Climate Preparedness and Resilience Policy Statement* (June 2014), requires consideration of climate change at every step in the project life cycle for all existing and planned USACE projects to reduce vulnerabilities and enhance the resilience of our water-resource infrastructure. Guidance for incorporating climate change and hydrologic analyses is provided in Engineering And Construction Bulletin (ECB) No. 2016-25 (16 Sept 2016), Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Designs, and Projects. This applies to all current and future studies and any completed projects for which Federal funds are being used to rehabilitate a project, but does not apply to short-term water management decisions. The analysis provides for consideration of specific climate change projections in the project area and potential impacts to the particular hydrologic analysis.

The required qualitative analysis involves two phases. Current climate change trends are analyzed during Phase I, and projected future changes to hydrology is analyzed during Phase II. Phase I consists of literature review and investigation of annual maximum stream flow trends using the USACE Climate Hydrology Assessment and USACE Nonstationarity Detection Tools. Phase II consists of investigating projected future trends in annual maximum stream flows using the same two USACE tools mentioned previously, and performing a vulnerability assessment using the USACE Watershed Vulnerability Assessment Tool. The Climate Change assessment for this project are presented in the following sections.

4.4.1 Phase I: Relevant Current Climate and Climate Change.

4.4.1.1 Loíza, Puerto Rico.

Loíza, Puerto Rico has a tropical climate characterized by relatively high temperatures and approximately 75% humidity. The warmest month is August, with an average maximum temperature of 88°F; and the coolest month is December, with an average maximum temperature of 83°F. The rainy season spans from May through December. May is the wettest month with an average monthly precipitation of over 6 inches, and February is the driest month with an average monthly precipitation of approximately 2 inches (https://weather-and-climate.com). The Hydrologic Unit Code (HUC) for this watershed is 21010005 (USGS 1994).

According to USACE (2015), which references the results of numerous climate studies in Puerto Rico and the Caribbean, there has been an observed increase in nightly and daily maximum air temperatures in the study region over the period of record of 1950 – 2004. The third NCA report (Carter et al., 2014) presents a study finding by the Puerto Rico Climate Change Council (PRCCC) that the annual average temperature in Puerto Rico has increased 1.8°F between 1900 and 2010. Station analyses during the same period across Puerto Rico show an increase of annual average temperatures at a rate of 0.022-0.025 °F/yr. It was noted that some areas of the island have experienced a faster warming trend than others due to the urban heat island effect.

With respect to precipitation as reported (USACE 2015), trend results vary between different reports, as well as across Puerto Rico. For example, the USACE study reported one analysis of station data showed no changes, while another indicated a 0.003 in/day/year decrease in rainfall between 1948 and 2007. Overall however, numerous literature syntheses reported an increased amount of rainfall during isolated extreme events, with an overall decrease in annual total precipitation (USACE 2015). According to USACE 2015, the precipitation trends in Puerto Rico differ both regionally and seasonally. The southern region of Puerto Rico has experienced an increase in precipitation, while the northern and western areas have experienced a decrease. Additionally, summers appear to be trending dryer, while winters are trending wetter (USACE 2015).

4.4.1.2 Observed Changes.

The USACE Climate Hydrology Assessment Tool was utilized to examine observed streamflow trends in the vicinity of the example project. However, the Climate Hydrology Assessment Tool did not contain stream gauge information for HUCs in Puerto Rico at the time of the assessment.

The Nonstationarity Detection Tool was also utilized to examine the hydrologic time series at a gauge in the project area. However, the Nonstationarity Detection Tool did not contain stream gauge information in Puerto Rico at the time of the assessment. During the time of writing this report, SAJ was in the process of providing rainfall information for incorporation into the Nonstationarity Tool.

4.4.1.3 Projected Changes in Climate.

The NOAA National Environmental Satellite, Data and Information Service (NESDIS) released a report in January 2013 assessing climate trends and scenarios into the next 50–100 years for the Southeast CONUS region (NOAA 2013). The report indicates that over the period of hydroclimatological record for the Southeastern United States, both temperature and precipitation have shown either a statistically insignificant trend or no trend in change. The only trend noted was a slight increase in precipitation in the Gulf region. To account for climate change, the projected meteorological conditions in the region considers the past temperature and precipitation records, as well as the modeled future conditions in the area through 2099. According to the NESDIS report, a warming trend of approximately 2-5°F and no discernable precipitation trend can be expected over the next 50 years, although these estimates have significant uncertainty.

4.4.2 Phase II: Projected Changes to Watershed Hydrology and Assessment of Vulnerability to Climate Change.

The USACE Climate Hydrology Assessment Tool was used to examine observed and projected trends in watershed hydrology to support the qualitative assessment. However, the Climate Hydrology Assessment Tool did not contain stream gauge information for HUCs in Puerto Rico at the time of the assessment.

The USACE Watershed Vulnerability Assessment (VA) Tool was used to examine the vulnerability of the project area to future flood risk. The VA Tool did not contain any watersheds in Puerto Rico at the time of the analysis. However, the tool did contain data on precipitation and temperature trends in the Southeastern United States, with some specific data for the island of Puerto Rico. The Regional Overview for the Southeast United States (which includes Puerto Rico) discusses threats to three key topics; increased sea level rise threats, increasing temperatures, and decreased water availability. For specific precipitation trends, this tool shows that Puerto Rico has experienced a 33% increase between 1958 and 2012 in precipitation amount during very heavy rain events (Figure 4-9). The tool also reports a modeled prediction of an over 30% increase in consecutive dry days in southeast Puerto Rico for the years 2070-2099 (as compared to the years between 1971-2000), if continued emissions increases (Figure 4-10). Regarding temperature trends, the VA Tool shows an average increase in the annual number of frost-free days between 5-9 days in the Southeastern US, which

includes Puerto Rico (Figure 4-11). The increased number of consecutive dry days combined with the higher temperatures and increased severity in large rainfall events has significant implications for native Puerto Rico flora and fauna, increased soil erosion, and human health.

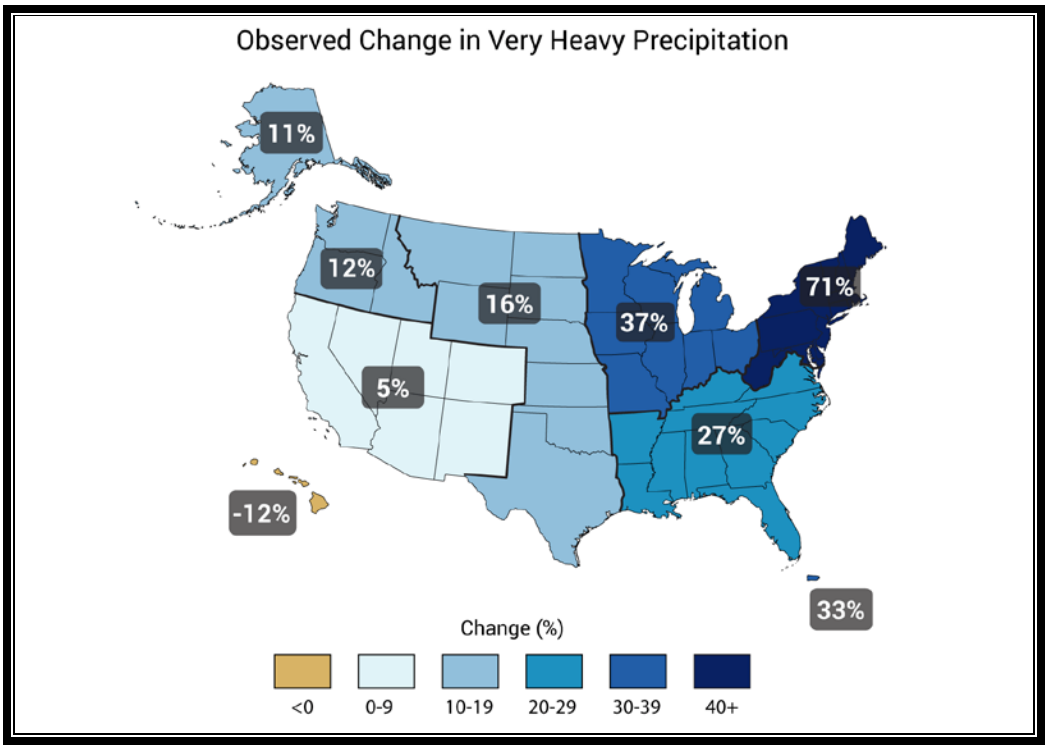


Figure 4-9 - Observed Change in Very Heavy Precipitation

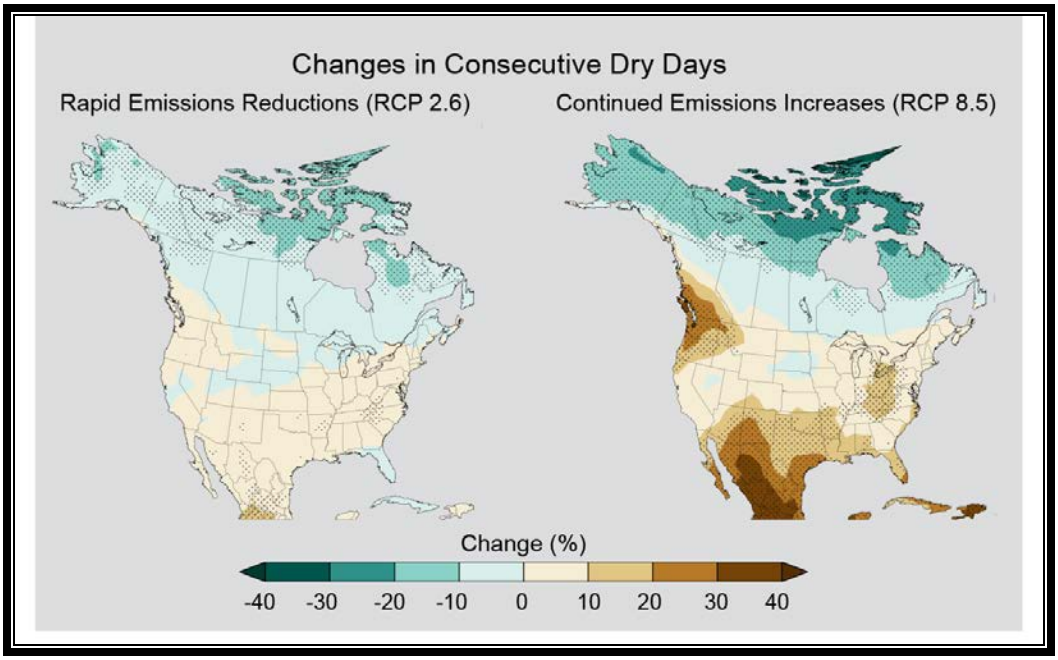


Figure 4-10 - Changes in Consecutive Dry Days

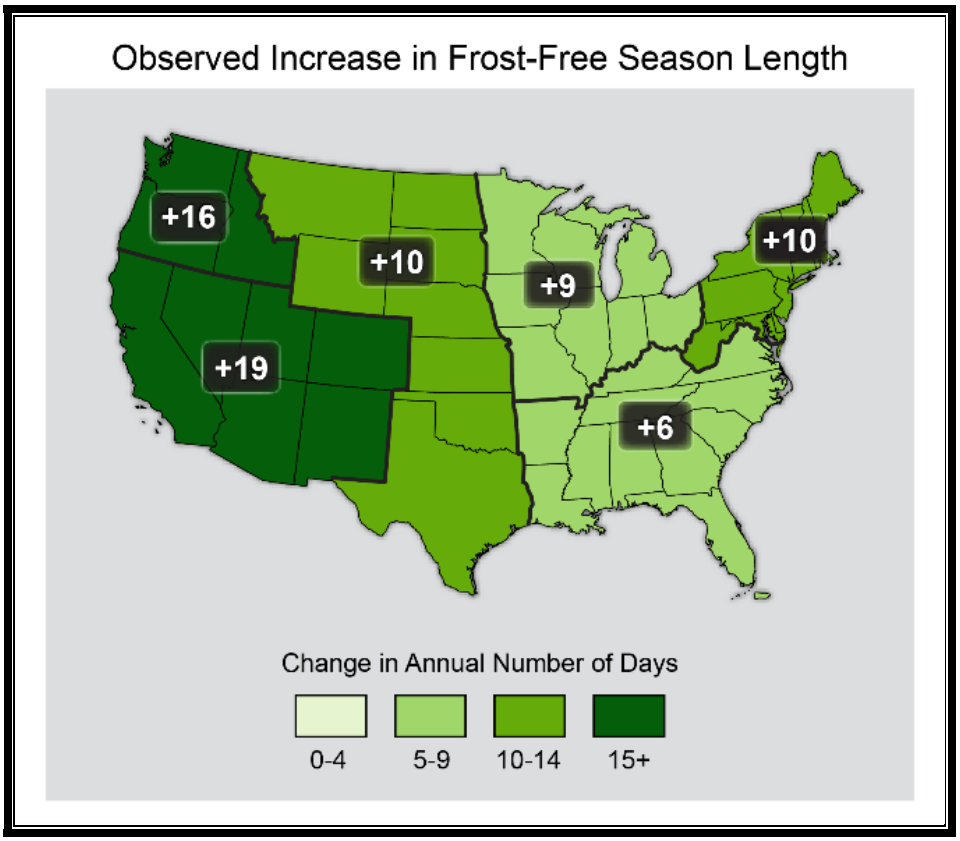


Figure 4-11 - Observed Increase in Frost-Free Season Length

The actions that can be taken in the context of the current study to make the community more resilient to higher future flows, overall wetter conditions, and higher temperatures are similar to those to be taken in the event of sea level change.

5.0 Geology and Geotechnical Analysis

5.1 Geology Background

The shoreline of the study area, located in Loíza, Puerto Rico, has experienced inundation and extensive shoreline erosion. Wave attack threatens infrastructure, including a public roadway, a community center and a school. Wave attack also contributes to public safety hazards by creating loose construction debris and weakening existing structures. The study area consists of a shoreline frontage of approximately 1,050 feet, located 16 miles east of San Juan. The shoreline in the study area generally erodes in the winter months and accretes during the summer months. Local efforts to slow the erosion have consisted the placing of loose rock and debris on the beach.

5.1.1 Regional Geology

The study area is located on the northeastern coast of Puerto Rico. The geology of eastern Puerto Rico is divided into three sections by the faults of the Cerro Mula Fault Zone. Formations on either side of this fault zone cannot be correlated because there is up to 33 km (20.5 mi) of lateral displacement. The Cerro Mula Fault Zone strongly controls the geomorphology of the region and separates the El Yunque highlands to the north from the lower hills to the south. The north side of the island is composed of limestones, marls and some non-carbonate sediments of late Oligocene to early Miocene age (Joyce, 1992).

5.1.2 Local Geology

The shore is mostly low-lying, with sandy beaches and small, rocky headlands. Broad sandy beaches cover the entire length of the study area. The beaches are characterized by an intermittent pavement of cemented beach sand, or beach rock, at intertidal levels. Although the coast is ordinarily somewhat protected by the reef, large waves are able to carry much of their energy to the shore. The width of the sandy beaches is delicately adjusted to the size and character of the surf. During intervals of large waves, beaches frequently recede 100 feet or more in a few days, only to advance the same distance during the ensuing intervals of normal surf (Kaye, 1959).

5.2 Native Beach

The native beach consists of poorly graded, fine to medium-grained grayish brown quartz sand, based on visual classification. No beach samples were collected from the study area for laboratory analysis. Some large rocks are present on the beach, likely placed there to help provide shoreline stabilization.

5.3 Potential Sand sources

Two potential sand sources were identified and are described below. Sand sources are shown on **Plate 1**, located in **ATTACHMENT 1**.

5.3.1 The Mouth of the Loíza River

Historical aerial photography was reviewed and it was observed that a sand shoal often builds up at the mouth of the Loíza River (see **Plate 1**) during periods of low flow. This shoal was identified as a potential sand source and a geotechnical investigation was conducted in December 2016 to examine the potential sediment volume and quality. At the time of the field investigation, the sand shoal was not built up across the entire mouth of the river. Three continuous, direct-push borings were collected near the mouth of the river to a depth of 20 feet below ground surface. The sand shoal material was generally described as poorly-graded, fine to medium-grained, grayish-brown quartz sand. The average mean grain size of the samples analyzed was 1.28 phi (0.43 mm) and the average standard deviation was 1.21 phi (poorly sorted). The contractor's geotechnical exploration final report is attached in **ATTACHMENT 1**. The available volume of sand from the mouth of the Loíza River will vary over time. As such, there are no guarantees that there will be sufficient material for this project. Material from this sand source could be transported to the study area by truck or barge. At a distance of 1.5 miles, material could possibly be delivered to the study area via pipeline.

5.3.2 Concretos de Puerto Rico, Inc.

Located approximately 15 miles south of the study area (**Plate 1**), near the municipality of Juncos, this sand mining operation uses material excavated from the banks of the Río Valenciano. Concretos de Puerto Rico, Inc. also has an on-site sand processing plant to produce material with different grain size distributions, depending on the desired application. This sand source can provide sufficient material for this project. Material from this sand source would likely be transported to the study area by truck.

5.4 Potential Rock Quarries

The following rock quarries were visited in December 2016 and all were actively blasting and producing rock at the time of the site visit. All rock quarry locations are shown on **Plate 1** and summarized in Table 5-1. Material from these quarries would likely be transported to the study area by truck.

5.4.1 Empresas Ortiz Brunet, Inc.

This is a basalt quarry located approximately 20 miles west-southwest of the study area, in the municipality of Guaynabo.

5.4.2 Cantera Carraízo, Inc.

This is a basalt quarry located approximately 13 miles southwest of the study area, in the municipality of Trujillo Alto.

5.4.3 LPC&D, Inc.

This is a basalt quarry located approximately 8 miles southwest of the study area, in the municipality of Carolina.

5.4.4 Oriental Sand & Gravel, Inc.

This is a granite quarry located approximately 24 miles south of the study area, in the municipality of Yabucoa.

Table 5-1 - Sand Source and Rock Quarry Locations

Location	Material	Latitude	Longitude	Northing	Easting
Mouth of Loíza River	Quartz Sand	18° 26' 16.33"	65° 52' 32.61"	875986	849427
Concretos de Puerto Rico, Inc.	Quartz Sand	18° 14' 22.56"	65° 54' 58.62"	803946	835574
Empresas Ortiz Brunet, Inc.	Basalt	18° 19' 48.86"	66° 8' 1.59"	836692	760054
Cantera Carraízo, Inc.	Basalt	18° 19' 50.22"	66° 1' 11.41"	836906	799568
LPC&D, Inc.	Basalt	18° 21' 39.68"	65° 57' 17.25"	848002	822097
Oriental Sand & Gravel, Inc.	Granite	18° 5' 36.5"	65° 51' 21.03"	750946	856713

5.5 Geotechnical Evaluation

Geotechnical analyses for this project included review of armor stone design in collaboration with the Corps Coastal Design Section, and preliminary design of bedding stone and geotextile. Additional geotechnical considerations were included for protection of the upland face of the revetment system to protect against erosion related to over-wash. Consideration was also given for the stability of the embankment grading proposed

along the new armoring alignment. Details of the geotechnical analyses performed are detailed below.

5.5.1 Stability Analyses

The proposed grade for the new armoring surface is being considered between 2.5H: 1V and 3H:1V. Based on the latest available field information, it appears that considerable scarping of the existing beach soils has occurred and has undermined and impacted portions of Calle Punta Del Atlantico and the adjacent sidewalk, limiting access along this portion of the roadway, and has undermined the foundation of an existing community center adjacent to the beach area. Based on available site information, scarping along the shoreline appears to be to depths of approximately 3 to 5 feet along the roadway, and approximately 2 to 2.5 feet below the foundation level at the community center.

Figure 5-1 – Photograph showing scarping, undermining, and loss of roadway along the beach near Calle 2, looking toward the southeast (08 Feb 2017)

Figure 5-2 – Photograph showing scarping along Calle Punta Del Atlantico, looking toward the east (11 Aug 2017)

Figure 5-3 - Scarping at the foundation level of the community center, looking northwest (11 Aug 2016)

Figure 5-4 - Undermining of the foundation of the community center, looking northwest (13 Sep 2017)

Considerations for the stability of the existing features (roads and buildings) after the proposed armoring is in-place was limited to the assessment of the revetment system's stability. It is understood that the stability or repair of features landward of the proposed revetment system, after the erosion protection is in-place, will be the responsibility of the local sponsor.

The proposed armoring plan includes removal of existing debris, stone fragments, and loose materials, and dressing of the remaining base soils to provide uniform support of the geotextile. A non-woven geotextile will be placed along the prepared ground surface, followed by the addition of overlying layers of bedding stone and armor stone. The estimated bulk unit weight of the armor stone system will be roughly equivalent to compacted soil, and will produce a similar bearing pressure. Furthermore, the surface slope of the armor layers will be flattened from that of the existing scarped areas, to a slope of approximately 2.5H: 1V and 3H:1V. Based on the review of available soils information from the local geology assessment and site photographs, the surface and subsurface materials include sandy soils and rock. These materials appear suitable for support of the overlying armor system at the proposed configurations. Please refer to the Attachment 1 for more detail.

Due to the flattening of the slopes, the relatively low height and generally similar bearing pressure produced by the materials to be placed, and the anticipated available bearing capacity of the foundation materials, there are no concerns with a bearing capacity slope failure of the armor system.

5.5.2 Stone Protection Design

Revetment design was performed as a collaboration between the Corps Soils and Coastal Design Sections, due to wave action along the protected area. Revetment for this project will be composed of graded, natural stone (armor). Portions of the armor design were performed using the following guidance:

- EM 1110-2-1601 – Hydraulic Design of Flood Control Channels (1994)
- EM 1110-2-1614 – Design of Coastal Revetments, Seawalls, and Bulkheads (1995)
- ASTM D 6092 – Standard Practice for Specifying Standard Sizes of Stone for Erosion Control (2008)

Actual project detail sections, including dimensions, end protection, and final configurations, will be included in the project drawings (to be completed during design phase). The conceptual armor template is shown in Figure 5-5 below.

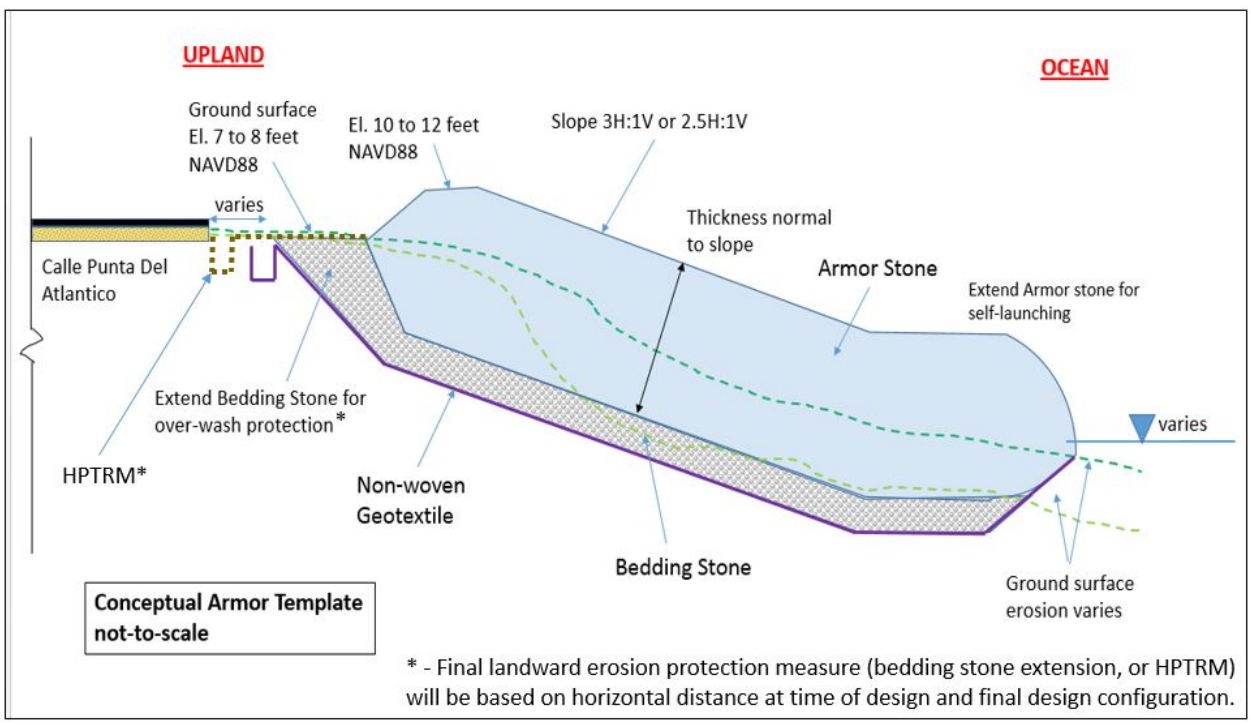


Figure 5-5 - Conceptual Armor Template

5.5.2.1 Design Armor Stone Gradation

A design gradation (single band) was provided by the Corps Coastal Design Section (Figure 5-6). This target gradation, the same design used for a similar USACE project near the subject site (Piñones), considered a diameter of a cube-shaped stone, and a unit weight of 160 pounds per cubic foot (lb/ft^3). To develop a design gradation range, the required W_{50} weight from the provided design gradation was converted to a diameter of a stone shape that is ½ way between a sphere and cube, and a comparison armor stone gradation was then developed by the Corps Soils Section using the D_{50} method from Chapter 2 of EM 1110-2-1614. The design comparison considered a stone unit weight of 165 pounds per cubic foot (lb/ft^3). This higher unit weight was considered based on the anticipated availability of local materials. The armor stone gradation proposed by the Corps Soils Section is included in Table 5-2. The stone considered in the design will be required to be imported if no source is available in the island (i.e., granite, etc.); however, it is understood that materials meeting the design criteria can be sourced locally.

RUBBLE MOUND REVETMENT DESIGN

Significant Wave Height	Hs:	4.40	ft
Significant Wave Period	Ts:	16.00	sec
Cotangent of Nearshore Slope	COT(phi):	100.00	
Water Depth at Toe of Revetment	ds:	5.40	ft
Cotangent of Structure Slope	COT(theta):	2.00	
Unit Weight of Rock	wr:	160.00	lbs/ft3
Permeability Coefficient	P:	0.10	
Damage Level	S:	2.00	

STONE SIZE GRADATION

ARMOR LAYER
Layer Thickness = 4.44 ft

PERCENT LESS THAN BY WEIGHT	WEIGHT (lbs)	DIMENSION (ft)
0.00	218.39	1.11
15.00	698.86	1.63
50.00	1747.16	2.22
85.00	3424.43	2.78
100.00	6988.63	3.52

FILTER LAYER
Layer Thickness = 1.11 ft

PERCENT LESS THAN BY WEIGHT	WEIGHT (lbs)	DIMENSION (ft)
0.00	0.57	0.15
15.00	0.96	0.18
50.00	3.24	0.27
85.00	10.92	0.41
100.00	18.38	0.49

Figure 5-6 - Design Gradation from Piñones

***Table 5-2* - Armor Stone Gradation**

Weight (lb)			Diameter (in)			Diameter (mm)		
$W_{\#}$	Max	Min	$D_{\#}$	Max	Min	$D_{\#}$	Max	Min
W_{100}	6997	3494	D_{100}	47	37	D_{100}	1194	945
W_{50}	2621	1747	D_{50}	34	30	D_{50}	858	750
W_{15}	---	546	D_{15}	---	20	D_{15}	---	509
Note: diameter consider stone shape to be ½ was between sphere ○ and cube □.								

Both design gradations proposed by the Corps Soils and Coastal Design Sections were reviewed with standard ASTM gradations; however, the required minimum band of the gradation was larger than the closest standard gradation. Therefore, not even the largest ASTM standard gradation (ASTM D6092, R1500) will be adequate, and a custom gradation will be needed for this project.

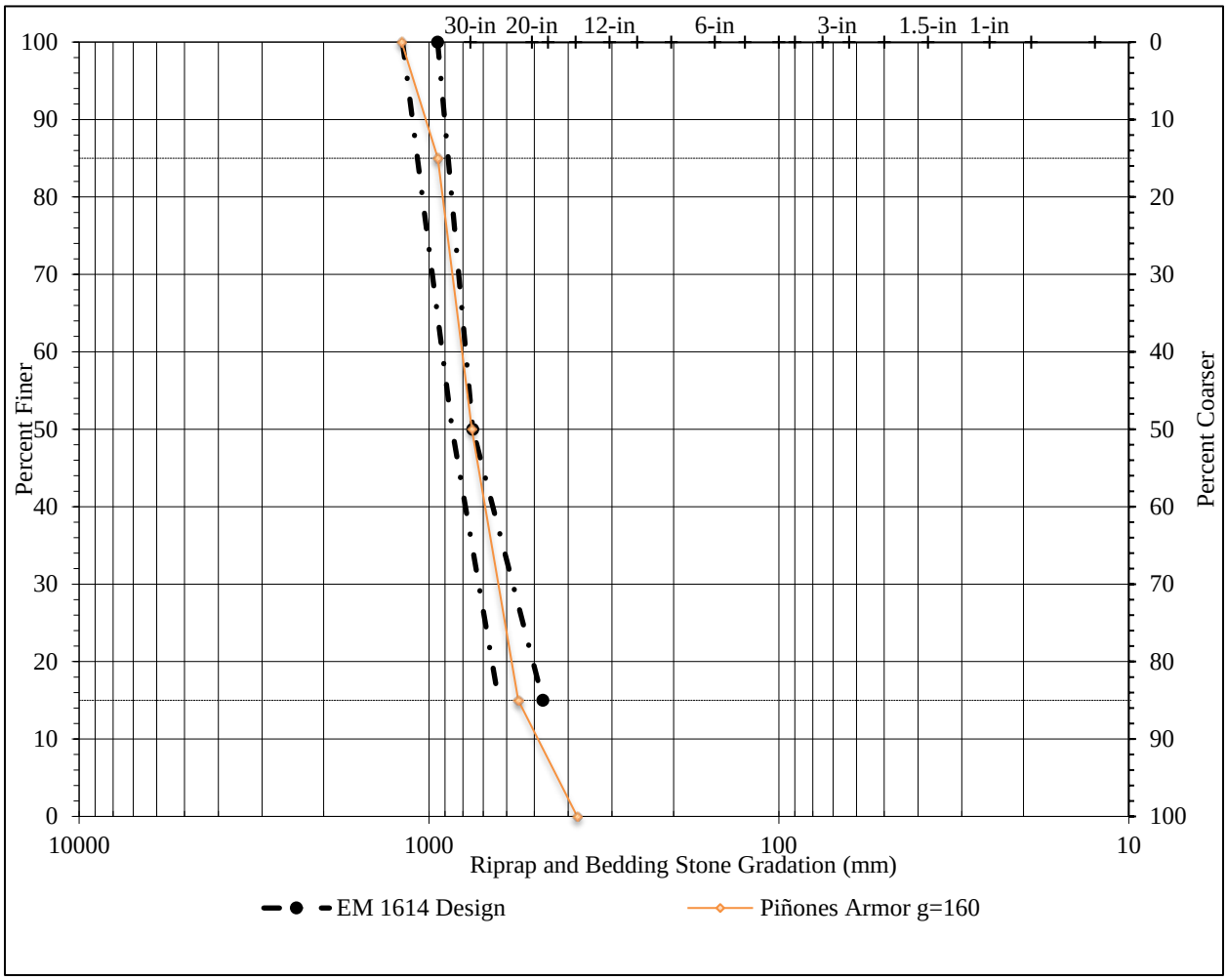


Figure 5-7 - Stone Gradation Comparison

The recommended blanket thickness for the armor stone will likely be between 4 and 5 feet, based on a relationship of 1.25 x D_{100} size. Depending on the final design gradation, the D_{100} size could vary between approximately 37 and 47 inches. The blanket thickness design considers placement of stone armor in-the-dry. Placement in the wet typically requires that the blanket thickness be increased by 50%. As design data is developed, and as uncertainties are resolved, consideration will be given to reducing the blanket thickness (i.e., 1.25 to 1 x D_{100} size).

5.5.2.2 Bedding Stone Design

Bedding stone gradation was based on criteria outlined in EM 1110-2-1614, Equation 2-28, to prevent loss of bedding stone through the void spaces of the armor stone. Based on the range of D_{15} sizes of the armor stone gradations, it is recommended that a layer of ASTM D 6092 R20 riprap be placed on top of the geotextile. Please refer to Table 5-3 and Figure 5-8 for more details.

Table 5-3 - Bedding Stone Gradation (ASTM D 6092 R20)

Weight (lb)			Diameter (in)			Diameter (mm)		
$W_{\#}$	Max	Min	$D_{\#}$	Max	Min	$D_{\#}$	Max	Min
W_{100}	45	20	D_{100}	9	7	D_{100}	221	169
W_{50}	20	10	D_{50}	7	5	D_{50}	169	134
W_{15}	10	2	D_{15}	5	3	D_{15}	134	78

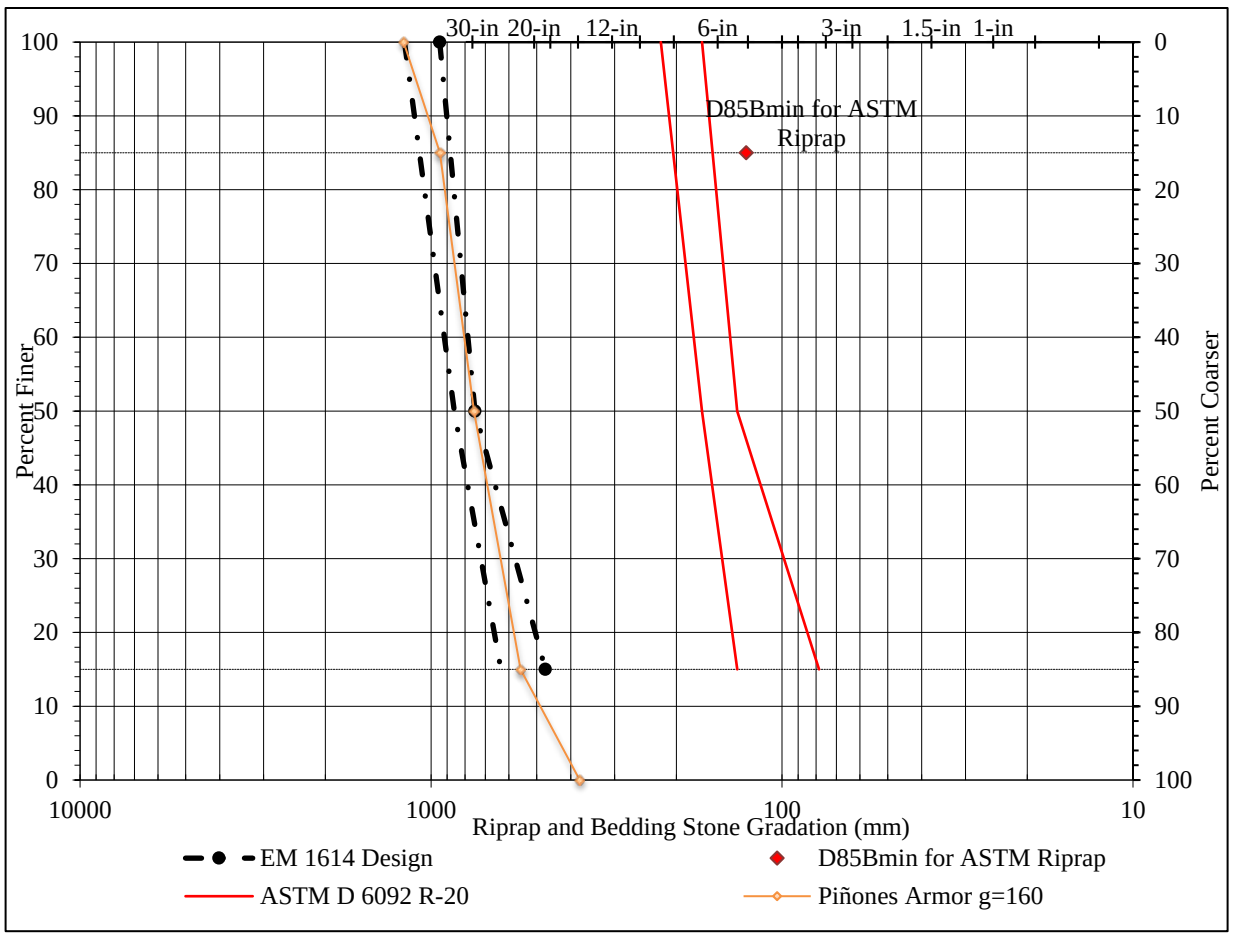


Figure 5-8 - Bedding Stone Gradation Comparison

It is recommended that a 12- to 18-inch thick layer of ASTM D 6092 R20 riprap be placed as bedding stone as a transition between the armor stone and geotextile, in order to protect the geotextile. Additionally, it is recommended that the bedding stone layer be extended horizontally, landward of the armor stone blanket, to provide protection to the upland face of the revetment system against erosion from over-wash and runoff.

5.5.2.3 Geotextile Design

Geotextile will be required as a separator at the interface of the stone revetment sections and the supporting soils. Design for geotextile was based on FHWA Publication No. FHWA HI-95-038, Geosynthetic Design and Construction Guidelines (1998). A range of soil gradations from the project site were considered. Available grain size test results from the vicinity were provided by the Corps Geology Section and reviewed as part of the analysis.

Table 5-4 - Foundation Soil Material Description

Parameters								
Borings	Depth (ft)	D_{85} (mm)	D_{60} (mm)	D_{30} (mm)	D_{15} (mm)	D_{10} (mm)	C_u	% passing 0.075 mm (No. 200)
GP-Loiza-16-01-B	0-4	0.7664	0.381	0.1909	0.1443	0.1226	3.11	3.1
GP-Loiza-16-01-B	4-8	1.2093	0.5006	0.2087	0.1362	0.1201	4.17	4.7
GP-Loiza-16-01-B	16-20	0.719	0.5059	0.3555	0.2936	0.2377	2.13	1.9
GP-Loiza-16-02-B	0-4	0.5972	0.4189	0.264	0.1791	0.1563	2.68	3.6
GP-Loiza-16-02-B	8-12	1.0649	0.6831	0.4321	0.329	0.3005	2.27	1.7
GP-Loiza-16-02-B	16-20	1.4352	0.74	0.2076	0.1575	0.1352	5.47	0.9
GP-Loiza-16-03-A	12-16	0.7289	0.5101	0.3338	0.2168	0.1704	2.99	3.3
GP-Loiza-16-03-B	8-12	0.5434	0.3528	0.1884	0.1338	0.1146	3.08	4.1
GP-Loiza-16-03-B	12-16	5.3788	0.846	0.568	0.3964	0.3516	2.41	1.6

The analyses resulted in the following requirements for the geotextile:

Apparent Opening Size (AOS): ≤0.27 mm

Permeability (k): ≥ 0.131 cm/sec

Permittivity (ψ): ≥ 0.7 sec^{-1}

Porosity (n): 70%

A non-woven geotextile with the following properties is currently considered for use on this project:

Table 5-5 - Geotextile Material Properties

Property	**Units**	**Acceptable Values**	**Test Method**
Grab Strength	lbs	320	ASTM D4632
Grab Elongation	%	50	ASTM D4632
CBR Puncture	lbs	650	ASTM D6241
Trapezoid Tear	lbs	100	ASTM D4633
Seam Strength	lbs	290	ASTM D4632
AOS (no larger than)	U.S. Sieve	50	ASTM D4751
Permittivity (no less than)	sec^{-1}	1	ASTM D4491
Flow Rate (no less than)	gpm/ft^2	75	ASTM D4491
Ultraviolet Degradation	%	70 at 500 hours	ASTM D4355

5.5.2.4 Construction Considerations

The subject site is located in a highly dynamic environment that is subject to severe erosion from regular wave actions and major storms, and subject to seasonal shoreline fluctuations (natural erosion and accretion). Based on the most recent available site information, the alignment of the proposed revetment system is currently anticipated to be located along the scarped area that is seaward of the sidewalk along Calle Punta Del Atlantico and seaward of the community center and school (See Figure 2-1). The horizontal location of the revetment crest (in the landward and seaward directions) is anticipated to vary at the time of construction, due to additional changes (additional erosion and scarping) that are likely to occur to the present site conditions.

It is anticipated that the majority of excavation needed to place the armor stone blanket will be performed in the sandy soils, similar to the surficial soils observed at the scarped

areas. However, there is evidence of near-surface rock formations that may either require excavation, or be utilized as natural armor. Tie-in of the proposed revetment system with any natural rock formations will require, at minimum, that the geotextile be placed to sufficiently form a barrier between any underlying sands and the overlying stone armor system. Additional considerations for use of natural rock formations as armor will be developed during final design.

5.6 Design Phase Recommendations

This section describes the considerations to be taken into account for the design and implementation phase of the project.

5.6.1 Subsurface Investigations

Soils information used for this feasibility study was from investigations taken in the prior Section 205 project in the vicinity of the current project site. In order to obtain site specific conditions and narrow soil parameters of the area, it is recommended that site specific investigations are performed.

5.6.2 Seismic

Seismic evaluation specific to the site was not available. However, studies on the Cerro Mula Fault and nearby faults indicate no recent fault movement or displacement have occurred. Conversely, the seismic history of Puerto Rico indicate tremors could be expected, although should be minor. Seismic evaluation should be considered in the armor stone revetment as well as measures to displacement of the armor stone.

6.0 Civil Design

6.1 Revetment Sections

The site quantities (demolition, cut, fill, etc.) were determined by estimating quantities from In-Roads cross sections and from aerial photography. The aerial photography data utilized was accessed through Google Earth. Cross sections depicting the existing shore geometry compared with the proposed geometry and bank protection were analyzed with Bentley In-Roads software.

The side slopes of 1V on 2.5H and 1V on 3.0H were determined during the coastal analysis to be the most optimal slopes for wave energy dissipation. The revetment adjacent to the public road is designed with the 1 on 3 slopes. The revetment fronting the community center and school is designed with the 1 on 2.5 slopes due to lack of space combined with the natural reflectivity of the head lands on which they are located. The revetment length was determined by the location at which the crest elevation would tie into natural ground west of the school and east of the public road. The resulting project length is approximately 1,050 feet. Figure 2-2 shows the typical cross section of the revetment.

The design includes an over-wash protection zone on the landside of the revetment. This will consist of either HPTRM mat, bedding stone, or a combination of the two, that will span between existing infrastructure and the revetment. The over-wash protection zone was designed with two purposes. It will be designed to pitch toward the revetment, to drain over-wash flows back through the revetment. It will also protect the soil between the revetment and existing infrastructure from additional erosion due to over-wash. It is assumed that any over-wash that plunges beyond the over-wash protection zone will be handled by the existing drainage infrastructure (i.e. the road drainage system). The over-wash rate for the 10-year storm was calculated to be less than 0.1 cfs/lf, as shown in Table 4-2 and Table 4-3.

6.2 Real Estate

This project will require the acquisition of real estate in order to obtain access for construction equipment. The design includes a proposed right of way width of 10 feet between the top of bank of the proposed revetment and the school and community center, and proposed use of the public road to construct adjacent to the road. This project will also require the acquisition of a proposed right of way width of 20 feet between the revetment toe and the ocean in order to obtain access for construction equipment.

Real estate acquisition will also be required for staging/lay down areas, borrow and spoil areas, and access roads, which were selected to be in close proximity to the construction. The locations are shown in Figure 6-2. This project is located within the Municipality of Loíza, and use the existing public city streets for transportation of construction equipment and material will be feasible.

Figure 6-1 - Access Roads, Staging and Storage Areas

6.3 Relocations

Utilities located in the vicinity of the project were identified by design engineers during on-site inspections. For the selected plan, two abandoned light poles were identified for removal. If the removal and relocation of any additional utilities is determined during design, the same size and type of material would be utilized in the relocation of a utility to accommodate the proposed revetment construction.

7.0 Structural Requirements

There are no structural elements in this shore protection project design.

8.0 Electrical and Mechanical Requirements

There are no electrical or mechanical elements in this shore protection project design.

9.0 Hazardous, Toxic, and Radioactive Waste (HTRW)

As a result of the environmental analysis performed, there is no indication of the possible existence of HTRW on the property. The detailed environmental analysis is presented in Sections 2.7.7 and 7.7.7 of the Main Report.

10.0 Construction Procedures and Water Control Plan

The construction of the revetment will be sequenced in order to minimize the impact on the local traffic patterns. Placement of stone on a public beach and park may require temporary closure of these facilities for safety.

Runoff and erosion control measures will also be put in place during construction to minimize erosion of the excavated slopes, the slopes adjacent to the newly constructed revetment, any stockpiled excavation, and all adjacent land that may have been stripped of vegetation.

10.1 Design and Implementation (D&I) Data

The following data and detailed analyses will occur during the D&I Phase:

- Value Engineering Study to determine the most cost effective materials and construction methods;
- Design level survey data;
- Drainage via HPTRM;
- Construction sequence to be able to add excavated sand back onto revetment with minimal handling; and
- Toe construction methodology (to remain in the dry or placement of gabions).

Based on available site information, including photographs of the changing site conditions between 2015 and September 2017, the intention is to construct in-the-dry as much as possible, considering tidal fluctuations and seasonal fluctuations of the beach materials, the topography at the time of construction, etc. (as discussed in Section 5.0 of the Engineering Appendix). The need for any temporary cofferdams, etc. to facilitate placement was not anticipated, as these measure are likely impractical in this environment. Based on the likelihood that some of the seaward-most portions of some areas of the armor zone may require construction in the surf (see Figure 5-1 of the Feasibility Report), it is understood that placing the geotextile could be challenging at times, and would require some type of ballast. The use of a gabion mattress bedding

system has also been considered. This method would allow for containment of the bedding and geotextile materials during placement in the wet. Additional considerations for use of natural rock formations as armor will be developed during final design.

10.2 Construction Techniques

Construction considerations are discussed in Section 5.5.2.4.

11.0 Operation and Maintenance

There will be no operation and maintenance activities necessary to maintain this shore protection project design. Caution signs will be provided as part of the design, warning the public that access to the beach over the revetment is dangerous and directing them to the beach access in the public park east of the project.

12.0 Schedule for Design and Construction

The schedule for design and construction is provided in the separate Cost Appendix.

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ATTACHMENT 1

GEOTECHNICAL EXPLORATION FINAL REPORT

TABLE OF CONTENTS

1 Background 3
1.1 Regional Geology 3
1.2 Local Geology 3
2 Native Beach 4
2.1 General 4
3 POTENTIAL Sand sources 4
3.1.1 The Mouth of the Loiza River 4
3.1.2 Concretos de Puerto Rico, Inc. 4
4 POTENTIAL ROCK QUARRIES 5
4.1.1 Empresas Ortiz Brunet, Inc. 5
4.1.2 Cantera Carraízo, Inc. 5
4.1.3 LPC&D, Inc. 5
4.1.4 Oriental Sand & Gravel, Inc. 5
5 References 6

INDEX OF TABLES

Table 1: Sand Source and Rock Quarry Locations 5

INDEX OF PLATES

Plate 1: Overview: Loiza Rock Quarry, Sand Source and Study Area Locations 7

SUB-APPENDIX 1

Sediment Sampling Collection and Laboratory Results for the United States Army Corps of Engineers, Rio Grande De Loiza Mouth, Loiza, Puerto Rico, CR Environmental, Inc., 2017 8

1 BACKGROUND

The shoreline of the study area, located in Loiza, Puerto Rico, has experienced inundation and extensive shoreline erosion. Wave attack threatens infrastructure, including an evacuation roadway, a community center and a school. Wave attack also contributes to public safety hazards by creating loose construction debris and weakening existing structures. The study area consists of a shoreline frontage of approximately 1,000 feet, located 16 miles east of San Juan. The shoreline in the study area generally erodes in the winter months and accretes during the summer months. Local efforts to slow the erosion have consisted the placing of loose rock and debris on the beach.

1.1 REGIONAL GEOLOGY

The study area is located on the northeastern coast of Puerto Rico (**Plate 1**). The geology of eastern Puerto Rico is divided into three sections by the faults of the Cerro Mula Fault Zone. Formations on either side of this fault zone cannot be correlated because there is up to 33 km (20.5 mi) of lateral displacement. The Cerro Mula Fault Zone strongly controls the geomorphology of the region and separates the El Yunque highlands to the north from the lower hills to the south. The north side of the island is composed of limestones, marls and some non-carbonate sediments of late Oligocene to early Miocene age (Joyce, 1992).

1.2 LOCAL GEOLOGY

The shore is mostly low-lying, with sandy beaches and small, rocky headlands. Broad sandy beaches cover the entire length of the study area. The beaches are characterized by an intermittent pavement of cemented beach sand, or beach rock, at intertidal levels. Although the coast is ordinarily somewhat protected by the reef, large waves are able to carry much of their energy to the shore. The width of the sandy beaches is delicately adjusted to the size and character of the surf. During intervals of large waves, beaches frequently recede 100 feet or more in a few days, only to advance the same distance during the ensuing intervals of normal surf (Kaye, 1959).

2 NATIVE BEACH

2.1 GENERAL

The native beach consists of poorly graded, fine to medium-grained grayish brown quartz sand, based on visual classification. No beach samples were collected from the study area for laboratory analysis. Some large rocks are present on the beach, likely placed there to help provide shoreline stabilization.

3 POTENTIAL SAND SOURCES

Two potential sand sources were identified and are described below. Sand sources are shown on **Plate 1**.

3.1.1 The Mouth of the Loiza River

Historical aerial photography was reviewed and it was observed that a sand shoal often builds up at the mouth of the Loiza River (**Plate 1**) during periods of low flow. This shoal was identified as a potential sand source and a geotechnical investigation was conducted in December 2016 to examine the potential sediment volume and quality. At the time of the field investigation, the sand shoal was not built up across the entire mouth of the river. Three continuous, direct-push borings were collected near the mouth of the river to a depth of 20 feet below ground surface. The sand shoal material was generally described as poorly-graded, fine to medium-grained, grayish-brown quartz sand. The average mean grain size of the samples analyzed was 1.28 phi (0.43 mm) and the average standard deviation was 1.21 phi (poorly sorted). The contractor's geotechnical exploration final report is attached in **Sub-Appendix 1**. The available volume of sand from the mouth of the Loiza River will vary over time. As such, there are no guarantees that there will be sufficient material for this project. Material from this sand source could be transported to the study area by truck or barge. At a distance of 1.5 miles, material could possibly be delivered to the study area via pipeline.

3.1.2 Concretos de Puerto Rico, Inc.

Located approximately 15 miles south of the study area (**Plate 1**), near the municipality of Juncos, this sand mining operation uses material excavated from the banks of the Río Valenciano. Concretos de Puerto Rico, Inc. also has an on-site sand processing plant to produce material with different grain size distributions, depending on the desired application. This sand source can provide sufficient material for this project. Material from this sand source would likely be transported to the study area by truck.

4 POTENTIAL ROCK QUARRIES

The following rock quarries were visited in December 2016 and all were actively blasting and producing rock at the time of the site visit. All rock quarry locations are shown on **Plate 1** and summarized in **Table 1**. Material from these quarries would likely be transported to the study area by truck.

4.1.1 Empresas Ortiz Brunet, Inc.

This is a basalt quarry located approximately 20 miles west-southwest of the study area, in the municipality of Guaynabo.

4.1.2 Cantera Carraízo, Inc.

This is a basalt quarry located approximately 13 miles southwest of the study area, in the municipality of Trujillo Alto.

4.1.3 LPC&D, Inc.

This is a basalt quarry located approximately 8 miles southwest of the study area, in the municipality of Carolina.

4.1.4 Oriental Sand & Gravel, Inc.

This is a granite quarry located approximately 24 miles south of the study area, in the municipality of Yabucoa.

Table 1: Sand Source and Rock Quarry Locations

Location	Material	Latitude	Longitude	Northing	Easting
Concretos de Puerto Rico, Inc.	Quartz Sand	18° 14’ 22.56”	65° 54’ 58.62”	803946	835574
Empresas Ortiz Brunet, Inc.	Basalt	18° 19’ 48.86”	66° 8’ 1.59”	836692	760054
Cantera Carraízo, Inc.	Basalt	18° 19’ 50.22”	66° 1’ 11.41”	836906	799568
LPC&D, Inc.	Basalt	18° 21’ 39.68”	65° 57’ 17.25”	848002	822097
Oriental Sand & Gravel, Inc.	Granite	18° 5’ 36.5”	65° 51’ 21.03”	750946	856713
Mouth of Loiza River	Quartz Sand	18° 26’ 16.33”	65° 52’ 32.61”	875986	849427

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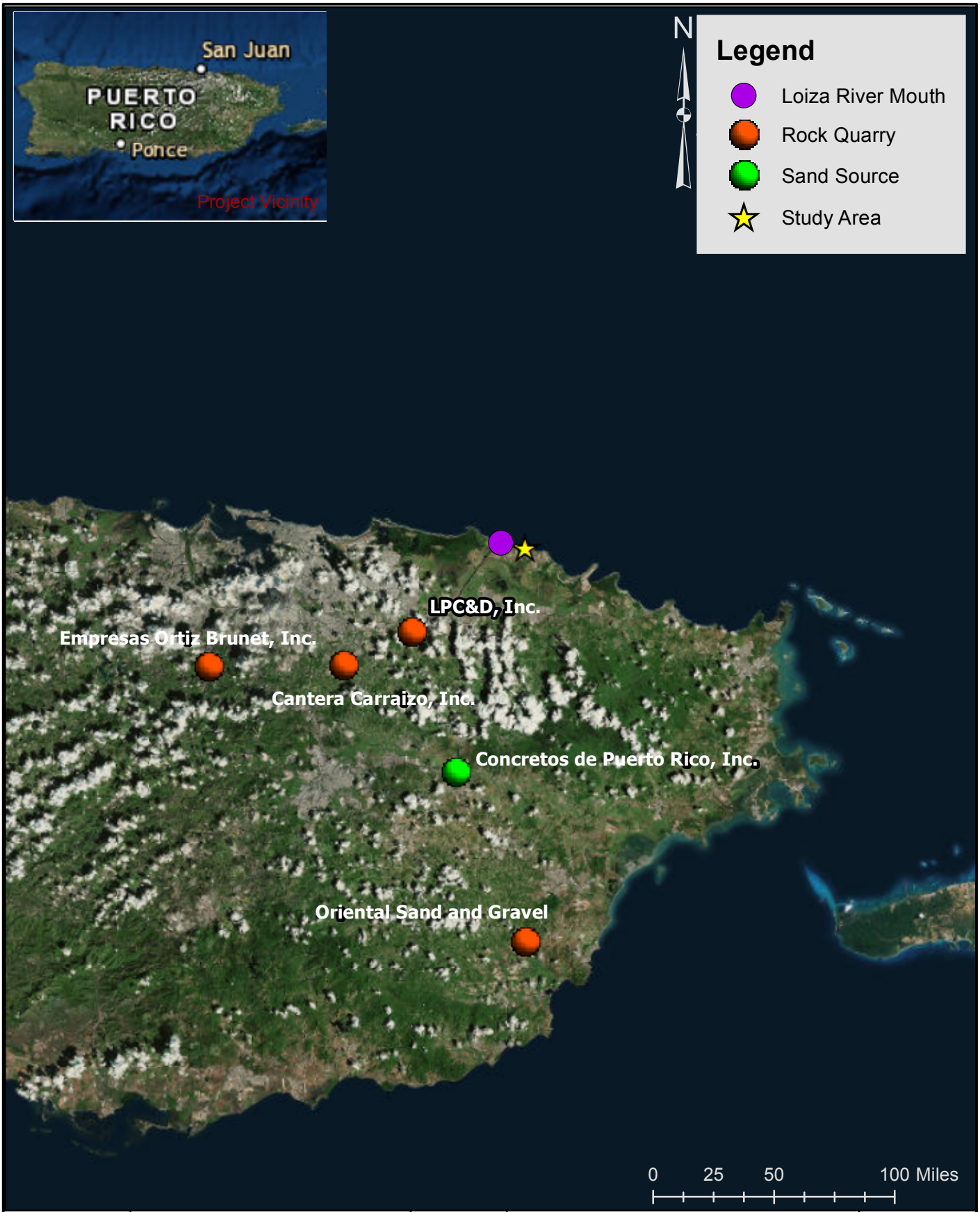

US Army Corps of Engineers ® Jacksonville District	Geotechnical Drawings	Dsn by: JLC Dwn by: JLC	DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA	PLATE NO.
	LOIZA, PUERTO RICO CAP SECTION 14 FEASIBILITY STUDY	Ckd by: TM Dated: 22AUG17		1

SUB-APPENDIX 1

SEDIMENT SAMPLING COLLECTION AND LABORATORY RESULTS FOR THE UNITED STATES ARMY CORPS OF ENGINEERS RIO GRANDE DE LOIZA MOUTH, LOIZA, PUERTO RICO CONTRACT #W912EP-16-P-0019

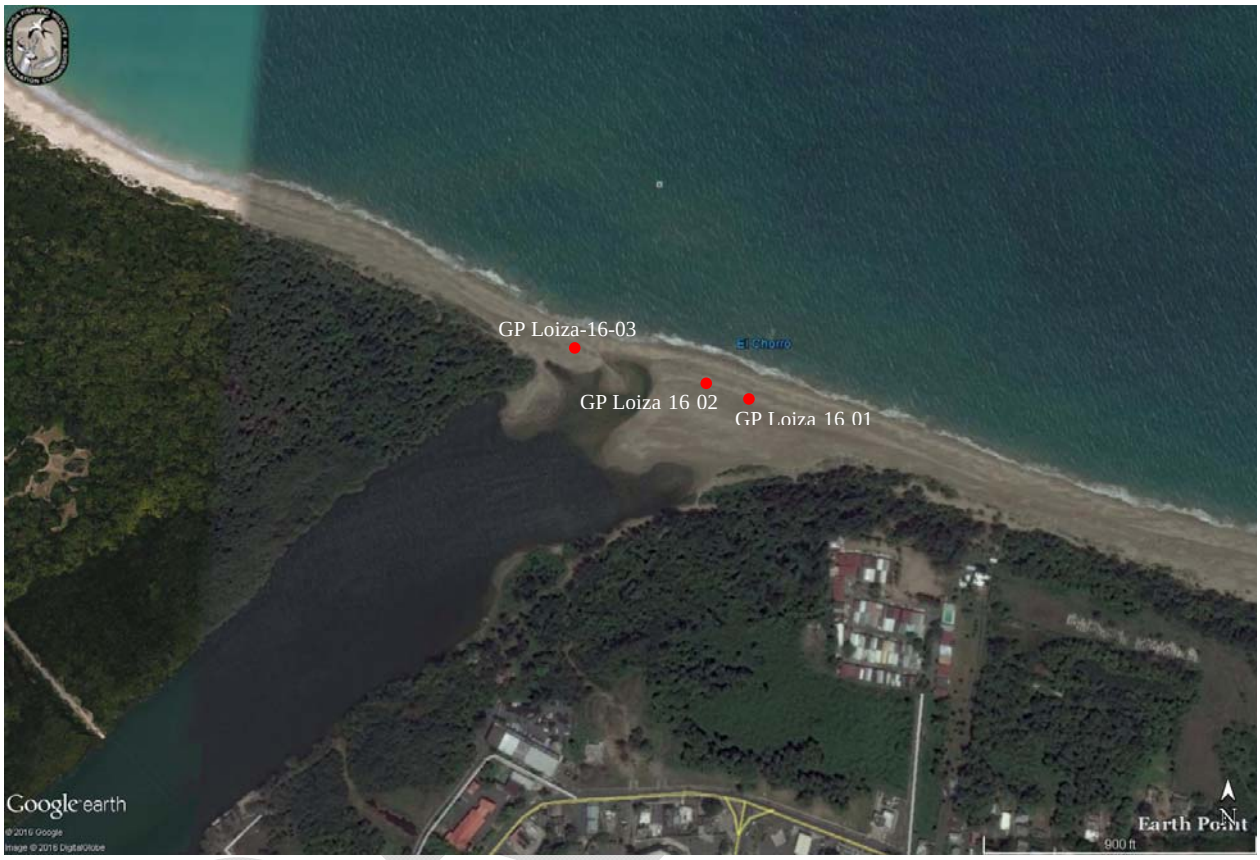

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TABLE OF CONTENT

1.0 INTRODUCTION 1
2.0 SITE LOCATION AND PROJECT DESCRIPTION 1
3.0 WORK PERFORMED 4
4.0 FIELD DATA AND LABORATORY RESULTS 9
5.0 ADDITIONAL COMMENTS 11

Appendixes

Soil Laboratory Results

SEDIMENT SAMPLING COLLECTION AND LABORATORY RESULTS FOR THE UNITED STATES ARMY CORPS OF ENGINEERS RIO GRANDE DE LOIZA MOUTH, LOIZA, PUERTO RICO

1.0 INTRODUCTION

The report presents the results of the sediment sampling drilling activities and laboratory testing, performed from December14 to 21, 2016 (drilling and testing), at Río Grande de Loiza Mouth, in the vicinity of the Loiza City, Puerto Rico. The work was awarded by the United States Army Corps of Engineers - Jacksonville Branch, to C.R. Environmental Inc., in October 2016, under contract W912EP-16-P-0019.

The purpose of the exploration was to establish the sediment thickness and size distribution up to twenty (20) feet below ground surface on six (6) soil borings distributed two (2) at three (3) different areas. In order to better stratified the soil layering, nine (9) sediment samples were preselected to perform routine particle size distribution testing.

2.0 SITE LOCATION AND PROJECT DESCRIPTION

The mouth of the Rio Grande de Loiza drilling location access is mainly by a dirt-unpaved and highly vegetated road that only can be reach by four track vehicles, and it is accessed by State Road PR-187, in Loiza, Puerto Rico. . **Figure 1A and Figure 1B**, included to this report, shows location of the site area. Sediment Borings GP Loiza 16-01 and GP Loiza 16-02 were located east of the river mouth, and GP Loiza 16-03 was located west of the mouth river. The proposed project considers the characterization and corroboration of the sediment thickness (up to 20 feet) at the proposed sand extraction location, which is part of the future improvements to the erosion control of the area.

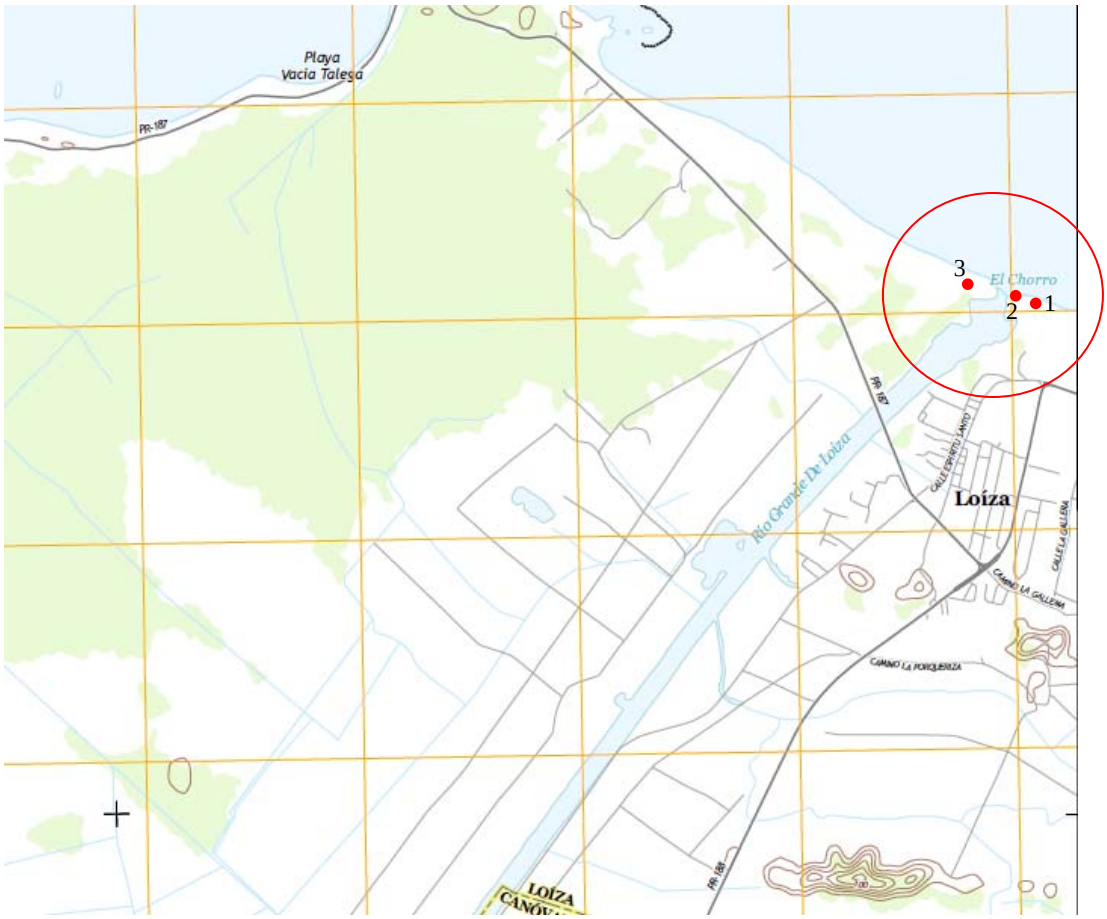


FIGURE 1A (Topographic Map of the Carolina Quadrangle, PR)

FIGURE 1B (Road Map of Loiza, PR - Metrodata Inc.)

3.0 WORK PERFORMED

Six (6) continuous sediment borings located, two (2) in three (3) different areas, were drilled at the specific area delimited by the USACE, near the mouth of the Rio Grande de Loiza. **Figure 2**, shows an aerial photo of the boring locations depicted on it.

In order to perform the soil borings, a Geoprobe® Rig using Direct Push technology, mounted in a Four by Four Pickup truck was used to collect sediment samples. The rig was positioned at the first boring location on December 13, 2016 at approximately 0800. Two (2) borings were completed during the day (GP Loiza 16-01 and GP Loiza 16-02). Field activities conducted during the day finished at 1630. On December 14, 2016 the final boring (GP Loiza 16-03) was finished from 0800 to 1230.

The soil borings were drilled using direct push drilling and Dual tubing DT-21 technology, with four (4) feet long polyethylene disposable liners to collect continuous samples to the maximum depth of twenty (20) feet bgs. Soil samples were inspected at the site by Geologist Troy Mayhew, from USACE, and place in air tight ziplock bags. Our company retain or the samples, until the USACE select the nine (9) samples for the laboratory testing. The samples selected by the USACE for laboratory testing were GP Loiza 16-01 (0'-4'), GP Loiza 16-01 (8'-12'), GP Loiza 16-01 (16'-20'), GP Loiza 16-02 (0'-4'), GP Loiza 16-02 (8'-12'), GP Loiza 16-02 (16'-20'), GP Loiza 16-03 (0'-4'), GP Loiza 16-03 (8'-12') and GP Loiza 16-03 (12'-16'). Laboratory tests were conducted on these nine (9) samples in order to obtain Grain Size Distribution, according to the applicable ASTM Designations. Soil laboratory results, are presented on an appendix to this report.

Figures 3 to 5, shows photos of the activities at the field.

Figure 2. Boring Location (Aerial Photo)

FIGURE 3 - SOIL BORING GP LOIZA 16-01 LOCATION (DECEMBER 13, 2016)

FIGURE 4 - SAMPLING COLLECTION AND DRILLING GP LOIZA 16-02 (DECEMBER 13, 2016)

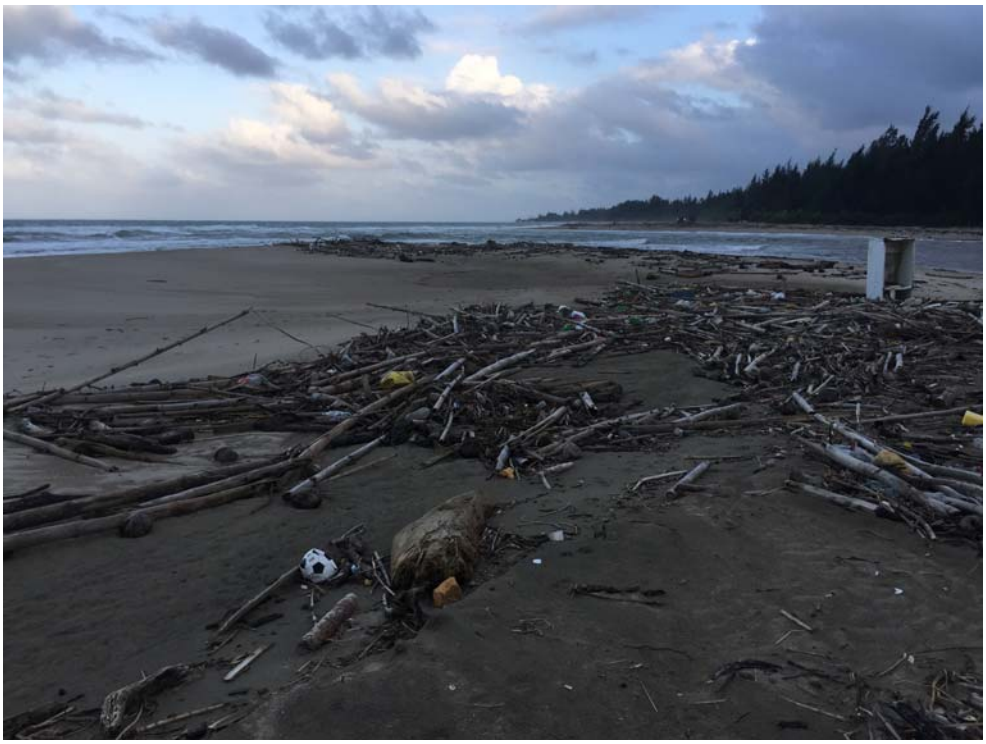


FIGURE 5 - SAMPLING LOCATION GP LOIZA 16-03 (DECEMBER 14, 2016)

4.0 FIELD DATA AND LABORATORY RESULTS

Table 1, present the data obtained during sampling collection.

RIO GRANDE DE LOIZA - SEDIMENT SAMPLING
(FIELD SAMPLING COLLECTION DATA)

SAMPLE	DEPTH	DATE/TIME	RETENTION (feet)	COMMENTS
GP-LOIZA-16-01-A	0-4	DEC-13-16/0850	2	
GP-LOIZA-16-01-A	4-8	DEC-13-16/0920	3	
GP-LOIZA-16-01-A	8-12	DEC-13-16/0945	1.5	
GP-LOIZA-16-01-A	12-16	DEC-13-16/0950	0.5	
GP-LOIZA-16-01-A	16-20	DEC-13-16/1010	0.33	
GP-LOIZA-16-01-B	0-4	DEC-13-16/1025	2.5	Sample for Testing
GP-LOIZA-16-01-B	4-8	DEC-13-16/1055	1.33	
GP-LOIZA-16-01-B	8-12	DEC-13-16/1130	3	Sample for Testing
GP-LOIZA-16-01-B	12-16	DEC-13-16/1135	3	
GP-LOIZA-16-01-B	16-20	DEC-13-16/1150	2	Sample for Testing
GP-LOIZA-16-02-A	0-4	DEC-13-16/1220	2	
GP-LOIZA-16-02-A	4-8	DEC-13-16/1230	2	
GP-LOIZA-16-02-A	8-12	DEC-13-16/1340	-	
GP-LOIZA-16-02-A	12-16	DEC-13-16/1450	-	
GP-LOIZA-16-02-A	16-20	DEC-13-16/1500	-	
GP-LOIZA-16-02-B	0-4	DEC-13-16/1515	2	Sample for Testing
GP-LOIZA-16-02-B	4-8	DEC-13-16/1520	2	
GP-LOIZA-16-02-B	8-12	DEC-13-16/1530	2	Sample for Testing
GP-LOIZA-16-02-B	12-16	DEC-13-16/1615	2	
GP-LOIZA-16-02-B	16-20	DEC-13-16/1625	-	Sample for Testing
GP-LOIZA-16-03-A	0-4	DEC-14-16/0900	1.5	Sample for Testing
GP-LOIZA-16-03-A	4-8	DEC-14-16/0920	1.5	
GP-LOIZA-16-03-A	8-12	DEC-14-16/0930	1	
GP-LOIZA-16-03-A	12-16	DEC-14-16/0940	2	Sample for Testing
GP-LOIZA-16-03-A	16-20	DEC-14-16/1000	3	
GP-LOIZA-16-03-B	0-4	DEC-14-16/1010	1.33	
GP-LOIZA-16-03-B	4-8	DEC-14-16/1020	1	
GP-LOIZA-16-03-B	8-12	DEC-14-16/1025	2	Sample for Testing
GP-LOIZA-16-03-B	12-16	DEC-14-16/	-	No retention (empty liner)
GP-LOIZA-16-03-B	16-20	DEC-14-16/1050	-	

As previously mentioned, soil laboratory testing were made in nine (9) samples collected by means of Dual tubing (DT-21) and polyethylene liners. Sieve Analyses were made at selected samples. The results of these testing are presented in a graphical form in the Soil Laboratory Test Results Appendix, included with this report.

These tests were performed by our soil and material testing laboratory, MGV-GES Lab, Inc., which is certified by AASHTO and by the U.S. Army Corps of Engineers.

5.0 ADDITIONAL COMMENTS

The drilling activities, field data collection, and laboratory testing, were performed in accordance with the requirements and direct supervision of the United States Army Corps of Engineers, ASTM guidelines, and under the supervision of a Senior Geologist. Any doubt or concern about the drilling activities, sampling, or laboratory results, contact us at your convenience.

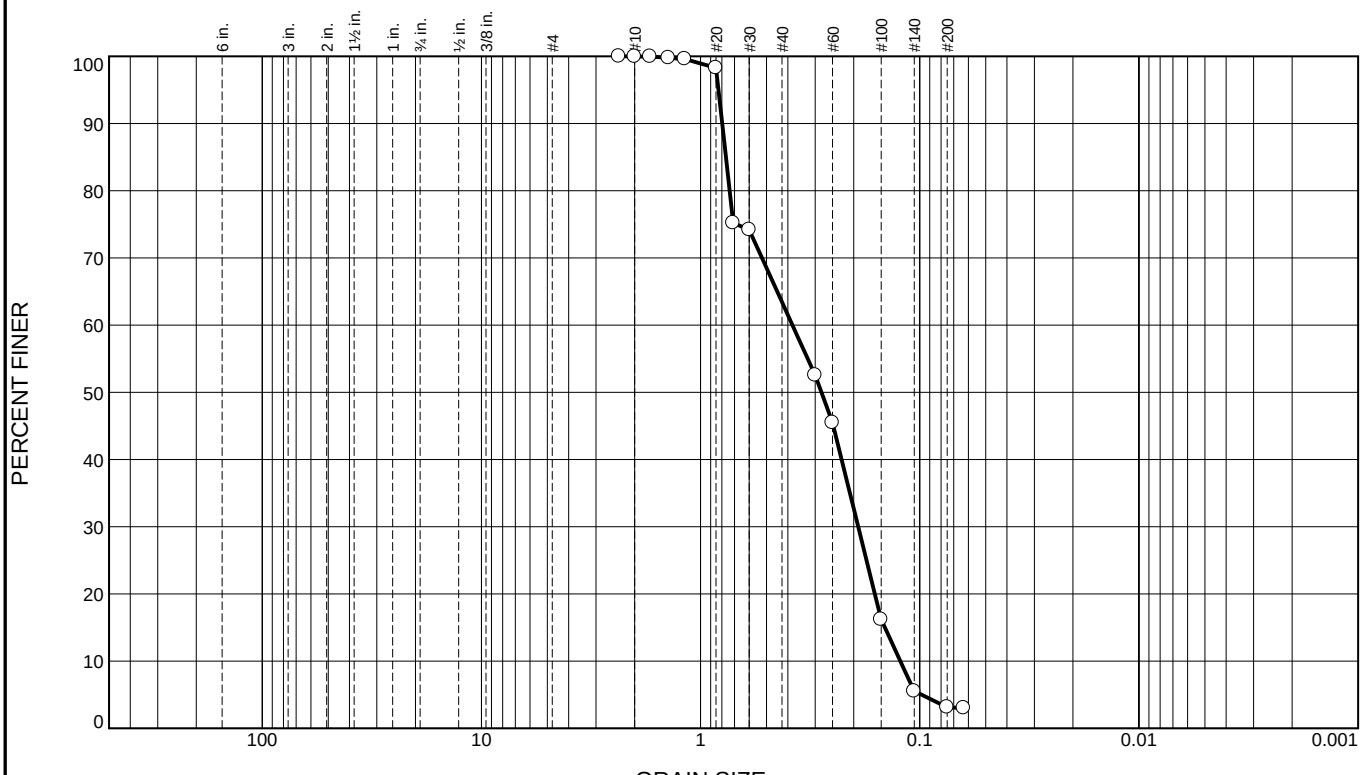
Respectfully submitted,

CALI RODRIGUEZ MENENDEZ, P.G.
PROFESSIONAL GEOLOGIST #044

Reference No. **JOB 16-009**
January 3, 2017

LABORATORY REPORT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	36.6	60.3	3.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#8	100.0		
#10	100.0		
#12	100.0		
#14	99.8		
#16	99.6		
#20	98.3		
#25	75.2		
#30	74.2		
#50	52.5		
#60	45.5		
#100	16.2		
#140	5.5		
#200	3.1		
#230	3.0		

* (no specification provided)

Material Description

poorly graded sand grayish brown, HUE 2.5 Y 5/2

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.7969 D_{85}= 0.7664 D_{60}= 0.3810
D_{50}= 0.2810 D_{30}= 0.1909 D_{15}= 0.1443
D_{10}= 0.1226 C_u= 3.11 C_c= 0.78

Classification

USCS= SP AASHTO= A-3

Remarks

Source of Sample: Bor. GP-Loiza 16-01 **Depth:** 0 TO 4 FT

Date: Dec. 20, 2016

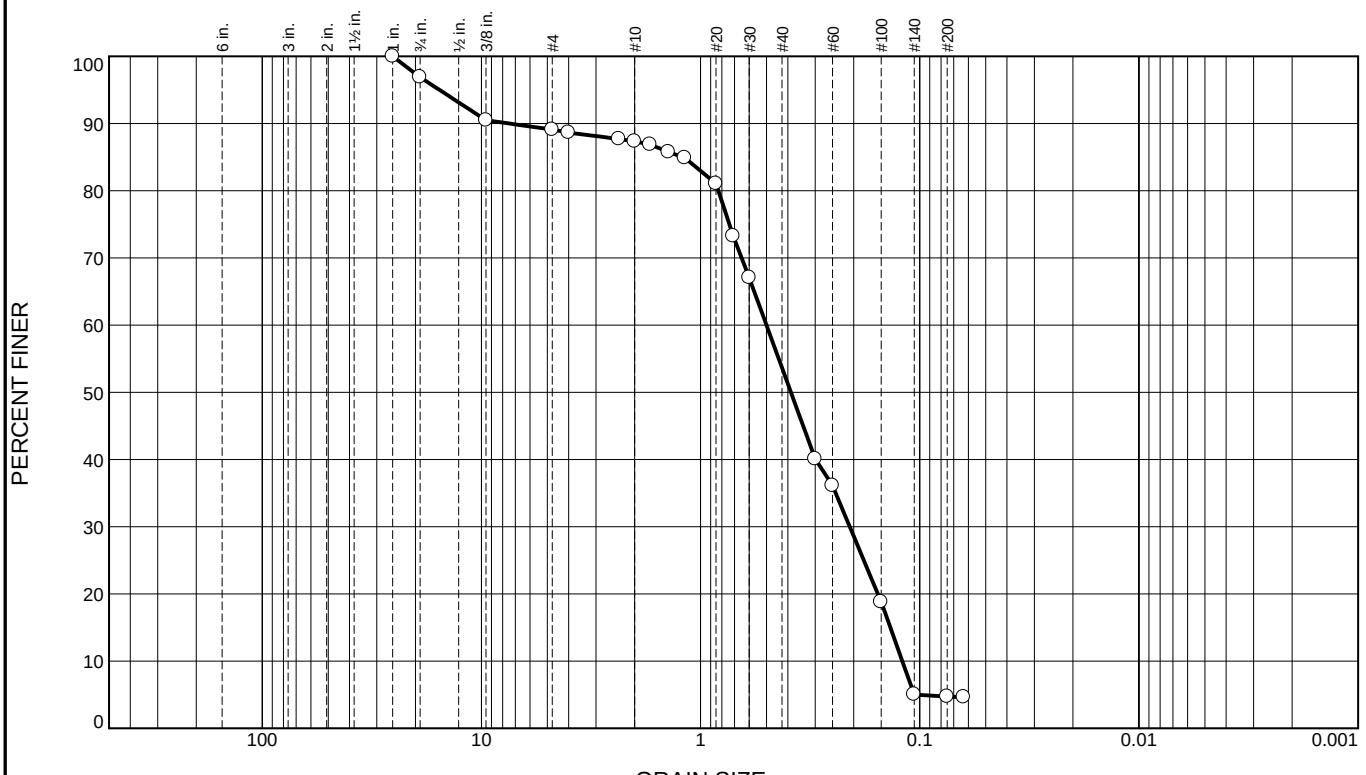
MGV-GES LAB, INC.

Barceloneta, Puerto Rico

Client: GES
Project: Rio Grande de Loiza
Project No: L-674 **Figure** 1

Tested By: J. Nieves **Checked By:** L.Correa

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.1	7.8	1.8	33.7	48.9	4.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	96.9		
.375	90.5		
#4	89.1		
#5	88.6		
#8	87.7		
#10	87.3		
#12	86.9		
#14	85.8		
#16	84.9		
#20	81.0		
#25	73.3		
#30	67.1		
#50	40.1		
#60	36.1		
#100	18.8		
#140	5.0		
#200	4.7		
#230	4.6		

* (no specification provided)

Material Description

poorly graded sand, grayish brown, Hue 2.5 Y 4/2

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 7.4871 D_{85}= 1.2093 D_{60}= 0.5006
D_{50}= 0.3871 D_{30}= 0.2087 D_{15}= 0.1362
D_{10}= 0.1201 C_u= 4.17 C_c= 0.72

Classification

USCS= SP AASHTO= A-3

Remarks

Source of Sample: Bor. GP-Loiza 16-01 **Depth:** 8 to 12 ft

Date: Dec.20, 2016

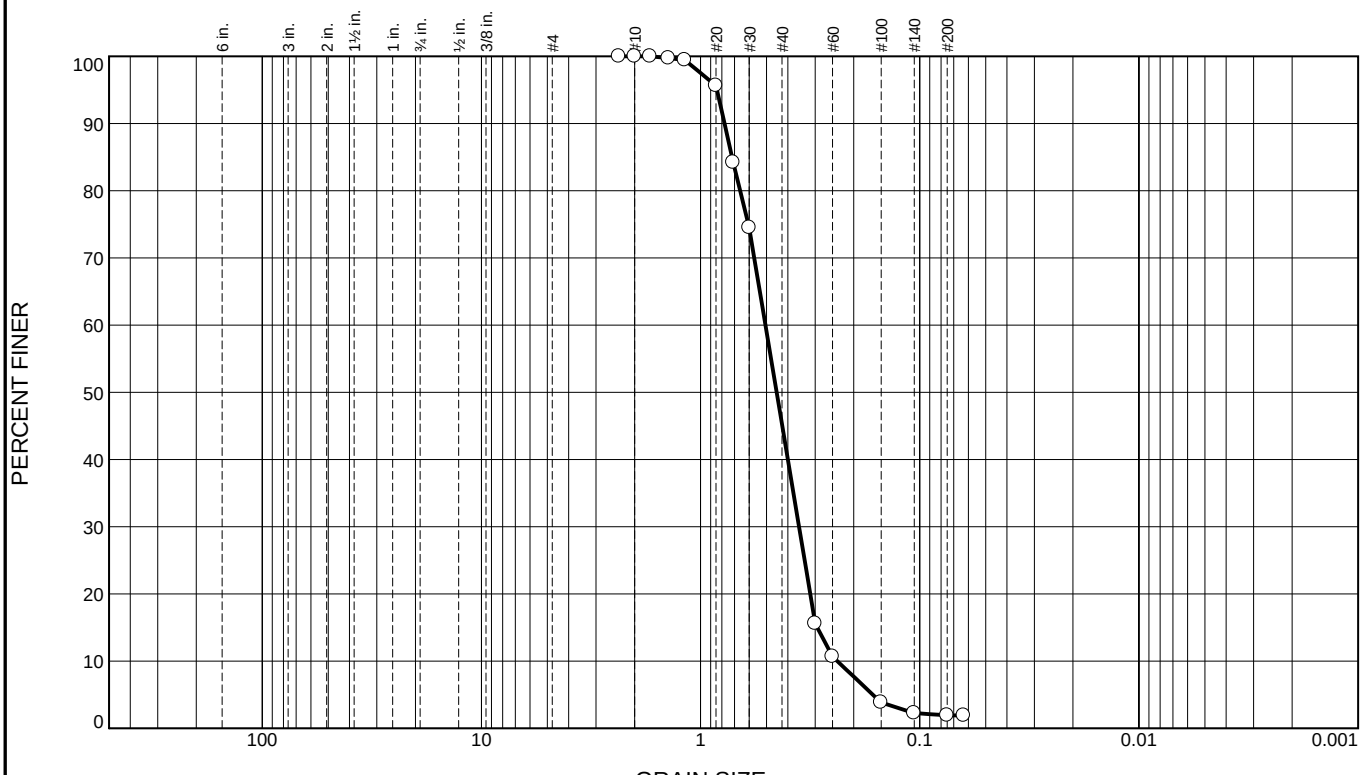
MGV-GES LAB, INC.

Barceloneta, Puerto Rico

Client: GES
Project: Rio Grande de Loiza
Project No: L-674 **Figure** 1

Tested By: D.Correa **Checked By:** L. Correa

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	54.8	43.3	1.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#8	100.0		
#10	100.0		
#12	100.0		
#14	99.7		
#16	99.5		
#20	95.6		
#25	84.2		
#30	74.5		
#50	15.6		
#60	10.7		
#100	3.8		
#140	2.3		
#200	1.9		
#230	1.9		

* (no specification provided)

Material Description

poorly graded sand, dark grayish brown, HUE 2.5 Y 4/2

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.7779 D_{85}= 0.7190 D_{60}= 0.5059
D_{50}= 0.4498 D_{30}= 0.3555 D_{15}= 0.2936
D_{10}= 0.2377 C_u= 2.13 C_c= 1.05

Classification

USCS= SP AASHTO= A-1-b

Remarks

Source of Sample: Bor. GP-Loiza 16-01 **Depth:** 16 to 20 ft

Date: DEC. 20, 2016

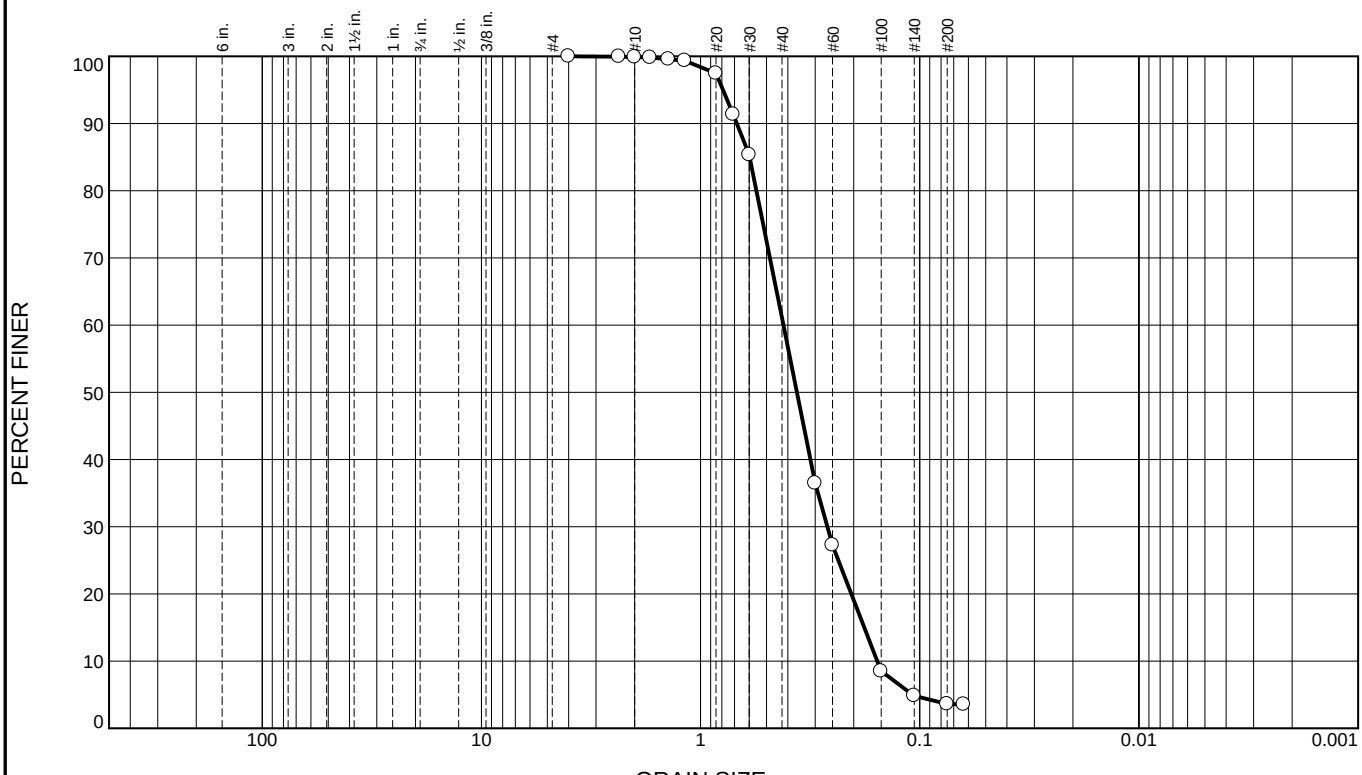
MGV-GES LAB, INC.

Barceloneta, Puerto Rico

Client: GES
Project: Rio Grande de Loiza
Project No: L-674 **Figure** 1

Tested By: D.Correa **Checked By:** L. Correa

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	38.9	57.4	3.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#5	100.0		
#8	99.9		
#10	99.9		
#12	99.8		
#14	99.6		
#16	99.3		
#20	97.5		
#25	91.3		
#30	85.3		
#50	36.5		
#60	27.2		
#100	8.5		
#140	4.8		
#200	3.6		
#230	3.6		

* (no specification provided)

Material Description

poorly graded sand, Graysish Brown , HUE 2.5 Y 5/2

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.6838 D_{85}= 0.5972 D_{60}= 0.4189
D_{50}= 0.3635 D_{30}= 0.2640 D_{15}= 0.1791
D_{10}= 0.1563 C_u= 2.68 C_c= 1.06

Classification

USCS= SP AASHTO= A-3

Remarks

Source of Sample: Bor.GP-Loiza 16-02 **Depth:** 0 to 4 ft

Date: Dec.20, 2016

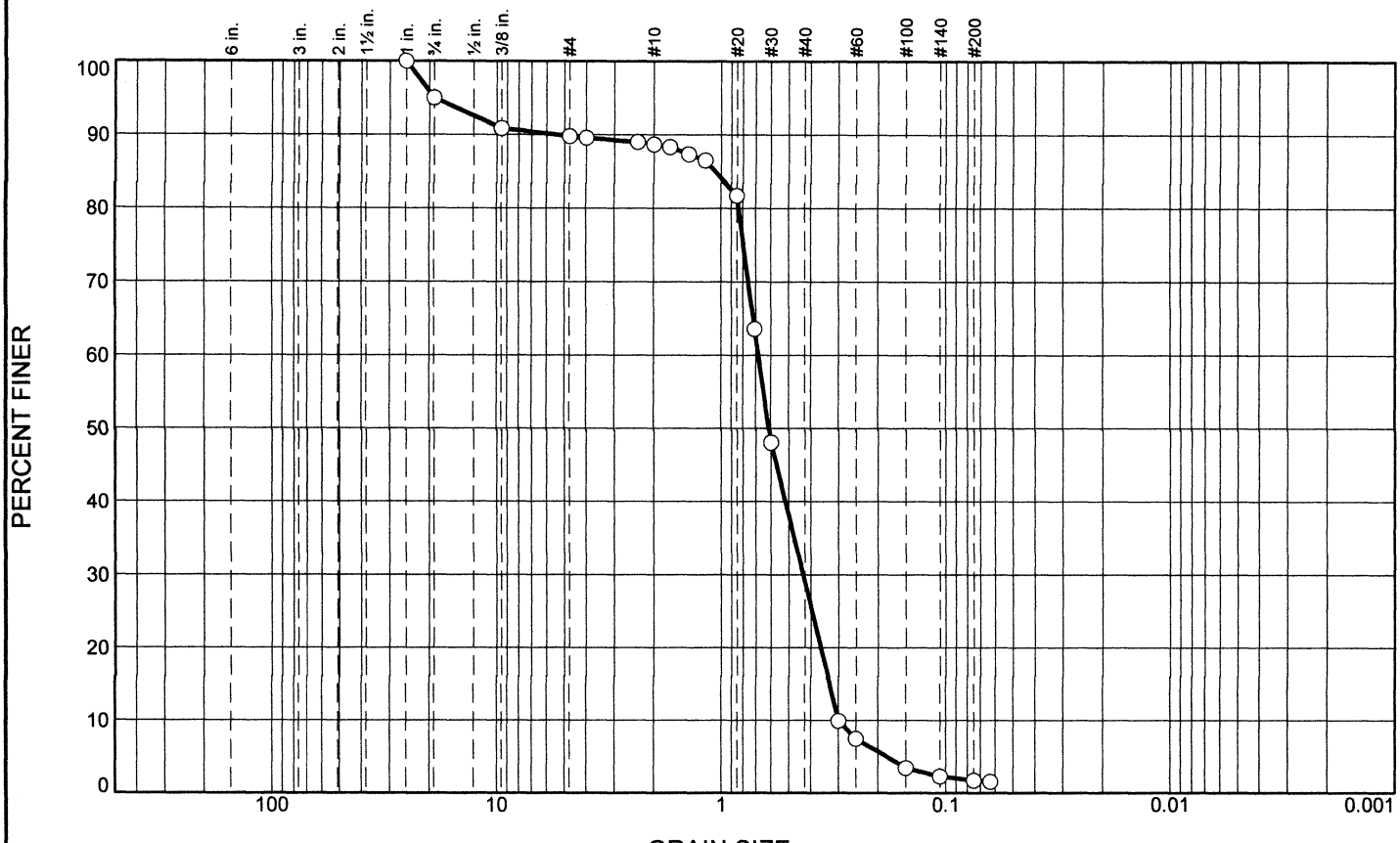
MGV-GES LAB, INC.

Barceloneta, Puerto Rico

Client: GES
Project: Rio Grande de Loiza
Project No: L-674 **Figure** 1

Tested By: D.Correa **Checked By:** L.correa

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.0	5.2	1.1	59.6	27.4	1.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	95.0		
.375	90.9		
#4	89.8		
#5	89.6		
#8	89.0		
#10	88.7		
#12	88.3		
#14	87.3		
#16	86.5		
#20	81.7		
#25	63.5		
#30	48.1		
#50	9.9		
#60	7.5		
#100	3.4		
#140	2.3		
#200	1.7		
#230	1.5		

* (no specification provided)

Material Description

poorly graded sand, Grayish brown, HUE 2.5 Y 5/2

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 5.4657 D_{85}= 1.0649 D_{60}= 0.6831
D_{50}= 0.6127 D_{30}= 0.4321 D_{15}= 0.3290
D_{10}= 0.3005 C_u= 2.27 C_c= 0.91

Classification

USCS= SP AASHTO= A-1-b

Remarks

Source of Sample: Bor.GP-Loiza 16-02 **Depth:** 8 TO 12 FT

Date: Dec. 20, 2016

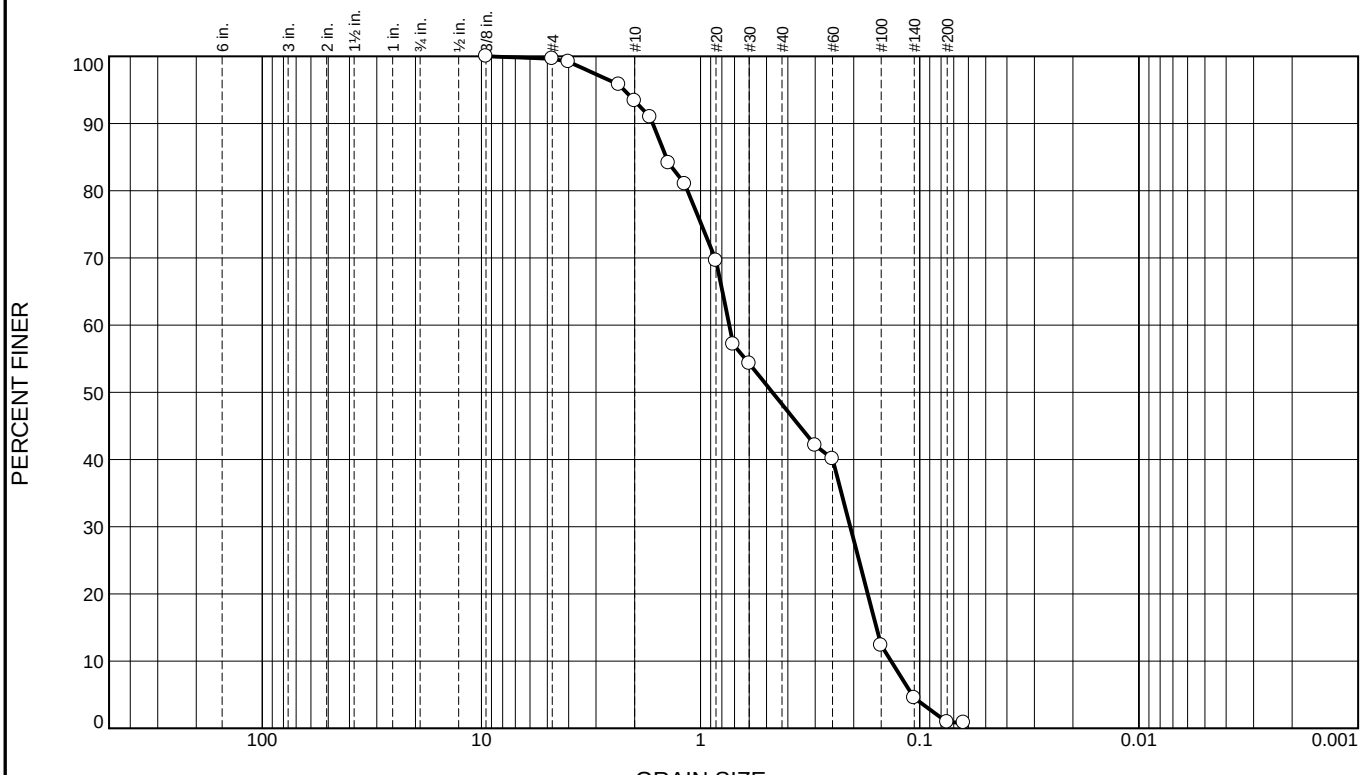
MGV-GES LAB, INC.

Barceloneta, Puerto Rico

Client: GES
Project: Rio Grande de Loiza
Project No: L-674 **Figure**

Tested By: D. Correa **Checked By:** L.Correa

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	6.2	45.2	47.3	0.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.6		
#5	99.2		
#8	95.8		
#10	93.4		
#12	91.0		
#14	84.1		
#16	81.0		
#20	69.6		
#25	57.1		
#30	54.3		
#50	42.1		
#60	40.1		
#100	12.4		
#140	4.5		
#200	0.9		
#230	0.8		

* (no specification provided)

Material Description

poorly graded sand, Dark grayish brown, HUE 2.5 Y 4/2

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.6543 D_{85}= 1.4352 D_{60}= 0.7400
D_{50}= 0.4704 D_{30}= 0.2076 D_{15}= 0.1575
D_{10}= 0.1352 C_u= 5.48 C_c= 0.43

Classification

USCS= SP AASHTO= A-1-b

Remarks

Source of Sample: Bor.GP-Loiza 16-02 **Depth:** 16 to 20 ft

Date: Dec.20,2016

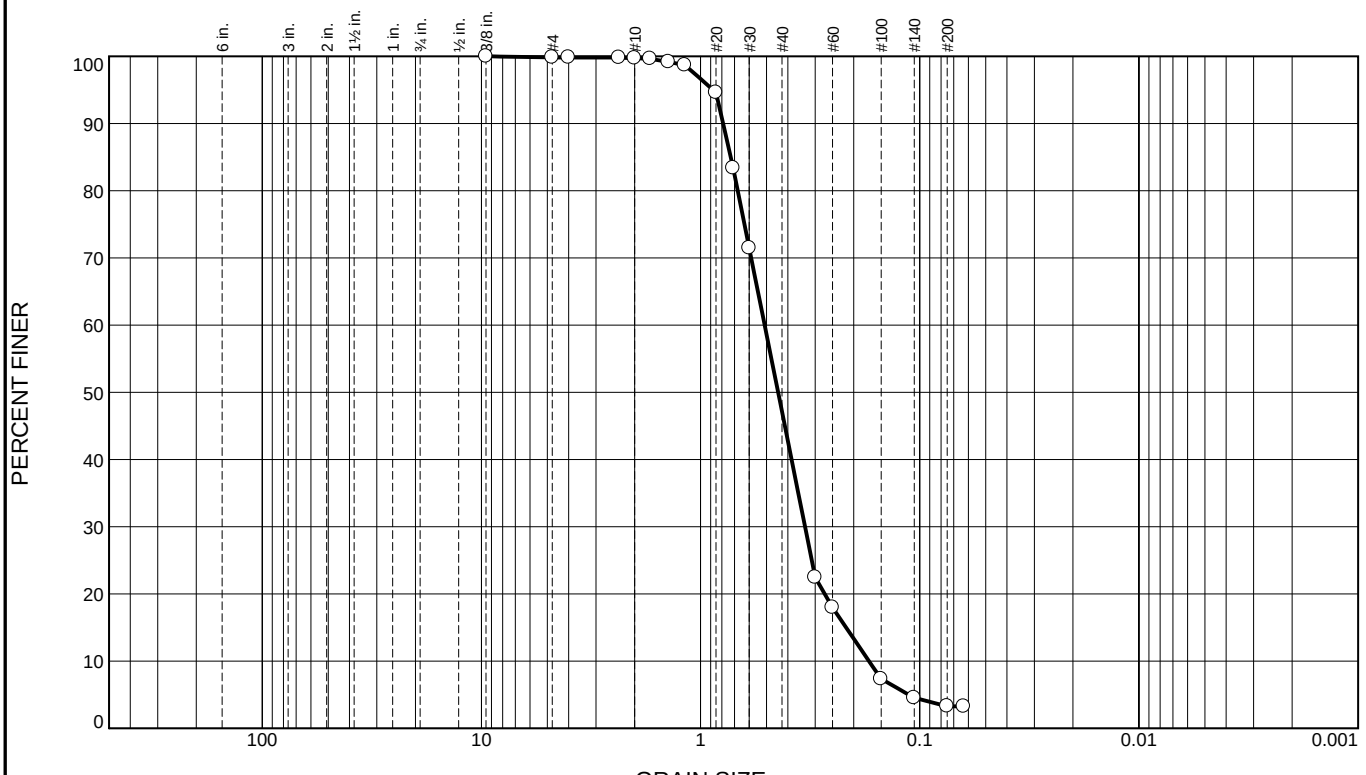
MGV-GES LAB, INC.

Barceloneta, Puerto Rico

Client: GES
Project: Rio Grande de Loiza
Project No: L-674 **Figure**

Tested By: J. Nieves **Checked By:** L.Correa

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.1	52.6	43.8	3.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.8		
#5	99.8		
#8	99.8		
#10	99.7		
#12	99.6		
#14	99.2		
#16	98.7		
#20	94.6		
#25	83.4		
#30	71.5		
#50	22.5		
#60	18.0		
#100	7.3		
#140	4.5		
#200	3.3		
#230	3.2		

* (no specification provided)

Material Description

poorly graded sand, Olive Brown, HUE 2.5 Y 4/4

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.7896 D_{85}= 0.7289 D_{60}= 0.5101
D_{50}= 0.4429 D_{30}= 0.3338 D_{15}= 0.2168
D_{10}= 0.1704 C_u= 2.99 C_c= 1.28

Classification

USCS= SP AASHTO= A-1-b

Remarks

Source of Sample: Bor. GP-Loiza 16-03 **Depth:** 0 to 4 FT

Date: Dec.21,2016

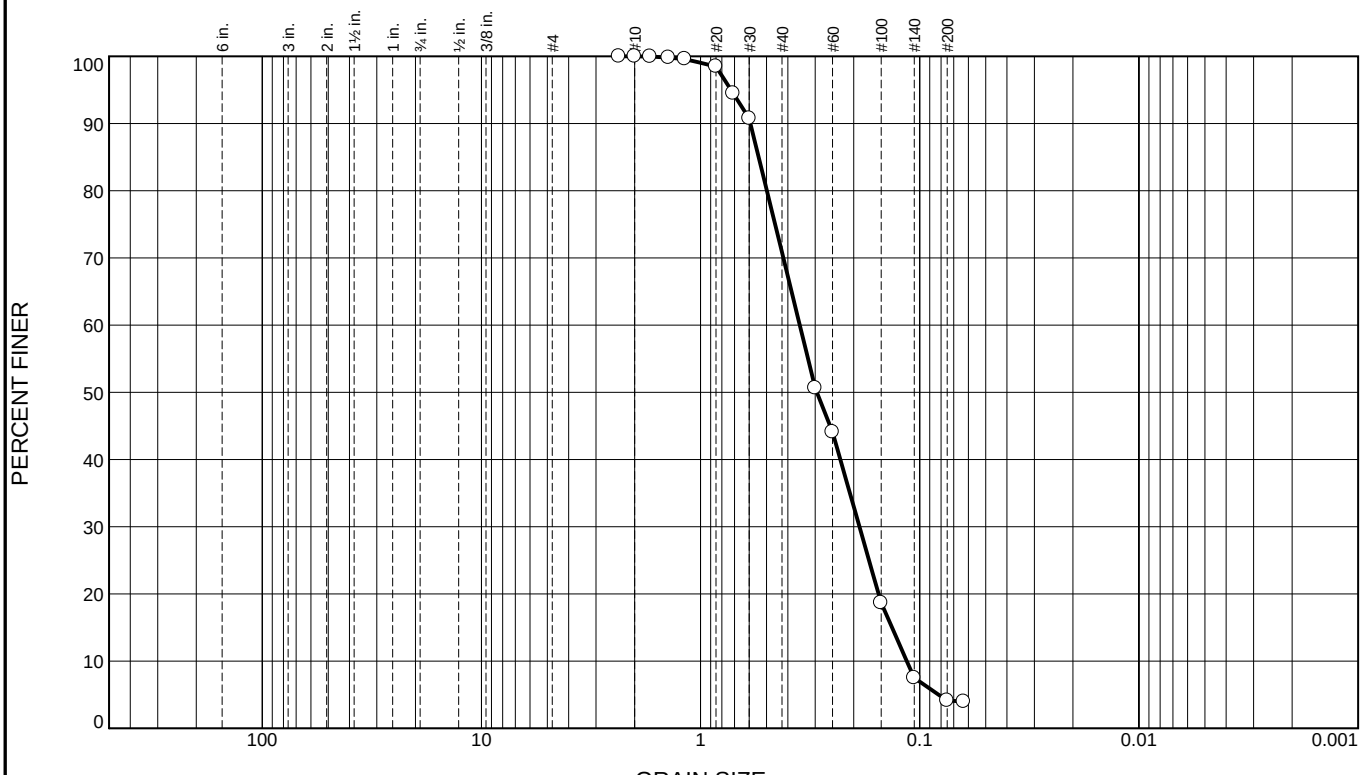
MGV-GES LAB, INC.

Barceloneta, Puerto Rico

Client: GES
Project: Rio Grande de Loiza
Project No: L-674 **Figure**

Tested By: D.Correa **Checked By:** L.Correa

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	29.2	66.7	4.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#8	100.0		
#10	100.0		
#12	100.0		
#14	99.8		
#16	99.6		
#20	98.5		
#25	94.5		
#30	90.7		
#50	50.6		
#60	44.1		
#100	18.7		
#140	7.5		
#200	4.1		
#230	4.0		

* (no specification provided)

Material Description

poorly graded sand, Dark grayish brown, HUE 2.5 Y 4/2

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.5924 D_{85}= 0.5434 D_{60}= 0.3528
D_{50}= 0.2948 D_{30}= 0.1884 D_{15}= 0.1338
D_{10}= 0.1146 C_u= 3.08 C_c= 0.88

Classification

USCS= SP AASHTO= A-3

Remarks

Source of Sample: Bor. GP-Loiza 16-03 **Depth:** 8 to 12 ft

Date: Dec. 20, 2016

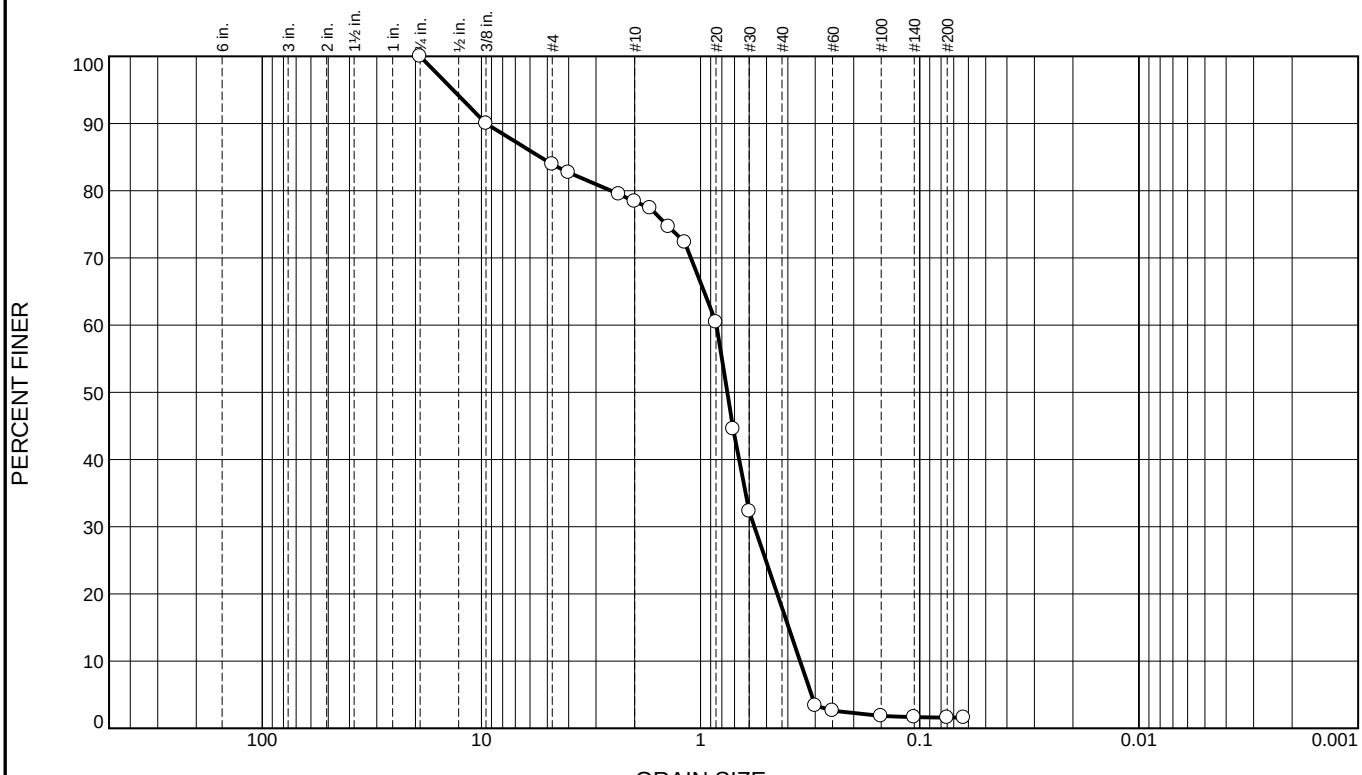
MGV-GES LAB, INC.

Barceloneta, Puerto Rico

Client: GES
Project: Rio Grande de Loiza
Project No: L-674 **Figure**

Tested By: J. Nieves **Checked By:** L. Correa

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	16.1	5.5	60.5	16.3	1.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.375	90.0		
#4	83.9		
#5	82.7		
#8	79.5		
#10	78.4		
#12	77.4		
#14	74.6		
#16	72.3		
#20	60.4		
#25	44.5		
#30	32.3		
#50	3.4		
#60	2.6		
#100	1.8		
#140	1.7		
#200	1.6		
#230	1.6		

* (no specification provided)

Material Description

poorly graded sand with gravel, Very dark grayish brown, HUE 2.5 Y 3/2

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 9.5346 D_{85}= 5.3788 D_{60}= 0.8460
D_{50}= 0.7553 D_{30}= 0.5680 D_{15}= 0.3964
D_{10}= 0.3516 C_u= 2.41 C_c= 1.08

Classification

USCS= SP AASHTO= A-1-b

Remarks

Source of Sample: Bor. GP-Loiza 16-03 **Depth:** 12 to 16 ft

Date: Dec.21,2016

MGV-GES LAB, INC.

Barceloneta, Puerto Rico

Client: GES
Project: Rio Grande de Loiza
Project No: L-674 **Figure**

Tested By: D.Correa **Checked By:** L.Correa

APPENDIX B

LOIZA, PUERTO RICO SECTION 14 STUDY
CONTINUING AUTHORITY PROGRAM (CAP)
SEC 14 EMERGENCY STREAMBANK PROTECTION
AND SHORELINE PROTECTION
LOIZA, PUERTO RICO

INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

REAL ESTATE PLAN

LOIZA, PUERTO RICO SECTION 14 STUDY

CONTINUING AUTHORITY PROGRAM (CAP)

SEC 14 EMERGENCY STREAMBANK PROTECTION

AND SHORELINE PROTECTION

LOIZA, PUERTO RICO

INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

REAL ESTATE PLAN

TABLE OF CONTENTS

Section	Page No
1. STATEMENT OF PURPOSE.	E-4
2. STUDY AND PROJECT AUTHORIZATION.	E-4
3. PROJECT LOCATION	E-5
4. PROJECT DESCRIPTION	E-6
5. REAL ESTATE REQUIREMENTS.	E-6
6. ESTATES TO BE ACQUIRED.	E-7
7. FEDERALLY OWNED LANDS.	E-8
8. NON-FEDERAL OWNED LANDS.	E-8
9. NON-FEDERAL OPERATION/MAINTENANCE RESPONSIBILITIES.	E-9
10. NON-FEDERAL AUTHORITY TO PARTICIPATE IN PROJECT.	E-9
11. NAVIGATION SERVITUDE.	E-9
12. ATTITUDE OF OWNERS.	E-9
13. MINERALS.	E-9
14. HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW).	E-9

15. INDUCED FLOODING. E-9

16. ZONING ORDINANCES E-9

17. RELOCATIONS ASSISTANCE (PUBLIC LAW 91-646). E-10

18. RELOCATIONS, ALTERATIONS, VACATIONS, AND ABANDONMENTS. E-10

19. STANDING TIMBER AND VEGETATIVE COVER. E-10

20. RECREATION RESOURCES. E-10

21. CULTURAL RESOURCES. E-10

22. OUTSTANDING RIGHTS. E-10

23. MITIGATION. E-10

24. ACQUISITION/ADMINISTRATIVE COSTS. E-11

25. SUMMARY OF PROJECT REAL ESTATE COST E-11

26. REAL ESTATE ACQUISITION SCHEDULE. E-11

27. CHART OF ACCOUNTS FOR PROJECT. E-12

EXHIBIT 1: REAL ESTATE CAPABILITY ASSESSMENT E-13

EXHIBIT 2: RISK LETTER E-15

APPENDIX B
LOIZA, PUERTO RICO SECTION 14 STUDY

CONTINUING AUTHORITY PROGRAM (CAP)

SEC 14 EMERGENCY STREAMBANK PROTECTION

AND SHORELINE PROTECTION

LOIZA, PUERTO RICO

INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

REAL ESTATE PLAN

1. STATEMENT OF PURPOSE.

This Real Estate Plan (REP) is provided in support of Loiza Puerto Rico Section 14 Study. The purpose of the study is to recommend a plan for streambank and shoreline protection to infrastructure located at Loiza Road, Loiza, Puerto Rico, which is on the shoreline of the Atlantic Ocean.

This report is preliminary and is intended for planning purposes only. Both the final real property lines and land value estimates are subject to change even after approval of this report. There may be modifications to the plans that occur during Pre-construction, Engineering and Design (PED) phase, thus changing the final acquisition area(s) and/or administrative and land costs.

2. PROJECT AND STUDY AUTHORIZATION.

The project is in response to a request from the Puerto Rico Department of Natural and Environmental Resources (DNER) that the U. S. Army Corps of Engineers provide assistance in addressing shoreline erosion problems along the coast of Loiza. Hurricane and coastal storm damages along the Loiza shoreline, including erosion causing receding shorelines, threatens infrastructure such as a public road, public buildings, commercial businesses, a public school, public parkland, private homes, and recreational beach access.

The authority and funds for this report were provided by Section 14 of the Flood Control Act of 1946 (33 U.S.C. 701r) as amended by Section 27 of the Water Resources and Development Act (WRDA) 1974, Section 915c of WRDA 1986, Section 2023 of WRDA 2007, and Section 1030i of the Water Resources Reform and Development Act (WRRDA) 2014, and reads as follows:

> The Secretary of the Army is hereby authorized to allot from any appropriations heretofore or hereafter made for flood control, not to exceed $20,000,000 per

year, for the construction, repair, restoration, and modification of emergency streambank and shoreline protection works to prevent damage to highways, bridge approaches, and public works, churches, hospitals, schools, and other nonprofit public services, when in the opinion of the Chief of Engineers such work is advisable: Provided, that not more than $5,000,000 shall be allotted for this purpose at any single locality from the appropriations for any one fiscal year.

3. PROJECT LOCATION

The project area is located in the Municipality of Loiza, located on Puerto Rico's northern Atlantic Coast, approximately 16 miles east of San Juan. The study area includes a community center, public school and roadway with a combined shoreline frontage of approximately 1,050 feet as indicated in Figure 1.

igure·1:··Study·Area·of·Loiza,·Puerto·Rico·¶

(Figure 1)

4. PROJECT DESCRIPTION

The project addresses the damages to infrastructure from storm impacts, including waves, inundation, and erosion without causing adverse impacts to the communities, the environment, and the existing infrastructure of the area. The goal is to develop alternatives to reduce the damages. An evaluation of the current conditions led to a recommended design which includes construction of a stone revetment along approximately 1,050 feet of shoreline in front of the public road, head start public school, and community center. Also included is a minimal road replacement of approximately 220 feet of public road connecting to the beach road.

5. REAL ESTATE REQUIREMENTS

Construction of a stone revetment will take place along the beach. The revetment will be approximately 1,050 feet long with a top elevation of 10.0 feet PRVD02 and building an over-wash protection zone that would consist of high performance mat (HPTRM) keyed in between the existing road and revetment. The non-Federal sponsor will acquire the lands via a standard estate - bank protection easement (#21) and certify that these lands are available for construction, operations and maintenance for the revetment. Construction/ replacement of approximately 220 feet of public road connecting to the beach road will take place. Access for the public road is available via its inherent public access. A staging area of approximately 4,356 square feet of land has been identified. The non-Federal sponsor will certify the availability of the staging area via a standard estate - temporary work area easement (#15). Access will be provided via public access roads. Construction is estimated to take approximately 11 months. No borrow or disposal areas are required for construction of the subject project. See Figure 2 for map highlighting property identified as the real estate for this project.

(Figure 2)

6. STANDARD ESTATES TO BE AQUIRED.

A. <u>Bank Protection Easement</u>

A perpetual and assignable easement and right-of-way in, on, over and across the land hereinafter described for the location, construction, operation, maintenance, alteration, repair, rehabilitation and replacement of a bank protection works, and for the placement of stone, riprap and other materials for the protection of the bank against erosion; together with the continuing right to trim, cut, fell, remove and dispose therefrom all trees, underbrush, obstructions, and other vegetation; and to remove and dispose of structures or obstructions within the limits of the right-of-way; and to place thereon dredged, excavated or other fill material, to shape and grade said land to desired slopes and contour, and to prevent erosion by structural and vegetative methods and to do any other work necessary and incident to the project; together with the right of ingress and egress for such work; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however to existing easements for public roads and highways, public utilities, railroads and pipelines.

B. Temporary Work Area Easement

A temporary easement and right-of-way in, on, and over across (the land described in Schedule A) Tracts Nos _____, _____ and _____), for a period not to exceed _____, beginning with date possession of the land is granted to the United States, for use by the United States, its representatives, agent, and contractors as a work area including the right to move, store, and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the _____ Project, together with the right to trim, cut fell and remove therefrom all trees, underbrush , obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowner, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridge the rights and easements hereby required ; subject however, to existing easements for public roads and highways, public utilities, railroads, and pipelines.

7. FEDERALLY-OWNED LAND

There are no Federally owned lands within the project limits.

8. NON-FEDERALLY-OWNED LAND

Lands required to support construction/operations of the proposed project are owned by the municipality of Loiza. In accordance with ER 1105-2-100, Appendix F, Continuing Authorities Program, Section III", the non-Federal sponsor will not receive credit for the value of LERRD it provides that are part of the tract of land on which the facility or structure to be protected is located, if such tract of land is owned by either the non-Federal sponsor or the owner of the facility". Lands and Damages cost are being shown as zero dollars in the Real Estate Project Cost Schedule as no credit is allowed. Additionally, the Local Sponsor will make available public lands owned by the Municipality of Loiza for both access and staging.

9. NON-FEDERAL OPERATION AND MAINTENACE RESPONSIBILITIES

The non-Federal Sponsor will be required to provide without cost to the United States the aforementioned lands necessary for project construction, operation and maintenance. Access authorization for entry for construction will be provided by the non-Federal Sponsor to USACE prior to solicitation for a construction contract in order to identify and validate that sufficient real property interests are available. Operation and maintenance is a 100% non-Federal responsibility.

10. NON-FEDERAL AUTHORITY TO PARTICIPATE IN PROJECT.

Non-Federal Sponsor's authority to participate in projects comes from Puerto Rico Law 23 of June 20, 1972, Section 5(e), as amended: "Article 5. Faculties and obligations of the Secretary

The Secretary of Natural Resources shall have, in addition to those transferred by this chapter, the following functions and duties:

(e) Execute the agreements necessary and convenient in order to achieve the objectives of the Department and its programs with bodies from the government of the United States of America, with state governments, with other departments, agencies or instrumentalities of the Government of the Commonwealth, its municipalities and with private institutions; [he/she] is also thus empowered to accept and receive any donations or funds on account of appropriations, advances or any other kind of assistance or benefit when these originate from said government bodies or from nonprofit institutions."

11. NAVIGATION SERVITUDE

Navigation servitude does not apply to this project.

12. ATTITUDE OF OWNERS

This project was requested by the Puerto Rico Department of Natural and Environmental Resources (DNER), the non-Federal sponsor, in a letter dated 03 July 2015. The project has both project sponsor and public support.

13. MINERALS

When the project is in the certification process, NFS will look into ensuring there are no mineral issues. There is not a history of mining expedition in this area. Do not expect any issues.

14. HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW).

No signs of potential HTRW problems were identified and no sites with potential for contamination with HTRW were found as cited in section 2.3.12 of the main report.

15. INDUCED FLOODING

There will be no induced flooding directly associated with this project.

16. ZONING ORDINACES

Applications or enactment of zoning ordinances will not be used in lieu of acquisition.

17. RELOCATIONS ASSISTANCE (PUBLIC LAW 91-646 AS AMENDED)

No persons or businesses will be impacted by the project. There are no benefits anticipated under Public Law 91-646, codified in U.S.C. Title 42 – The Public Health and Welfare, Chapter 61 – Uniform Relocation Assistance and Real Property Acquisition Policies for Federal and Federally Assisted Programs which are implemented in the Uniform Regulations contained in 49 Code Of Federal Regulation, Part 24 as amended.

18. RELOCATIONS, ALTERATIONS, VACATIONS, AND ABANDONMENTS

No relocations, alterations, vacations or abandonments of utilities, structures, facilities, cemeteries, or towns have been identified within the proposed construction limits of the recommended plan.

19. STANDING TIMBER AND VEGETATIVE COVER

There is no timber or unusual vegetative cover that will be impacted by the project.

20. RECREATION RESOURCES

There are no separable recreational lands identified for the project.

21. CULTURAL RESOURCES

There are no known cultural resources that have been identified as being affected by the project. Please refer to the environmental assessment regarding details for species.

22. OUTSTANDING RIGHTS

There are no known outstanding rights in the project area.

23. MITIGATION

There is no mitigation for the Recommended Plan.

24. AQUISITION/ADMINISTRATIVE COSTS

The estimate of the Federal real estate administrative cost is **$ 30,000.00**. This figure includes project real estate planning, mapping, review, oversight, monitoring, analysis of real estate requirements and estates. The non-federal sponsor will receive credit towards its share of real estate administrative project cost incurred for certifications. Non-Federal acquisition/administrative costs are estimated to be **$ 30,000.00.**

25. SUMMARY OF PROJECT REAL ESTATE COSTS.

The following cost figures are subject to change prior to construction. The Lands and Damages cost are being shown as zero dollars in accordance with Section 8 of this report.

a. Lands and Damages		$ 0
b. Acquisition Administrative cost		$ 60,000.00
Federal	$ 30,000.00	
Non-Federal	$ 30,000.00	
c. Public Law 91-646		$ 0
d. Condemnations		$ 0
e. Total Estimated Real Estate Cost		$ 60,000.00
f. Contingency (15%)		$ 9,000.00
g. Total Real Estate Costs		$ 69,000.00

26. REAL ESTATE ACQUISTION SCHEDULE

The Puerto Rico Department of Natural and Environmental Resources (DNER), as the non-Federal sponsor is responsible for certifying that lands are available for project advertisement and construction. The Municipality of Loiza owns all the lands in fee. For scheduling purposes, nine months has been established to accomplish real estate certification, once final plans and specs have been completed and the Project Partnership Agreement has been executed. The Project Sponsor, Project Manager and Real Estate Technical Manager will formulate the milestone schedule upon project approval to meet date for advertisement and award of the construction contract.

27. CHART OF ACCOUNTS FOR PROJECT

01 - Lands & Damages			$ 0
01B-- Acquisitions Administrative cost			$ 60,000.00
01B20 - Non-Federal		$30,000.00	
01B40 – Federal		$30,000.00	
01B10 - By Govt		$ 0	
01B20 - By Local sponsor		$ 0	
01E10 - By Govt (In-House)	$ 0		
01M00 – Contingency (15%)			$ 9,000.00
Total Estimated Real Estate Cost:			**$ 69,000.00**

Exhibit 1

REAL ESTATE CAPABILITY ASSESSMENT

ASSESSMENT OF NON-FEDERAL SPONSOR'S REAL ESTATE ACQUISITION CAPABILITY

FOR LOIZA, PUERTO RICO SECTION 14 PROJECT EMERGENCY STREAMBANK PROTECTION AND SHORELINE PROTECTION

I. Legal Authority:

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? **YES**
b. Does the sponsor have the power of eminent domain for this project? **YES**
c. Does the sponsor have "quick-take" authority for this project? **YES**
d. Are any of the lands/interests in land required for the project located outside the sponsor's political boundary? **NO**
e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? **NO**

II. Human Resource Requirements:

a. Will the sponsor's in-house staff require technical training to become familiar with the real estate requirements of Federal projects including P.L. 91·646, as amended? **NO**
b. If the answer to a. is "yes," has a reasonable plan been developed to provide such training? **NO**
c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? **YES**
d. Is the sponsor's projected in-house staffing level sufficient considering its other work load, if any, and the project schedule? **YES**
e. Can the sponsor obtain contractor support, if required in a timely fashion? **YES**
f. Will the sponsor likely request USACE assistance in acquiring real estate? **NO**

III. Other Project Variables:

a. Will the sponsor's staff be located within reasonable proximity to the project site? **YES**

b. Has the sponsor approved the project/real estate schedule/milestones? **YES**

IV. Overall Assessment:

a. Has the sponsor performed satisfactorily on other USACE projects? **YES**
b. With regard to this project, the sponsor is anticipated to be: highly capable/fully.

V. Coordination:

a. Has this assessment been coordinated with the sponsor? **YES**
b. Does the sponsor concur with this assessment? **YES**

Date: _____

Prepared by:

_____
Angela Huggins
Realty Specialist, Acquisition Branch
Real Estate Division

Reviewed by:

_____
Hansler A. Bealyer
Chief, Acquisition Branch
Real Estate Division

Reviewed and approved by:

_____
Derrick D. Moton
Chief (Acting), Real Estate Division
Real Estate Division

Exhibit 2

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207

REPLY TO ATTENTION OF

Real Estate Division

Ms. Mabel Rivera
Department of Natural Environmental Resources
P. O. Box 366147
San Juan, Puerto Rico 00936

Dear Ms. Rivera:

The intent of this letter is to formally advise the Puerto Rico Department of Natural and Environmental Resources as the non-Federal sponsor for the Loiza Puerto Rico Section 14 Study Continuing Authority Program (CAP) SEC 14 Emergency Streambank Protection and Shoreline Protection Feasibility Study, of the risks associated with land acquisition prior to the execution of the Project Partnership Agreement (PPA) or prior to the Government's formal notice to proceed with acquisition. If a non-Federal sponsor deems it necessary to commence acquisition prior to an executed PPA for whatever reason, the non-Federal sponsor assumes full and sole responsibility for any and all costs, responsibility, or liability arising out of the acquisition effort.

Generally, these risks include, but may not be limited to, the following:

1. Congress may not appropriate funds to construct the proposed project;

2. The proposed project may otherwise not be funded or approved for construction;

3. A PPA mutually agreeable to the non-Federal sponsor and the Government may not be executed and implemented;

4. The non-Federal sponsor may incur liability and expense by virtue of its ownership of contaminated lands, or interests therein, whether such liability should arise out of local, state, or Federal laws or regulations including liability arising out of CERCLA, as amended;

5. The non-Federal sponsor may acquire interests or estates that are later determined by the Government to be inappropriate, insufficient, or otherwise not required for the project;

6. The non-Federal sponsor may initially acquire insufficient or excessive real property acreage which may result in additional negotiations and/or benefit payments under P.L. 91-646 as well as the payment of additional fair market value to affected landowners which could have been avoided by delaying acquisition until after PPA execution and the Government's notice to commence acquisition and performance of LERRD; and

7. The non-Federal sponsor may incur costs or expenses in connection with its decision to acquire or perform LERRD in advance of the executed PPA and the Government's notice to proceed which may not be creditable under the provisions of Public Law 99-662 or the PPA.

We appreciate the Municipality's participation in this project. Should you have questions or concerns pertaining to this letter please feel free to contact Ms. Angela Huggins at angela.f.huggins@usace.army.mil (904) 232-1939.

Sincerely,

Derrick D. Moton
Chief (Acting), Real Estate Division

Section 14 Project
Emergency Streambank and Shoreline Protection

Project Cost and Abbreviated Risk Analysis

Appendix C

To be included in the
Final Integrated Feasibility Report and Environmental Assessment

US Army Corps of Engineers ®
Jacksonville District

Table of Contents

EXECUTIVE SUMMARY ES-1
MAIN REPORT 1
1.0 PURPOSE 1
2.0 BACKGROUND 1
3.0 REPORT SCOPE 2
3.1 Project Scope 2
4.0 ABBREVIATED RISK ANALYSIS METHODOLOGY/PROCESS 5
4.1 Identify and Assess Risk Factors 5
5.0 KEY ASSUMPTIONS AND LIMITATIONS 6
6.0 RESULTS 7
6.1 Risk Register 7
6.2 Cost Contingency 7

LIST OF TABLES

Table 1: Project Cost Contingency Summary 7

LIST OF FIGURES

Figure 1: Conceptual Revetment Cross Sections 3
Figure 2: Conceptual Revetment Plan 4
Figure 3: Project Site Photo 6

LIST OF ATTACHMENTS

Attachment A – Total Project Cost Summary (TPCS) 8

EXECUTIVE SUMMARY

This Project Cost and Abbreviated Risk Analysis (ARA) Report has been completed by the US Army Corps of Engineers (USACE), Jacksonville District.

- The Cost Estimates were prepared under guidance given in the Corps of Engineers Regulation ER 1110-2-1302 (dated June 30, 2016), Civil Works Cost Engineering and EP 1110-1-8 Vol 3, Construction Equipment Ownership and Operating Expenses Schedule Cost Book Dated 2014.

- The ARA was developed with tools provided by the Cost Engineering Mandatory Center of Expertise (MCX) for Civil Works. The ARA was reviewed internally by Jacksonville District Cost Engineering before being presented for Agency Technical Review (ATR). The ARA was developed to model the remaining work concerning scope growth, potential for mods and claims, and other concerns as seen in the risk register.

This report presents a recommendation for the total project cost contingency for cost certification of the Loiza Emergency Streambank and Shoreline Protection Project. An abbreviated risk analysis study was conducted for the development of the contingency to be applied to the total project cost. The purpose of this risk analysis was to establish a project contingency by identifying and measuring the cost impact of project uncertainties with respect to the estimated total project cost.

The most likely total project cost (at Project First Cost) is approximately $5,063K. Based on the results of the analysis, the Jacksonville District recommends a contingency value of approximately $1,170K or 43% for construction costs; $189K or 36% for Planning, Engineering, and Design costs; and $51K or 16% for Construction Management costs for a combined contingency of 39%. The contingency value is based on several variables the project team believes to be perceived risk related to the project.

MAIN REPORT

1.0 PURPOSE

This report provides a general understanding of the costs associated with the project. In addition, it includes the cost estimate supporting documentation for the direct cost and the contingencies.

2.0 BACKGROUND

The project is in the Municipality of Loiza located on Puerto Rico's northern Atlantic Coast, approximately 16 miles east of San Juan. The study area includes approximately 1,050 feet of shoreline within the Municipality of Loiza, which fronts a public school, a community center and a public roadway.

Erosion is causing a receding shoreline that is threatening the permanent loss of public facilities. Increased erosion beneath unprotected, aging infrastructure has resulted in weakened foundations and loose construction debris, creating public safety hazards. The most threatened of the structures include a public school, a public community center, and a public road (Calle Punta Del Atlantico).

Section 14 of the Flood Control Act of 1946, as amended, provides for implementation of projects to protect public facilities and facilities owned by non-profit organizations that are used to provide public services that are open to all on equal terms.

During the feasibility study, the project delivery team (PDT) evaluated five alternatives to attempt to solve some of the problems. Upon evaluation, as discussed in the Engineering Appendix, the alternatives were screened leaving alternative S-5 as the Recommended Plan. Refer to the Engineer Appendix for further information regarding alternatives S-1 through S-4.

A. Alternative overview:

1. Alternative S-1 – Energy dissipation protection (breakwater) or structures such as jetties, spurs, rip-raps or armoring, includes a range of measures constructed in the water to minimize erosional forces on the shoreline by either dissipating the wave energy or providing armoring.

2. Alternative S-2 – Beach nourishment with select construction of vegetated dunes, includes construction of vegetated dunes that can reduce effects of erosional forces in two ways. The dunes act as a barrier between the erosional forces and the threatened infrastructure, and store a reservoir of sand to help reduce the rate of beach erosion. The vegetation on the dunes provides additional cohesive forces to the sand, increasing the dune's resistance to erosion.

3. Alternative S-3 – Beach nourishment in conjunction with groins to stabilize nourishment, combines the measures of energy dissipation and armoring with the addition of sand to the beach. This alternative includes the construction of a groin in the water as an energy dissipation measure to protect the re-nourished beach.

4. Alternative S-4 – Vegetated dune construction with minimal beach berm, includes adding to the berm (or width of the beach) and construction of vegetated dunes.

5. Alternative S-5 – Select revetment construction, involves constructing an armored protective barrier between the erosive forces and the threatened structures.

Alternatives S-1 through S-4 were screened out of consideration by the PDT for reasons unrelated to cost and prior to any cost exercises being performed.

3.0 REPORT SCOPE

The scope of this report is to facilitate a technical overview of the recommended plan. Part of the report includes the risk analysis used to calculate and present the cost contingency at the 80% confidence level using the risk analysis processes, as mandated by U.S Army Corps of Engineers (USACE) Engineer Regulation (ER) 1110-2-1150, Engineering and Design for Civil Works, ER 1110-2-1302, Civil Works Cost Engineering, and Engineer Technical Letter 1110-2-573, Construction Cost Estimating Guide for Civil Works. The study and presentation does not include consideration for life cycle costs.

3.1 Project Scope

The recommended plan is alternative S-5 Optimized Revetment Construction. The design consists of the construction of revetment, replacement of sidewalk with an armored green space and minor road repairs.

This alternative involves placing a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, school, and community center. Minimal asphalt replacement of approximately 220 linear feet of public road would be included only to maintain resident access and re-connect the public route to its existing elevation. The elevation of the revetment crest would be 10.0-ft PRVD02. Reference paragraph 5.5.2.4 Construction Considerations in the Engineering Appendix for the basis of constructing revetment. Due to existing public sidewalk damage, the sidewalk will be demolished, and replaced with a “Greenway” between the road and revetment to eliminate erosion from over wash and storm runoff. The Greenway would consist of high performance turf reinforcement mat (HPTRM) keyed in between the existing road and revetment. The recommended alternative is shown in Figure 1(Conceptual Revetment Cross Sections) and Figure 2 (Conceptual Revetment Plan) below.

A. Major Project Features includes:
   1. Revetment shore protection including, but not limited to, excavation, backfill, geotextile, bedding stone and revetment stone.

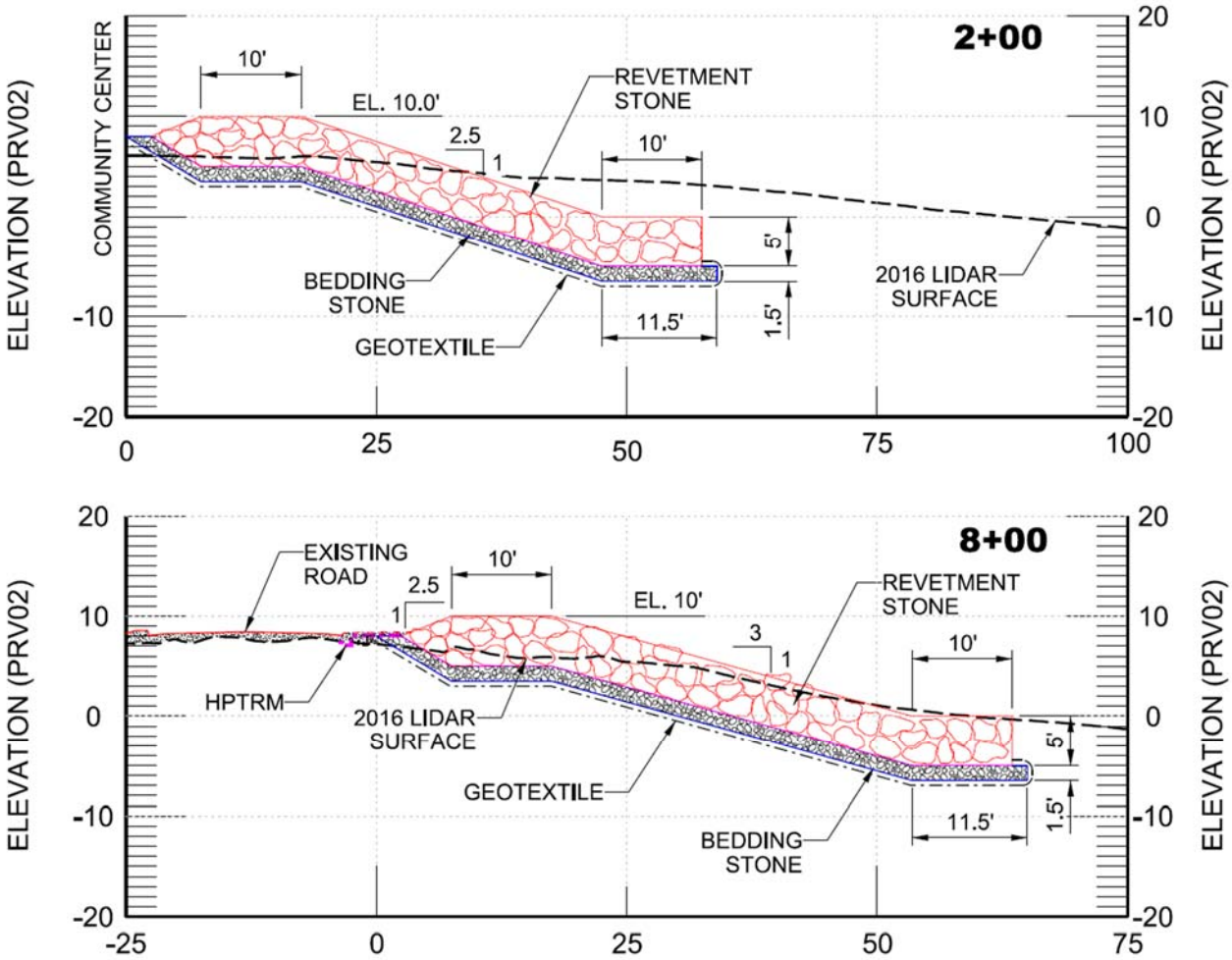


Figure 1: Conceptual Revetment Cross Sections

B. <u>Estimate Assumptions:</u>

1. Estimate assumes a Civil Contractor as the Prime who has the capability to self-perform some of the major features of work.
2. Construction will be executed during day light hours and only five days a week.
3. Contractor will place material primarily in the dry. The work at the toe of the revetment is assumed to be constructed at low tide.
4. Surplus material will be placed on the beach seaward of revetment.
5. The project will facilitate the use of highway trucks to haul the stone to the site.

Figure 2: Conceptual Revetment Plan

C. <u>Construction Sequence</u>:

1. Procure armor and bedding stone.
2. Establish operation at the shoreline through mobilization and site preparation activities.
2. Excavate and shape revetment profile.
3. Initiate hauling the stone and associated materials to project site for placement.
4. Place revetment system in segmented lengths for project control.
5. The estimated construction duration is 325 calendar days.
6. It is assumed funding will become available in FY18. Midpoint of construction is estimated at FY20 Q1 with an approximate one year construction period.

4.0 ABBREVIATED RISK ANALYSIS METHODOLOGY/PROCESS

The risk analysis process for this estimate is intended to determine the probability of various cost outcomes and to quantify the required contingency needed in the cost estimate to achieve the desired level of cost confidence. In simple terms, contingency is an amount added to an estimate to allow for items, conditions or events for which the occurrence or impact is uncertain and that experience suggests will likely result in additional costs being incurred or additional time being required. The amount of contingency included in project control plans depends, at least in part, on the project leadership's willingness to accept risk of project overruns. The less risk that project leadership is willing to accept, the more contingency should be applied in the project control plans. The risk of overrun is expressed, in a probabilistic context, using confidence levels.

Contingency for the cost estimate has been developed using materials provided by the USACE Cost Center of Expertise located in Walla Walla District. The cost estimator assigned risk factors based upon the project Work Breakdown Structure. The contingency was developed using a condensed format since the total project cost is below the threshold for completing a Cost and Schedule Risk Analysis. The contingency was primarily affected by the weight of very likely risks with regards to scope growth and the potential of quantity increases due to the highly dynamic project site. These impacts are considered significant.

The primary steps, in functional terms, of the risk analysis process are described in the following subsections. Risk analysis results are provided in section 6.

4.1 Identify and Assess Risk Factors

Identifying risk factors is considered a qualitative process that results in establishing a risk register that serves as the basis for the resulting contingency percentage. Risk factors are events and conditions that may influence or drive uncertainty in project performance. They may be inherent characteristics or conditions of the project or external influences, events, or conditions such as weather or economic conditions. Risk factors may have either favorable or unfavorable impacts on project cost and schedule. A risk brainstorming session was conducted on 5 January 2018, to discuss all possible risks and impacts. The Project Delivery Team (PDT) attendees are listed on the PDT Involvement tab of the ARA spreadsheet.

Contingency is analyzed using formulas within the spreadsheet, as opposed to the more complex analysis of the Crystal Ball software's *Monte Carlo* simulations used in a formal cost and schedule risk analysis. Contingencies are calculated according to the likelihood and impact of each factor identified in the risk register.

The Abbreviated Risk Analysis was developed with input of the Project delivery team (PDT). The highest risk level identified during the development of the Risk Register was level 4. This risk was associated with the potential for scope growth which would affect design assumptions and quantity increases. The concern is expected to be address during the design and implementation phase of the project once current surveys can be completed. The remaining risk levels are level 3 and under.

A. Major concerns registered in the Risk Register include:

1. There is a high probability that the quantities and scope growth used for the cost estimate will change due to the dynamic characteristics of the site. Since this concern has been addressed on the Risk Register in the case of an increase, the PDT believes we have addressed this risk.
2. The project is located on the north coastline of Puerto Rico. Schedule delays due to adverse weather conditions are a concern. This has been identified on the Risk Register.

This tool helps with the development of the contingency for the project and provides essential information that could be used to establish control measures. The Risk Register will continue to be updated during the project life cycle.

5.0 KEY LIMITATIONS

Key limitations are those that are most likely to significantly affect the determinations of contingency presented in the ARA. The key limitations are important to help ensure that project leadership and other decision makers understand the logic and decisions made in the risk analysis, as well as any resulting implications on the use of outcomes and results.

A. Key assumptions:

1. The project site conditions will likely change between the latest data available and the design and implementation phase.
2. Construction will happen from land.
3. Contractor will place material without the need to dewater (reference paragraph 5.5.2.4 Construction Considerations in the Engineering Appendix).
4. Required materials are locally available at an average historical price level.

Figure 3: Project Site Photo

6.0 RESULTS

6.1 Risk Register

An abbreviated risk register is a tool commonly used in project planning and risk analysis. It is important to note that a risk register can be an effective tool for managing identified risks throughout the project life cycle. As such, it is generally recommended that risk registers be updated as the designs, cost estimates, and schedule are further refined, especially on large projects with extended schedules.

As mentioned in the Executive Summary, tools/materials from the MCX were used throughout the process of acknowledging and accounting for known risk.

6.2 Cost Contingency

The contingency was calculated based on the likelihood and impact of the risk concerns. Some of the major areas of concern were seen under the Scope Growth, Construction Elements, Design and Quantities and External Project Risk categories.

Table 1 provides the contingencies percentages calculated based upon the factors assigned in the risk register.

Table 1: Project Cost Contingency Summary

Totals	% Contingency
Real Estate	15.0 %
Construction	42.5 %
Planning, Engineering & Design	36.3 %
Construction Management	16.4 %
Combine Contingency	39 %

ATTACHMENT A:
TOTAL PROJECT COST SUMMARY (TPCS)

WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW CERTIFICATION STATEMENT

For Project No. 45537

SAJ – Loiza, Puerto Rico
Section 14 – Emergency Stream Bank and Shoreline Protection

The Loiza, Puerto Rico Section 14 – Emergency Stream Bank and Shoreline Protection Project as presented by Jacksonville District, has undergone a successful Cost Agency Technical Review (Cost ATR), performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of February 12, 2018, the Cost MCX certifies the estimated total project cost:

FY19 Project First Cost:	$5,063,000
Fully Funded Total Project Cost:	$5,170,000
Federal Cost of Project:	$3,995,000

It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management through the period of Federal participation.

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DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=JACOBS.MICHAEL.PIERRE.1160569537
Date: 2018.02.12 10:34:49 -08'00'

Michael P. Jacobs, PE, CCE
Chief, Cost Engineering MCX
Walla Walla District

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: **Loiza Shoreline - CAP - Section 14**
PROJECT NO: **455357**
LOCATION: **Loiza, Puerto Rico**

DISTRICT: **South Atlantic Jacksonville** PREPARED: **2/12/2018**
POC: **CHIEF, COST ENGINEERING, MATTHEW CUNNINGHAM**

This Estimate reflects the scope and schedule in report; CAP Feasibility Study

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2019									
						Effective Price Level Date: 1-Oct- 18									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	REMAINING COST ($K)	Spent Thru: 1-Oct-17 ($K)	TOTAL FIRST COST ($K)	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
16	BANK STABILIZATION	$2,696	$1,147	43%	$3,843	2.1%	$2,752	$1,170	$3,922		$3,922	2.0%	$2,807	$1,194	$4,001
			-			-						-			
	CONSTRUCTION ESTIMATE TOTALS:	$2,696	$1,147		$3,843	2.1%	$2,752	$1,170	$3,922		$3,922	2.0%	$2,807	$1,194	$4,001
01	LANDS AND DAMAGES	$60	$9	15%	$69	2.1%	$61	$9	$70		$70		$61	$9	$70
30	PLANNING, ENGINEERING & DESIGN	$500	$182	36%	$682	3.9%	$519	$189	$708		$708	1.8%	$529	$192	$721
31	CONSTRUCTION MANAGEMENT	$300	$49	16%	$349	3.9%	$312	$51	$363		$363	4.2%	$325	$53	$378
	PROJECT COST TOTALS:	$3,556	$1,387	39%	$4,943		$3,644	$1,419	$5,063		**$5,063**	2.1%	$3,721	$1,448	$5,170

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CHIEF, COST ENGINEERING, MATTHEW CUNNINGHAM

SUGGS.JAMES.LUCINE.1232229701 — Digitally signed by SUGGS.JAMES.LUCINE.1232229701 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=SUGGS.JAMES.LUCINE.1232229701 Date: 2018.05.16 12:07:38 -04'00'
PROJECT MANAGER, JAMES SUGGS

CHIEF, REAL ESTATE, DERRICK MOTON

CHIEF, PLANNING, ERIC SUMMA

CHIEF, ENGINEERING, LAUREEN BOROCHANER

CHIEF, OPERATIONS, CAROL BERNSTEIN

CHIEF, CONSTRUCTION, STEPHEN DUBA

ACTING CHIEF, CONTRACTING, RICARDO TORRES

CHIEF, PM-PB, KAREN SMITH

CHIEF, DPM, TIM MURPHY

ESTIMATED TOTAL PROJECT COST:		**$5,170**
ESTIMATED FEDERAL COST:	**65%**	$3,360
ESTIMATED NON-FEDERAL COST:	**35%**	$1,809
22 - FEASIBILITY STUDY (CAP studies):		**$180**
ESTIMATED FEDERAL COST:	100%	$180
ESTIMATED NON-FEDERAL COST:		
SECTION 1032 OF WRRDA 14 WAIVER (FEDERAL):		$455
ESTIMATED FEDERAL COST ALLOCATION		**$3,995**
ESTIMATED NON-FEDERAL COST ALLOCATION		**$1,354**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: Loiza Shoreline - CAP - Section 14
LOCATION: Loiza, Puerto Rico
This Estimate reflects the scope and schedule in report; CAP Feasibility Study

DISTRICT: South Atlantic Jacksonville
POC: CHIEF, COST ENGINEERING, MATTHEW CUNNINGHAM
PREPARED: 2/12/2018

WBS Structure		ESTIMATED COST				PROJECT FIRST	TOTAL PROJECT COST (FULLY FUNDED)							
		Estimate Prepared: 17-Jan-18 Estimate Price Level: 1-Oct-17				Program Year (Budget EC): 2019 Effective Price Level Date: 1 -Oct-18								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 1 or CONTRACT 1													
16	BANK STABILIZATION	$2,696	$1,147	42.5%	$3,843	2.1%	$2,752	$1,170	$3,922	2020Q1	2.0%	$2,807	$1,194	$4,001
	CONSTRUCTION ESTIMATE TOTALS:	$2,696	$1,147	42.5%	$3,843		$2,752	$1,170	$3,922			$2,807	$1,194	$4,001
01	LANDS AND DAMAGES	$60	$9	15.0%	$69	2.1%	$61	$9	$70	2019Q1		$61	$9	$70
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$50	$18	36.3%	$68	3.9%	$52	$19	$71	2019Q2	1.0%	$52	$19	$71
	Planning & Environmental Compliance	$50	$18	36.3%	$68	3.9%	$52	$19	$71	2019Q2	1.0%	$52	$19	$71
	Engineering & Design	$141	$51	36.3%	$192	3.9%	$146	$53	$200	2019Q2	1.0%	$148	$54	$202
	Engineering Tech Review ITR & VE	$45	$16	36.3%	$61	3.9%	$47	$17	$64	2019Q2	1.0%	$47	$17	$64
	Contracting & Reprographics	$45	$16	36.3%	$61	3.9%	$47	$17	$64	2019Q2	1.0%	$47	$17	$64
	Engineering During Construction	$98	$36	36.3%	$134	3.9%	$102	$37	$139	2020Q1	4.2%	$106	$38	$145
	Planning During Construction	$35	$13	36.3%	$48	3.9%	$36	$13	$50	2020Q1	4.2%	$38	$14	$52
	Project Operations	$36	$13	36.3%	$49	3.9%	$37	$14	$51	2019Q2	1.0%	$38	$14	$51
31	CONSTRUCTION MANAGEMENT													
	Construction Management	$200	$33	16.4%	$233	3.9%	$208	$34	$242	2020Q1	4.2%	$216	$36	$252
	Project Operation:	$50	$8	16.4%	$58	3.9%	$52	$9	$60	2020Q1	4.2%	$54	$9	$63
	Project Management	$50	$8	16.4%	$58	3.9%	$52	$9	$60	2020Q1	4.2%	$54	$9	$63
	CONTRACT COST TOTALS:	$3,556	$1,387		$4,943		$3,644	$1,419	**$5,063**			$3,721	$1,448	**$5,170**

APPENDIX D
ENVIRONMENTAL

D-1: Environmental Coordination

Integrated Feasibility Report and Environmental Assessment for Continuing Authorities Program Section 14 Emergency Streambank and Shoreline Protection project in Loiza, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-0019

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

JUN 15 2018

Ms. Arleen Reyes Rodríguez, PE, MSCE, CFM
Coastal Zone Management Consistency Office
Puerto Rico Planning Board
P.O. Box 41119, Minillas Station
San Juan, Puerto Rico 00940

Dear Ms. Rodríguez:

This letter acknowledges the U.S. Army Corps of Engineers (Corps), Jacksonville District, receipt of your May 25, 2018 letter regarding the Coastal Zone Management Act coordination for the Draft Integrated Feasibility Report and Environmental Assessment for the Loíza Continuing Authorities Program Section 14 Project in Loíza, Puerto Rico. In that letter, the Puerto Rico Planning Board (PRPB) staff provided recommendations for the project based on the agency's Federal Consistency Determination (FCD) evaluation and comments received during PRPB's FCD evaluation public comment period. Corps has prepared the enclosed responses (see Table 1) after reviewing the PRPB recommendations and public comments.

Corps appreciates the input provided by the PRPB on this project. Any questions regarding this project should be directed to Ms. Kristen Donofrio at the letterhead address or by telephoning 904-232-2918.

Sincerely,

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch

Enclosure

Table 1 Summary of U.S. Army Corps of Engineers, Jacksonville District (USACE) responses to comments received during Puerto Rico Planning Board (PRPB) agency and public comment period for Federal Consistency Determination (FCD) evaluation for the Loíza Section 14 Continuing Authorities Program (CAP) project in the Municipality of Loíza in Puerto Rico (PR).

#	Commenter	Comment	Response
1	PRPB	The USACE must coordinate with Ernesto Díaz, Director of Puerto Rico Coastal Zone Management Program (PRCZMP), to complete the required procedure for compliance with Article 4B(3) of the PR Environmental Policy Law.	USACE will ensure compliance with Article 4B(3) of the PR Environmental Policy Law.
2	PRPB	Review and consider the attached comments provided by the University of Puerto Rico (UPR) University Professor Aurelio Mercado, in the required analysis for the final design of the proposed revetment.	The comments provided with PRPB's May 25, 2018 letter to USACE were reviewed. USACE responses to those comments are addressed in this table.
3	PRPB	It is important to maintain coordination and inform the Loíza Municipal Government on next steps and final design of the proposed revetment.	USACE will continue to coordinate with the Loíza Municipal Government throughout the project's design and implementation phase.
4	PR State Historic Preservation Officer (SHPO)	This project has been previously reviewed by SHPO personnel and our comments presented in our letter dated October 6, 2017 remain in effect.	Noted. Thank you for your comment.
5	Aurelio Mercado, Professor of Physical Oceanography/Department of Marine Sciences UPR, Mayaguez	It is surprising that it is stated "adding sand is not a sustainable solution to erosion". (a) Is it just at this location or elsewhere also?	The addition of sand not being sustainable pertains only to this location, based upon the fact that a previously existing dune had already eroded away from this reach of shoreline.

#	Commenter	Comment	Response
6	Aurelio Mercado, Professor of Physical Oceanography/Department of Marine Sciences UPR, Mayaguez	(a) The reference made to Federal Emergency Management Agency (FEMA) 2009 is not shown in the references.	The FEMA 2009 Flood Insurance Study (FIS) reference has been added to the Final report's list of references. For your convenience, the FEMA 2009 FIS reference can be viewed online at the following link: http://www.saj.usace.army.mil/About/Divisions-Offices/Planning/Environmental-Branch/Environmental-Documents/ (Click "Puerto Rico" and scroll to Loíza CAP Section 14 Project.)
7	Aurelio Mercado, Professor of Physical Oceanography/Department of Marine Sciences UPR, Mayaguez	(b) FEMA 2007 clearly states that no wave model was coupled to Advanced CIRCulation Model (ADCIRC) in order to obtain the stillwater evaluations including wave setup.	Page 129 of the FEMA 2009 FIS describes how ADCIRC and Empirical Simulation Technique (EST) were used for this analysis.
8	Aurelio Mercado, Professor of Physical Oceanography/Department of Marine Sciences UPR, Mayaguez	(i) Did the CoE (USACE) run the Steady-State Spectral Wave (STWAVE) model at the Loíza Study Site just for this report on top of the 1, 2, 5, 10, 20, 50, and 100 years return periods stillwater evaluations?	No. Running the STWAVE model for feasibility level is out of scope. USACE relies on published available data at this point in project planning.
9	Aurelio Mercado, Professor of Physical Oceanography/Department of Marine Sciences UPR, Mayaguez	(ii) If yes, how does the wave setups for the study site compare with the wave setups estimates obtained by Dean's or Gourlay's method?	Page 156 of the FEMA 2009 FIS states that the criterion applied in areas with offshore coral reefs was based upon Gourlay's methodology.

#	Commenter	Comment	Response
10	Aurelio Mercado, Professor of Physical Oceanography/Department of Marine Sciences UPR, Mayaguez	Although mention is made that Sea Level Rise (SLR) has to be considered, the analysis doesn't seem to show that it has been considered.	Only a qualitative analysis is required, including a description of how the design can be easily updated or retrofitted to account for sea level change (SLC). On page A-23, it states " To maintain shoreline erosion protection level of this project's components, as well as reduce the frequency of flooding due to over-wash, the revetment structure can be retrofitted by increasing the height by adding larger stone." In other words, a new structure will not be needed.
11	Aurelio Mercado, Professor of Physical Oceanography/Department of Marine Sciences UPR, Mayaguez	Tables 4-3 and 4-4 state that the deepwater Significant Wave Height, Ho = 2.802 ft, but Table 4.2 states that Ho = 27.9 ft for the 10-yr event. Explain?	The former is the local-depth limited wave height at Loíza for the 10 year event and the latter is the offshore wave height for the 10 year event.
12	Aurelio Mercado, Professor of Physical Oceanography/Department of Marine Sciences UPR, Mayaguez	Table 4-2 states that the "storm surge + spring tide + setup = 5.76 ft" for the 10-year event. These are supposed to be elevations above Mean Sea Level (MSL). In Tables 4-3 and 4-4 it is stated that the depth at the structure's toe is ds = 5.8 ft, which one assumes should already include the 5.76 ft due to the storm surge as given above. Does this mean that the fair weather water depth at the structure toe is just 5.8 – 5.76 = 0.04 ft?	The water depth at the structure toe values in Tables 4-3 and 4-4 are actual depths, not elevations. Therefore, the depth of the 10-yr event wave at the toe is approximately 5.8 ft.
13	Aurelio Mercado, Professor of Physical Oceanography/Department of Marine Sciences UPR, Mayaguez	We must remember that the stone weight varies as the cube of the wave height.	Noted

#	Commenter	Comment	Response
14	Aurelio Mercado, Professor of Physical Oceanography/Department of Marine Sciences UPR, Mayaguez	On page A-14 it is stated that the present historical SLR for the San Juan tidal gauge is 2.08 mm/year (0.006824 ft/year). But between 2010 and 2015 the actual rate was about three times higher than that value. And, though it is decreasing, it is still larger than the historical trend of 2.08 mm/year.	Noted. Published National Oceanic and Atmospheric Administration NOAA rates were used for the evaluation. sea level change (SLC) databases and analysis techniques will be updated as more data is collected.
15	Aurelio Mercado, Professor of Physical Oceanography/Department of Marine Sciences UPR, Mayaguez	In page A-16 they use the NOAA Sea Level Rise Viewer to examine the Study Site under an increase of 6 ft in sea level, concluding that at least up to this value there is no concern. But is should be noted that the NOAA viewer shows only "bathtub" flooding. Dynamic flooding is not considered nor the possibility of flooding due to the upwelling of the water table. These last two cases could make things more difficult to handle.	Noted. SLC databases and analysis techniques will be updated as more data are collected.

#	Commenter	Comment	Response
16	Aurelio Mercado, Professor of Physical Oceanography/Department of Marine Sciences UPR, Mayaguez	In page A-42, mention is made of gabions. But the placement of gabions should be avoided at all cost. It is just a matter of seeing the damage they have done all over the island.	The reference to gabion-related damage is not understood. The intent of gabions would be to protect the shoreline as part of the armor system (i.e., as bedding for the large armor stone). The subject site is located in a highly dynamic environment that is subject to severe erosion from regular wave actions and major storms, and subject to seasonal shoreline fluctuations (natural erosion and accretion). Based on available site information, including photographs of the changing site conditions between 2015 and September 2017, the intention is to construct the armor system in-the-dry as much as possible, considering tidal fluctuations and seasonal fluctuations of the beach materials, the topography and length of beach at the time of construction, etc. Based on the likelihood that some of the seaward-most portions of some areas of the armor zone may require construction in the surf, it is understood that placing the geotextile could be challenging at times, and would require some type of ballast. The use of a gabion mattress bedding system (i.e., a wire or geogrid basket containing graded stone, with a geotextile bottom) has been considered for this reason. This method would allow for containment of the bedding and geotextile materials during placement in the wet/wave environment.

#	Commenter	Comment	Response
17	Department of Natural and Environmental Resources (DNER)	*(Translated from Spanish)* Of the evaluation of the presented information, the project is compatible and complies with the requirements of the DNER and with the objectives and public policy of the PRCZMP, especially those related to the protection and conservation of natural resources.	Thank you for your support of the project.
18	DNER	*(Translated from Spanish)* In recognition of the need to carry out this action and the urgency of the situation, the DNER has no objection to the issuing of the FCD concurrence with the PRCZMP for this project.	Thank you for your support of the project.
19	DNER	*(Translated from Spanish)* It should be noted that, through a letter to USACE on January 31, 2018, the DNER reaffirmed its support for the federal program under which this project will be carried out.	Thank you for your support of the project.
20	DNER	*(Translated from Spanish)* During demolition of the remainder of the sidewalk, existing materials and debris should not being released into the sea, which would cause damage to the natural systems. Should the release of these materials and debris into the water occur, all efforts should be made to remove them quickly, and they should be disposed of by landfill or other authorized facility for the final disposal of solid waste.	Best management practices will be used avoid the possibility of adverse effects. Detailed pollution and erosion control plans will be developed during the design phase of the project.

#	Commenter	Comment	Response
21	DNER	*(Translated from Spanish)* In addition, the project must comply with any other requests from agencies, authorities, departments, public corporations, or other government agencies, with jurisdiction in the type of project or this consultation.	Under the requirements of National Environmental Policy Act, the Environmental Assessment, integrated with the Feasibility Report, was coordinated with pertinent agencies, interested parties, and stakeholders for review and comment. The project will obtain all required permits and authorizations and will be in compliance with all applicable Federal and Commonwealth of Puerto Rico's laws and regulations.

GOVERNMENT OF PUERTO RICO
OFFICE OF THE GOVERNOR
PUERTO RICO PLANNING BOARD

May 29, 2018

CZ-2018-0411-033
Federal Consistency Certificate with the
Puerto Rico Coastal Zone Management Program (PRCZMP)

RESOLUTION

TO NOTIFY PARTIES ABOUT THE PUERTO RICO PLANNING BOARD CONCURRENCE WITH A FEDERAL AGENCY DETERMINATION ABOUT CONSISTENCY WITH THE PRZCMP POLICIES ACCORDING TO COASTAL ZONE MANAGEMENT ACT FEDERAL CONSISTENCY REGULATIONS AT 15 CFR Part 930

The U.S. Army Corps of Engineers (USACE) submitted a Federal Consistency Determination for the **Loiza Section 14 Continuing Authorities Program (CAP) project**. It consists in building a continuous rock revetment along 1,052 linear area at the coast located north of "Parcelas Suarez" in Loiza. The purpose of this project is to provide emergency shoreline protection for mitigating the coastal erosion problem, which threatens the infrastructure and properties at this area. Proposed stone revetment will be construct by placing rocks with the appropriate weight, size and arrangement according to the field studies and information gathered on the geomorphology and behavior of the waves in the project area.

The project area is located north of Punta del Atlántico Street and "Parcelas Suarez" Community Center, at Medianía Baja Ward in Loíza, Puerto Rico.

The evaluation process for this Federal Consistency Determination began on March 13, 2018. The Puerto Rico Planning Board requested a 15 days extension in letter dated April 27, 2018. As part of the required evaluation, a digital copy of the submitted *Feasibility Report and Environmental Assessment* document including appendices were send to the Department of Natural and Environmental Resources (DNER), the PRCZMP Office, the Puerto Rican Culture Institute (PRCI), the State Historic Preservation Office (SHPO), and the Fish & Wildlife Service (FWS), for their review and comments. A public notice was also issue. During the granted comment period, the following comments were receive:

- **SHPO**: this agency provided copy of their letter dated October 6, 2017 in which supports the USACE findings of no historic properties affected within the project's area of potential effects.

- **DNER**: According to presented information, the proposed project is consistent and complies with the DNER requirements and PRCZMP policies, specifically those related with protection and conservation of natural resources. However, regarding demolition of the existing sidewalk remainder to replace it with revetment, the DNER recommends to avoid that removed material and debris from the site be released into the sea impacting natural marine systems in the vicinity of the coast.

- **Aurelio Mercado, Professor of Physical Oceanography**: provided some comments on the Appendix A (Engineering). These comments were send to the USACE as enclosure of the PRPB letter dated May 25, 2018 for their review and consideration.

Regarding compliance with Article 4B(3) of the PR Environmental Policy Law, a meeting was held on May 17, 2018, with participation of the PR Permit Management Office (OGPe), the DNER, the Environmental Quality Board and the PRPB to orient and discuss on how to facilitate the USACE the procedure to comply with this enforceable policy. The EQB representative indicated that the proposed project might qualify for compliance under categorical exclusion number 119, which covers *"Corrective actions that include one or more measures proposed to mitigate or eliminate damage that may be caused to the environment or that present an imminent risk to human health"*. The DNER will be in charge of completing the required procedure to obtain this endorsement.

GOBIERNO DE PUERTO RICO
OFICINA DEL GOBERNADOR
JUNTA DE PLANIFICACIÓN

After reviewing the submitted documents, received comments, and information at file, the Puerto Rico Planning Board in its meeting of May 29, 2018 determined to "***concur with the USACE determination that the proposed mitigation project is Consistent with the Puerto Rico Coastal Zone Management Program. However, the USACE must comply with the article 4B(3) of the PR Environmental Policy Law (Law 416-2004) and take into consideration the received comments".***

This Federal Consistency Certificate does not exempt the project to comply with other federal or state requirements.

The following parties shall be notified: Gina Paduano Ralph, Chief, Environmental Branch, U.S. Army Corps of Engineer; **Tania Vázquez**, Secretary, Department of Natural and Environmental Resources; **Edmée Zeidan,** Environmental Quality Board; **Jaime Green,** PR Permit Management Office; **Ernesto Díaz,** Puerto Rico Coastal Zone Management Program, Department of Natural and Environmental Resources.

María del C. Gordillo Pérez
President

Certify: That this Resolution is copy of the agreement adopted by Puerto Rico Planning Board (PRPB) in its meeting of **May 29, 2018**. I expedite and notify this copy to the parties under my sign and official stamp of the Puerto Rico Planning Board stamp, for general use and knowledge.

In San Juan, Puerto Rico, today JUN - 7 2018

Loida E. Soto Nogueras
Secretary

GOBIERNO DE PUERTO RICO
OFICINA DEL GOBERNADOR
JUNTA DE PLANIFICACIÓN

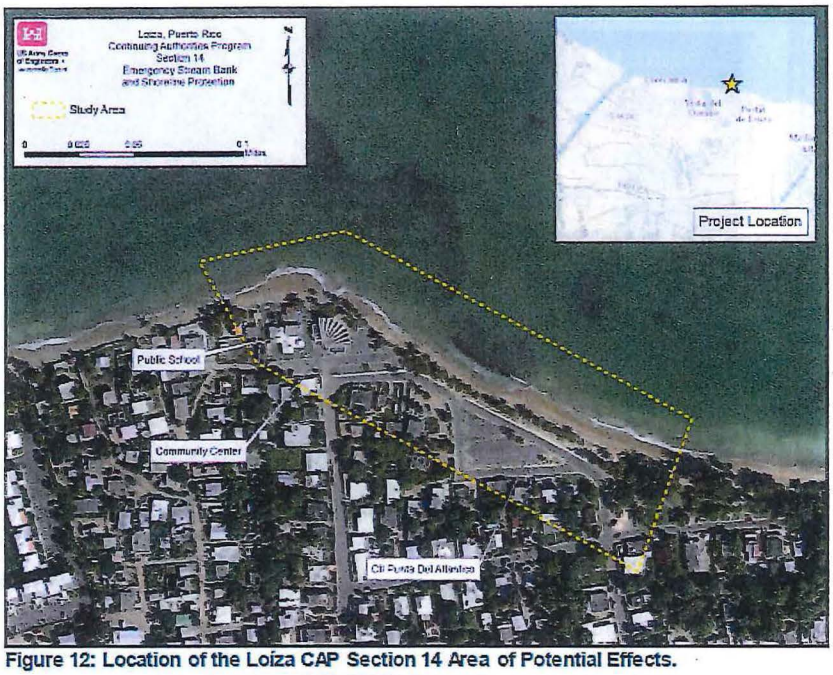


Figure 12: Location of the Loiza CAP Section 14 Area of Potential Effects.

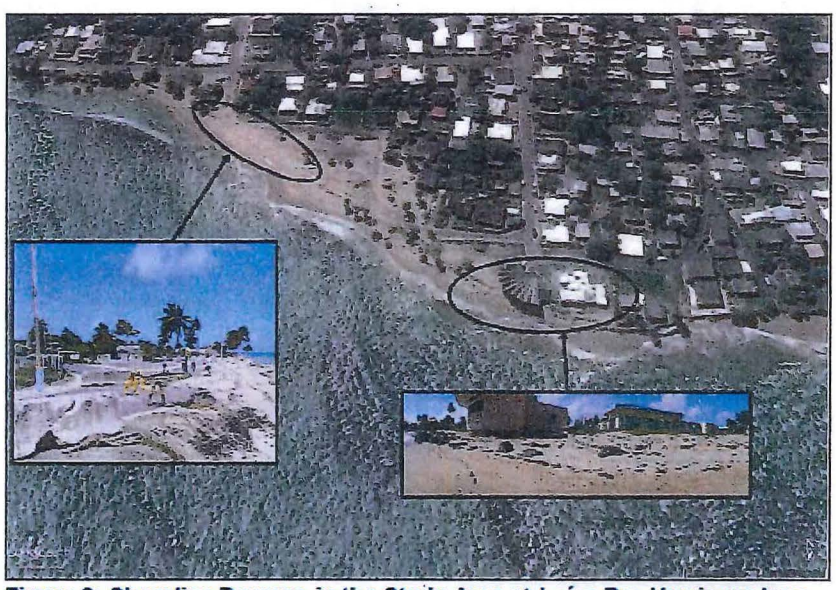
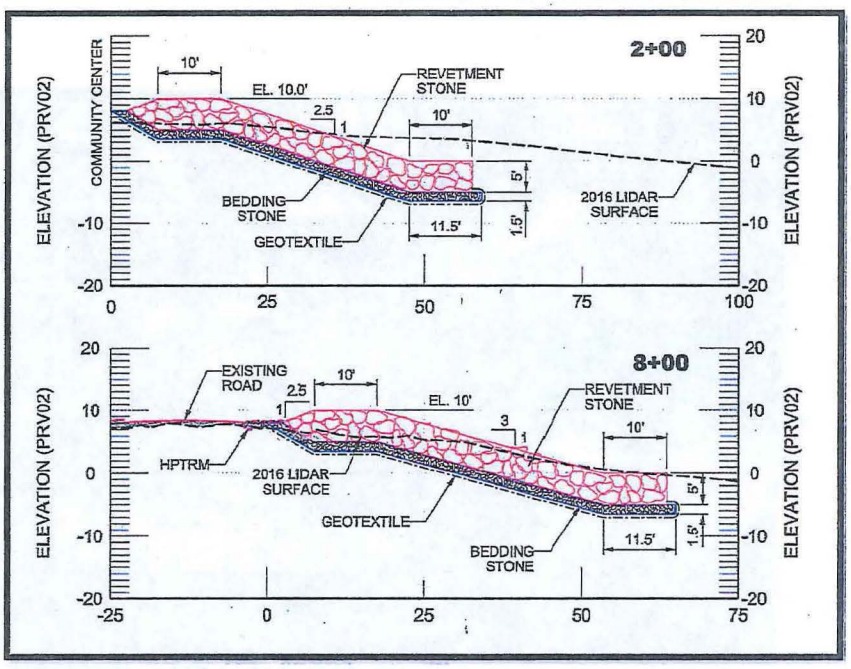


Figure 2: Shoreline Damage in the Study Area at Loiza Pre-Hurricane Irma



GOBIERNO DE PUERTO RICO
OFICINA DEL GOBERNADOR
JUNTA DE PLANIFICACIÓN

GOVERNMENT OF PUERTO RICO
Planning Board
Office of the Governor

May 25, 2018

Gina Paduano Ralph
Chief, Environmental Branch
U.S. Army Corps of Engineers, Jacksonville District
PO Box 4970
Jacksonville, Florida 32203-4412

Application for Federal Consistency Review
CZ-2018-0411-033
Loíza, Puerto Rico –CAP Section 14
Medianía Baja, Loíza

Dear Ms. Paduano:

We have been completing the required Federal Consistency review process for the application at reference. The application and submitted documents were sent to the Department of Natural and Environmental Resources (DNER), the State Historic Preservation Office (SHPO), the Puerto Rican Culture Institute (PRCI), and the Fish & Wildlife Service (FWS). A public notice was also issue and disclosed.

During the evaluation period, we only received comments from the SHPO, DNER and Dr. Aurelio Mercado. Copy of the received letters are enclosed for your review and record. As result of the evaluation of the received comments and information at file, we have the following recommendations:

1- As it was discussed in our meeting with Jorge Tous on May 17, 2018, the USACE must coordinate with Ernesto Díaz, Director of the PRCZMP to complete the required procedure for compliance with Article 4B(3) of the PR Environmental Policy Law.

2- Review and consider attached comments provided by the UPR University Professor Aurelio Mercado, in the requiered analysis for the final design of the proposed revetment.

3- It is important to maintain coordination and inform the Loiza Municipal Government on next steps and final design of the proposed revetment.

The Puerto Rico Planning Board will be concluding the evaluation and taking a decision on this application during the next week from May 29, 2018 to June1, 2018. If you have any question or need assistance, do not hesitate to contact Rose A. Ortiz at (787) 722-0101, ext. 16012 or e-mail: ortiz_r@jp.pr.gov

Thanks for your cooperation with our Program.

Cordially,

Arleen Reyes Rodríguez, PE, MSCE, CFM
Director
Geology and Hydrogeology Office

c Ernesto Díaz, PRCZMP, DNER

Enclosures

GOBIERNO DE PUERTO RICO
Oficina Estatal de Conservación Histórica
State Historic Preservation Office

May 1, 2018

Arleen Reyes Rodríguez, PE, MSCE, CFM
Director
Geology and Hydrogeology Office
Puerto Rico Planning Board
P. O. Box 41119
San Juan, Puerto Rico 00940-1119

SHPO: 10-03-17-01 SECTION 14 EMERGENCY STREAM BANK AND SHORELINE PROTECTION STUDY, LOIZA, PUERTO RICO/CZ-2018-0411-033

Dear Ms. Reyes Rodríguez,

Our Office received correspondence on April 23, 2018 requesting our comments for the above referenced project. We would like to inform you that this project had been previously reviewed by SHPO personnel and our comments presented in our letter dated October 6, 2017 (copy enclosed) remain in effect.

If you have any questions regarding this matter, please contact our Office at (787) 721-3737.

Sincerely,

Carlos A. Rubio-Cancela
State Historic Preservation Officer

CARC/GMO/BRS/MC

Enclosure

Cuartel de Ballajá (Tercer Piso),
Calle Norzagaray, Esquina Beneficencia, Viejo San Juan, P.R. 00901

PO Box 9023935, San Juan, P.R. 00902-3935
Tel: 787-721-3737 Fax: 787-721-3773
www.oech.pr.gov

SHPO
OECH
OFICINA ESTATAL DE CONSERVACIÓN HISTÓRICA
OFICINA DEL GOBERNADOR
STATE HISTORIC PRESERVATION OFFICE
OFFICE OF THE GOVERNOR

GOBIERNO DE PUERTO RICO
Oficina Estatal de Conservación Histórica

October 6, 2017

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch
Department of the Army
Jacksonville District Corps of Engineers
701 San Marco Boulevard
Jacksonville, Florida 32207-0019

SHPO 10-03-17-01 SECTION 14 (EMERGENCY STREAM BANK AND SHORELINE PROTECTION) STUDY, LOÍZA, PUERTO RICO

Dear Ms. Paduano Ralph,

Our office has received and reviewed the above referenced project in accordance with 54 U.S.C. 306108 (commonly known as Section 106 of the National Historic Preservation Act) and 36 CFR Part 800: Protection of Historic Properties from the Advisory Council on Historic Preservation. The State Historic Preservation Officer (SHPO) is to advise and assist federal agencies and other responsible entities when identifying historic properties, assessing effects upon them, and considering alternatives to avoid or reduce the project's effects.

Our records support your finding of **no historic properties affected** within the project's area of potential effects.

Please note that should the agency discover other historic properties at any point during project implementation, you should notify the SHPO immediately. If you have question regarding this matter, please contact Archaeologist Miguel A. Bonini, (787)721-3737 or mbonini@prshpo.pr.gov.

Sincerely,

Carlos A. Rubio-Cancela
State Historic Preservation Officer

CARC/CMO/BRS/MB/eds

SHPO
OFICINA ESTATAL DE CONSERVACIÓN HISTÓRICA
STATE HISTORIC PRESERVATION OFFICE
OECH

Calle Cristo 601 San Juan, PR • PO Box 9021776 San Juan, PR 00902-1776 • www.oech.pr.gov • 787 721 3737

SOME COMMENTS ON

ENGINEERING APPENDIX FOR LOÍZA EMERGENCY STREAMBANK AND SHORELINE PROTECTION PROJECT INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

By

Aurelio Mercado

Professor of Physical Oceanography/Department of Marine Sciences

UPR/Mayaguez

1. Page A-5: It is surprising that it is stated "adding sand is not a sustainable solution to erosion".
   a) Is it just at this location, or elsewhere also? Because the CoE has been a promoter of sand nourishment elsewhere for decades. This need to be clarified.
2. On page A-9, line number 4 (below Table 4-1) the statements are confusing and require clarification.
   a) First, the make reference to (FEMA, 20009), but that report is not shown in the references. As a matter of fact, I was told that nowhere there is a report FEMA (2009), but a report FEMA/Dewberry 2007, which explains how the new FEMA maps were revised at the end of the last decade.
   b) It is stated that "The Study Site is at FIS Stillwater Location 136, between FIS transects 63 and 64. Storm surge values were predicted using ADCIRC and STWAVE numerical models (FEMA, 2009)." But FEMA 2007 clearly states that no wave model was coupled to ADCIRC in order to obtain the stillwater elevations including wave setup. The wave setup was obtained, and added to the pressure and wind setups obtained by the EST, using methods developed by Robert Dean's Dynamic Integration Model and Gourlay's paper on wave setup on coral reefs. This begs the questions:
      i) Did the CoE run the STWAVE model at the Loiza Study Site just for this report on top of the 1, 2, 5, 10, 20, 50, and 100 years return periods stillwater elevations (just wind and pressure setup after using the EST method) obtained by Dewberry 2007?
      ii) If the above question is answered positively, how does the wave setups for the study site compare with the wave setups estimates obtained by Dean's, or Gourlay's, method.
3. Although mention is made that Sea Level Rise has to be considered, the analysis doesn't seem to show that it has been considered.
4. Tables 4-3 and 4-4 state that the deepwater Significant Wave Height, Ho = 2.802 ft, but Table 4-2 states that Ho = 27.9 ft for the 10-year event. Explain?
5. Table 4-2 states that the "storm surge + spring tide + setup = 5.76 ft" for the 10-year event. These are supposed to be elevations above MSL. In Tables 4-3 and 4-4 it is stated that the depth at the structure's toe is ds = 5.8 ft, which one assumes should already include the 5.76 ft due to the storm surge as given above. Does this means that the fairweather water depth at the structure toe is just 5.8 – 5.76 = 0.04 ft?
6. In page A-12, bottom paragraph, it is stated that "To be conservative the maximum wave height allowable by the ACES system of 5.1 ft at the toe of the structure was selected for stone sizing, instead of the calculated incident wave height of 4.5 ft." But Tables 4-3 to 4-6 show that the

wave height used in the calculation of the stone weights and runup was 4.5 ft, not the just stated 5.1 ft. We must remember that the stone weight varies as the cube of the wave height.

7. On page A-14 it is stated that the present historical SLR for the San Juan tide gauge is 2.08 mm/year (0.006824 ft/year). But between 2010 and 2015 the actual rate was about three times higher than that value. And, though it is decreasing, it is still larger that the historical trend of 2.08 mm/year.
8. In page A-16 they use the NOAA Sea Level Rise Viewer to examine the Study Site under an increase of 6 ft in sea level, concluding that at least up to this value there is no concern. But it should be noted that the NOAA viewer shows only "bathtub" flooding. Dynamic flooding is not considered, nor the possibility of flooding due to the upwelling of the water table. These last two cases could make things more difficult to handle.
9. In page A-42 mention is made of gabions. But the placement of gabions should be avoided at all cost. It is just a matter of seeing the damage they have done all over the island.

GOBIERNO DE PUERTO RICO
Departamento de Recursos Naturales y Ambientales

MAY 1 1 2018

SRA LOIDA SOTO NOGUERAS
SECRETARIA
JUNTA DE PLANIFICACIÓN
P O BOX 41119
SAN JUAN PR 00940-1119

REC OGH 23 MAY '18 PM12:33

Attn: Ing. Arleen Reyes Rodríguez
Directora
Oficina de Geología e Hidrogeología

Estimada señora Soto:

Solicitud de Certificación de Compatibilidad Federal con el Programa de Manejo de la Zona Costanera de Puerto Rico

Proyecto para el Control de la Inundación Costera
Sector Parcelas Suárez
Bo. Medianía Baja, Loíza

CZ-2018-0411-033
O-CO-EJP04-SJ-00052-07052018

Hemos evaluado los documentos sometidos en relación con el asunto descrito en el epígrafe. Mediante carta del 20 de abril de 2018, la Junta de Planificación (JP) solicita los comentarios del Departamento de Recursos Naturales y Ambientales (DRNA) sobre la Solicitud de Certificación de Compatibilidad con el Programa de Manejo de la Zona Costanera de Puerto Rico (PMZCPR), presentada por el Cuerpo de Ingenieros del Ejército de los Estados Unidos (USACE), para realizar un proyecto con el fin de atender el problema de erosión existente en el litoral costero de Loíza, específicamente al norte de las Parcelas Suárez.

Según carta dirigida a la JP el 12 de marzo de 2018, el Plan Recomendado por el USACE para la acción propuesta consiste en la colocación de un revestimiento continuo de roca a lo largo de un segmento de playa de 1,050' (320 metros) lineales, cerca del cual ubican una de las calles de la comunidad y facilidades escolares y comunitarias. La cresta del revestimiento estará a 12.0' (3.66 metros) por encima del nivel del mar, expresado éste como el Datum Vertical de Puerto Rico de 2012 (PRVD 2012). Como parte del proyecto, se requerirá demoler el segmento remanente de la acera existente averiada por la acción del oleaje y reemplazarlo con una zona de protección de desbordes ("*over-wash protection zone*"). Esta zona de protección consistirá en una alfombra de refuerzo de césped de alto rendimiento ("*high performance*

MAY 1 1 2018

turf reinforcement mat"), colocada ("*keyed-in*") entre el revestimiento prospectivo y el camino municipal existente. El propósito del Plan Recomendado por el USACE es proteger la infraestructura pública existente de los daños continuos ocasionados por la erosión costera y las marejadas ciclónicas.

De la evaluación de la información presentada, se desprende que el proyecto es compatible y cumple con los requisitos del DRNA y con los objetivos y la política pública del PMZCPR, especialmente aquéllos relacionados con la protección y conservación de los recursos naturales.

A tales efectos, y en reconocimiento de la necesidad de realizar esta acción y de la situación apremiante que se requiere atender, el DRNA no tiene objeción a que la JP emita la Certificación de Compatibilidad Federal con el PMZCPR para este proyecto. Cabe señalar que, mediante carta al Distrito de Jacksonville, Florida, del USACE, suscrita por la Secretaria el 31 de enero de 2018, el DRNA reafirmó su apoyo al programa federal bajo el cual se estará llevando a cabo este proyecto.

No obstante, en lo referente a la demolición del remanente de la acera existente para reemplazarlo con la zona de protección de desbordes, la parte proponente deberá evitar que los materiales terrígenos y escombros removidos del lugar sean liberados al mar y ocasionen la afectación de los sistemas naturales marinos en los alrededores del litoral objeto de la prospectiva acción de control de erosión. De ocurrir la liberación de estos materiales y escombros al agua, deberá hacerse todo lo posible para que los mismos sean removidos rápidamente y se deberá disponer de éstos llevándolos a un vertedero de relleno sanitario u otra facilidad autorizada para la disposición final de desperdicios sólidos.

Además, la parte proponente deberá cumplir con cualesquiera otros requerimientos de agencias, autoridades, departamentos, corporaciones públicas u otras instrumentalidades de gobierno, con injerencia en el tipo de proyecto objeto de esta consulta.

Cordialmente,

Moisés Sánchez Loperena
Secretario Auxiliar
Secretaría Auxiliar de Permisos,
Endosos y Servicios Especializados

MSL/GIFS/LDBB/ldbb

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-0019

REPLY TO
ATTENTION OF

MAY 0 4 2018

Planning and Policy Division
Environmental Branch

Ms. Arleen Reyes Rodríguez, PE, MSCE, CFM
Coastal Zone Management Consistency Office
Puerto Rico Planning Board
P.O. Box 41119, Minillas Station
San Juan, Puerto Rico 00940

Dear Ms. Rodríguez:

This letter acknowledges the U.S. Army Corps of Engineers (Corps), Jacksonville District, receipt of your April 27, 2018 letter regarding the Coastal Zone Management Act coordination for the Draft Integrated Feasibility Report and Environmental Assessment for the Loíza Continuing Authorities Program Section 14 Project in Loíza, Puerto Rico. In that letter, the Puerto Rico Planning Board (PRPB) staff expressed concern regarding compliance of this Federal Activity with enforceable policies of the Puerto Rico Coastal Zone Management Program. Corps reviewed the concerns raised by the PRPB and prepared the enclosed responses.

Corps appreciates the input provided by the PRPB on this project. Any questions regarding this project should be directed to Ms. Kristen Donofrio at the letterhead address or by telephoning 904-232-2918.

Sincerely,

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch

Enclosure

Integrated Feasibility Report and Environmental Assessment (IFR/EA) for the Loíza Continuing Authorities Program (CAP) Section 14 Project in Loíza, Puerto Rico

U.S. Army Corps of Engineers (USACE) Responses to Puerto Rico Planning Board (PRPB) Coastal Zone Management Program Request for Additional Information

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Puerto Rico Planning Board (PRBP) requests for additional information are listed below in italics, and the U.S. Army Corps of Engineers, Jacksonville District (USACE) response is provided below each request.

1. The USACE must submit the Feasibility Report and Environmental Assessment document to OGPe as soon as possible, including received comments or comment request letters sent to the state agencies (PR Department of Natural and Environmental Resources, Environmental Quality Board, PR Culture Institute, and SHPO).

USACE will coordinate with the designated OGPe point of contact identified in PRBP's letter to provide a current copy of the Integrated Feasibility Report/Environmental Assessment (IFR/EA).

2. Please provide information about coordination with the Loíza Municipal Government and community outreach if available.

Based on a letter from the Municipality of Loíza, the Department of Natural and Environmental Resources (DNER) requested assistance from USACE in investigating hurricane and storm damage reduction alternatives for the Loíza shoreline on February 1, 2010. As a result of this request, a site visit was conducted and a trip report was prepared in 2010 under the Section 22 Water Resources Development Act 1974 (P.L. 93-251), as amended. The trip report verified a need for coastal storm damage reduction alternatives, which eventually resulted in the USACE recommending the proposed CAP Section 14 project. (The IFR/EA section 1.4 (Prior Reports and Studies) lists more regional reports and studies, some which date back as early as 1959.)

In addition to continuous engagement between the CAP Program Manager and the local sponsor, the most recent site visit to the proposed project area occurred on March 8, 2018. During the visit, USACE representatives explained the project's current status, purpose, and need as well as answered questions from Resident Commissioner Jenniffer González Colón, members of the Resident Commissioner's staff, the Mayor of Loíza, the Director of the Loíza Community Board, and interested community members. Following the visit, a Notice of Availability for the Proposed Finding of No Significant Impact, integrated report, and associated appendices was coordinated with pertinent agencies and interested stakeholders for a 30-day review and comment period (starting March 13, 2018 through April 13, 2018). The list of recipients includes: National Oceanic

and Atmospheric Administration-National Marine Fisheries Service, USACE, U.S. Coast Guard, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Municipality of Loíza, Loíza Community Board, DNER, Puerto Rican Culture Institute, Puerto Rico Economic Development Department, Puerto Rico Environmental Quality Board, Puerto Rico Fire Department, Puerto Rico Health Department, Puerto Rico National Guard, Puerto Rico Permits Management Agency, Puerto Rico Planning Board, Puerto Rico Public Service Commission, and the Puerto Rico State Historic Preservation Office. Comments on the draft documents as well as USACE responses are included in the final report's Environmental Appendix D-3. No comments were received from the Loíza Municipal Government or the community.

GOVERNMENT OF PUERTO RICO

Planning Board
Office of the Governor

April 27, 2018

Gina Paduano Ralph
Chief, Environmental Branch
U.S. Army Corps of Engineers, Jacksonville District
PO Box 4970
Jacksonville, Florida 32203-4412

Application for Federal Consistency Review
CZ-2018-0411-033
Loíza, Puerto Rico –CAP Section 14
Medianía Baja, Loíza

Dear Ms. Paduano:

We have been evaluating the documents submitted for the application at reference. According to our review, the application is considered complete and the Federal Consistency review period began on **March 13, 2018** date in which the application documents were received by e-mail. The number **CZ-2018-0411-033** has been assign for this review; please refer to it in your future communications.

The project at reference is a Federal Activity according to Federal Consistency regulations at 15 CFR Part 930. This regulation establishes a 60 day period to complete the Federal Consistency review for these activities. Therefore, for this application it will expire on **May 11, 2018**.

According to our initial review of the submitted Feasibility Report and appendices, the Puerto Rico Planning Board have the following concerns regarding the proposed Federal Activity:

1- The proposed Project must comply with Article 4B(3) of the Puerto Rico Environmental Policy Law. According to this law, before a proposing agency reaches a final decision regarding a proposed action or project, it shall comply with the Puerto Rico state process of environmental planning by issuing an environmental document, either establishing that the actions involved will have or not an environmental impact. According to applicable state procedures, the corresponding environmental document must be submit electronically at the PR Permit Management Office (OGPe) through ogpe.pr.gov. Projects that require compliance with the NEPA requirements and procedure can use the same environmental document to obtain the state compliance. Therefore, the USACE must submit the Feasibility Report and Environmental Assessment document to OGPe as soon as possible, including received comments or comment request letters send to the state agencies (PR Department of Natural and Environmental Resources, Environmental Quality Board, PR Culture Institute and SHPO).

This must be submitted electronically through **ogpe.pr.gov**. For any assistance with this procedure you may contact:

Jaime Green
Director
Environmental Compliance Division
PR Permit Management Office
Phone: 787-721-8282 ext. 16368
E-mail: jaimegreen@ogpe.pr.gov

2- Although this project addresses a problem that affects the Loíza community, it will have a significant impact in this coastal area, especially in the beach and recreational uses. Therefore, the Loíza community must be informed and have the opportunity to comment on this project. Please provide information about coordination with the Loiza Municipal Government and community outreach if available.

As part of the established procedures for Federal Consistency review, the Puerto Rico Planning Board (PRPB) must provide adequate means for public participation. The PRPB edited a public notice in Spanish and English that was sent by mail (notified) on April 23, 2018. The PRPB granted 15 days to submit comments. In order to provide the required public participation the PRPB requests an extension of **15 labor days**, until June 4, 2018, to conclude the Federal Consistency review of this project. The proposed work schedule is as follows:

Date	Task
April 23, 2018 to May 10, 2018	Public notice disclosure and comment period for the consulted agencies and public.
May 11, 2018 to May 18, 2018	Evaluation of received comments. If the consulted agencies and public raise concerns or provide recommendations, the PRPB will provide copy of the received letters to the USACE to address it. If the consulted agencies do not present concerns or matters to be addressed, the Puerto Rico Planning Board will proceed directly with the final evaluation and include the case in the PRPB agenda for presentation to emit the Federal Consistency Concurrence Determination (FCCD).
May 21, 2018 to June 4, 2018	Final evaluation including USACE comments or additional information, PRPB presentation to emit the FCCD and edition and disclosure of the official document.

Please indicate as soon as possible if the U.S. Army Corps of Engineers agree with the above mentioned work schedule and requested extension. If you have any question or need assistance, do not hesitate to contact Rose A. Ortiz at (787) 722-0101, ext. 16012 or e-mail: ortiz_r@jp.pr.gov

Thanks for your cooperation with our Program.

Cordially,

Arleen Reyes Rodríguez, PE, MSCE, CFM
Director
Geology and Hydrogeology Office

c Ernesto Díaz, PRCZMP, DNER

GOBIERNO DE PUERTO RICO
OFICINA DEL GOBERNADOR
JUNTA DE PLANIFICACION

DESPACHADO
23 APR 2018
UNIDAD DE CORREO

AVISO PUBLICO

Solicitud de Certificación de Compatibilidad Federal
Proyecto de Medidas para el control de Erosión en Loíza
Loiza Section 14 CAP Project
CZ-2018-0411-033

A quien pueda interesar: En conformidad con las Secciones 306 (d) 14 y 307 (3) (A) de la Ley Federal de Manejo de la Zona Costanera del 27 de octubre de 1972 según enmendada, queremos informarle que la Junta de Planificación tiene ante su consideración la siguiente solicitud de Certificación de Compatibilidad Federal con el Programa de Manejo de la Zona Costanera de Puerto Rico (PMZCPR):

Proponente: Cuerpo de Ingenieros del Ejército de Estados Unidos (USACE, por sus siglas en inglés)

Descripción y Propósito del Proyecto: El USACE propone llevar a cabo la construcción de un proyecto conocido como "Loiza Section 14 CAP" para atender el problema de erosión existente en una zona del litoral costero del Municipio de Loíza. La Sección 14 de la Ley de Control de Inundaciones de 1946, según enmendada, prevé para la implantación de proyectos para proteger las instalaciones públicas y las instalaciones propiedad de organizaciones sin fines de lucro que se utilizan para proporcionar servicios públicos. El propósito del proyecto es proporcionar protección de emergencia en la línea costera que se extiende a lo largo de aproximadamente 1,050 pies lineales en la costa de Loiza. Los huracanes, las tormentas costeras y el proceso de erosión consistente que se ha dado en la costa de Loíza han impactado significativamente el litoral costero de las Parcelas Suarez constituyendo un peligro a la seguridad pública y amenazando la integridad de la vía pública, la escuela, parques públicos, casas privadas y el acceso recreativo a la playa Luego del análisis de cinco (5) alternativas, el USACE determinó que la mejor alternativa para proveer la protección requerida en esa área es construir un revestimiento de roca continuo a lo largo del área de 1,050 pies lineales, ubicada al frente de la escuela, el Centro Comunal y la calle Punta del Atlántico.

Localización del proyecto: El área del proyecto se ubica al norte de la calle Punta del Atlántico y el Centro Comunal de las Parcelas Suarez, Barrio Medianía Baja en Loíza, Puerto Rico.

Método de construcción: El revestimiento de piedra se construirá colocando rocas con el peso, tamaño y arreglo adecuado de acuerdo a los estudios de campo e información recopilada sobre la geomorfología y comportamiento de las olas en el área. Los detalles sobre las alternativas evaluadas y el diseño conceptual de la estructura propuesta se encuentran en el apéndice A(Engineering) del "Integrated Feasibility Report and Environmental Assessment" radicado por el Cuerpo de Ingenieros como parte de esta solicitud.

Impacto sobre los Recursos Naturales: De acuerdo al análisis provisto en el documento ambiental (Integrated Feasibility Report and Environmental Assessment), la alternativa seleccionada conllevará pérdida de vegetación dentro de la huella del revestimiento propuesto y habrá impacto temporero de ruido por las actividades de construcción. El Proyecto no afectará el habitat de anidaje de las tortugas marinas, tomando en consideración el hecho de que la playa en el sitio del proyecto está muy erosionada. En función de las condiciones existentes, es poco probable que esta sección de la playa se utilice actualmente para la actividad de anidación.

Impacto sobre los Recursos Culturales e Históricos: Los archivos de la Oficina de Preservación Histórica del Estado de Puerto Rico (SHPO) fueron consultados para identificar recursos culturales conocidos en y cerca del área del proyecto. De acuerdo a la base de datos de dicha agencia, no se identificaron recursos de valor cultural dentro del área a ser impactada por el proyecto. En febrero del 2017, el arqueólogo del USACE llevo a cabo un reconocimiento visual del área para identificar recursos de valor cultural y arqueológico en el área. Como resultado de esta evaluación no se identificaron materiales de valor arqueológico en el área. La escuela y el Centro comunal de las Parcelas Suarez fueron construidas entre el año 1977 al 1978. Aunque estas estructuras muestran características únicas de diseño las mismas no han adquirido significancia dentro de los pasados 50 años como para ser consideradas elegibles para incluirse dentro del Registro Nacional de Lugares Históricos según definidos por la reglamentación 36 CFR 60.4.

La documentación radicada referente a esta solicitud estará disponible a partir de la fecha de notificación de este aviso para su revisión de compatibilidad con las políticas públicas del Programa de Manejo de Zona Costanera de P.R. en las oficinas del **Programa de Planificación Física de la Junta de Planificación, ubicado en el Piso 15 del edificio Norte del Complejo Gubernamental Roberto Sanchez Vilella (Minillas Norte), en un horario de 8:00 AM a 4:30 PM, de lunes a viernes**. Además, los documentos de esta solicitud están disponibles para revisión del público a través del portal de la Junta de Planificación, *bajo **"Certificación de Compatibilidad Federal"** en la dirección: **http://jp.pr.gov***

Para presentar comentarios referentes a esta solicitud tendrá un período de **quince (15) días** a partir de la fecha de notificación de este aviso. Todo comentario deberá dirigirse por escrito a través de correo regular o correo electrónico a:

Oficina de la Secretaria
Junta de Planificación
P.O. Box 41119
San Juan, Puerto Rico 00940-1119

Dirección de correo electrónico: comentariosjp@jp.pr.gov

Favor de hacer referencia al número de la solicitud en su correspondencia. Para cualquier pregunta referente a este asunto puede comunicarse con la Unidad de Zona Costanera al (787)-723-6200 ext. 16012 o a través de correo electrónico a: ortiz_r@jp.pr.gov

Certifico y Notifico hoy: 3 ABR 2018

Loida Soto Nogueras
Secretaria

GOBIERNO DE PUERTO RICO
OFICINA DEL GOBERNADOR
JUNTA DE PLANIFICACIÓN

PUERTO RICO GOVERNMENT
GOVERNOR'S OFFICE
PUERTO RICO PLANNING BOARD

PUBLIC NOTICE

Application for Federal Consistency Certification with the P.R. Coastal Zone Management Program
Loiza Section 14 CAP Project
CZ-2018-0411-033

According to sections 306(d) 14 and 307(3)(A) of the Coastal Zone Management Act of 1972, as amended, and applicable Federal Consistency Regulations at 15 CFR Part 930, the Puerto Rico Planning Board informs that the following project is under Federal Consistency review with the P.R. Coastal Zone Management Program:

Applicant: U.S. Army Corps of Engineers (USACE)

Description and purpose of the project: The USACE proposes to carry out the construction of a protection measure to address the shoreline erosion problem along the coast of Loiza. Section 14 of the Flood Control Act of 1946, as amended, provides for implementation of projects to protect public facilities and facilities owned by non-profit organizations that are used to provide public services. The purpose of the Loiza Section 14 CAP Project is to provide emergency shoreline protection to the approximately 1,050 feet of the Loiza shoreline. Hurricane and coastal storm damages along the Loiza shoreline, including erosion causing receding shorelines, contribute to public safety hazards and threaten existing infrastructure such as a public road, public school, public parkland, private homes, and recreational beach access. After the analysis of five (5) alternatives, the USACE determined that the best alternative to provide the protection required in that area is to build a continuous rock covering along an area of 1,050 linear feet, located in front of the school, the Community Center and the Punta del Atlántico street.

Location: The project area is located north of Punta del Atlántico Street and the Suarez Parcel Community Center, at Medianía Baja Ward in Loíza, Puerto Rico.

Construction Method: The proposed stone revetment will be constructed by placing rocks with the appropriate weight, size and arrangement according to the field studies and information gathered on the geomorphology and behavior of the waves in the area. Details on evaluated alternatives and the conceptual design of the proposed structure can be found in appendix A (Engineering) of the "Integrated Feasibility Report and Environmental Assessment" filed by the USACE as part of this application.

Impact on Natural Resources: According to the analysis provided in the Integrated Feasibility Report and Environmental Assessment document, the selected alternative will lead to vegetation loss within the proposed revetment footprint and there will be temporary noise impact from the construction activities. The beach at the Project site is highly eroded and based on the existing conditions it is unlikely that this section of the beach will be used for sea turtle nesting activity. Any nests at the project site's beach would be lost to the high tide.

Impacts on Cultural and Historic Resources: The archives of the PR State Historic Preservation Office (SHPO) were consulted to identify known cultural resources in and near the project area. According to the database of this agency, no resources of cultural value were identified within the area to be impacted by the project. In February 2017, the USACE archaeologist carried out a visual reconnaissance of the area to identify resources of cultural and archaeological value. As result of this evaluation, no materials of archaeological value were identified.

The school and the Community Center of Parcelas Suarez were built between 1977 to 1978. Although these structures show unique design characteristics, it have not acquired significance within the past 50 years to be considered eligible for inclusion in the National Registry of Historic Places as defined by regulation 36 CFR 60.4.

The documents related to this application will be available for public review in the **Office of Geology and Hydrogeology of the Puerto Rico Planning Board, located in the Physical Planning Program at floor 15 of the Roberto Sanchez Vilella Government Building, north tower, during regular office hours, Monday through Friday from 8:00 AM to 4:30 PM**. The documents will also be available at the Puerto Rico Planning Board web page, under ***"Certificación de Compatibilidad Federal"*** at **http://jp.pr.gov**

Comments must be submitted within a period of **fifteen (15) days from this public notice notification**. Any comment or information in relation to this case must be submitted in writing by regular mail or e-mail to the following addresses:

Secretary Office
Puerto Rico Planning Board
PO Box 41119
San Juan, Puerto Rico 00940-1119

E-mail Address: comentariosjp@jp.pr.gov

Please, refer to the application number in your comment letter. For any question or orientation in relation to this case, you may contact Rose A. Ortiz at (787) 723-6200, extension 16012, or send an e-mail to: ortiz_r@jp.pr.gov

I Certify and Notify today: 3 ABR 2018

Loida Soto Nogueras
Secretary

GOBIERNO DE PUERTO RICO
OFICINA DEL GOBERNADOR
JUNTA DE PLANIFICACIÓN

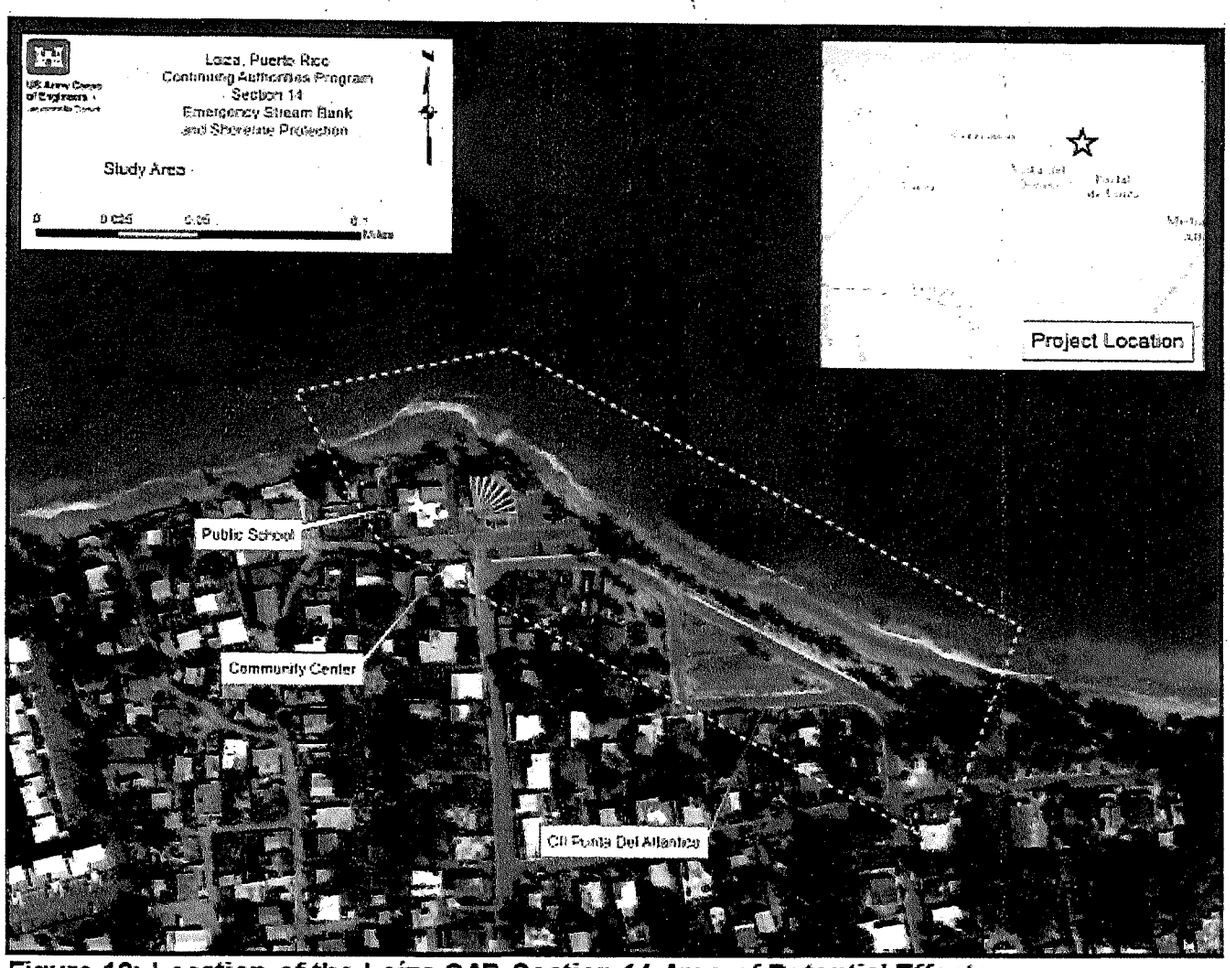


Figure 12: Location of the Loíza CAP Section 14 Area of Potential Effects.

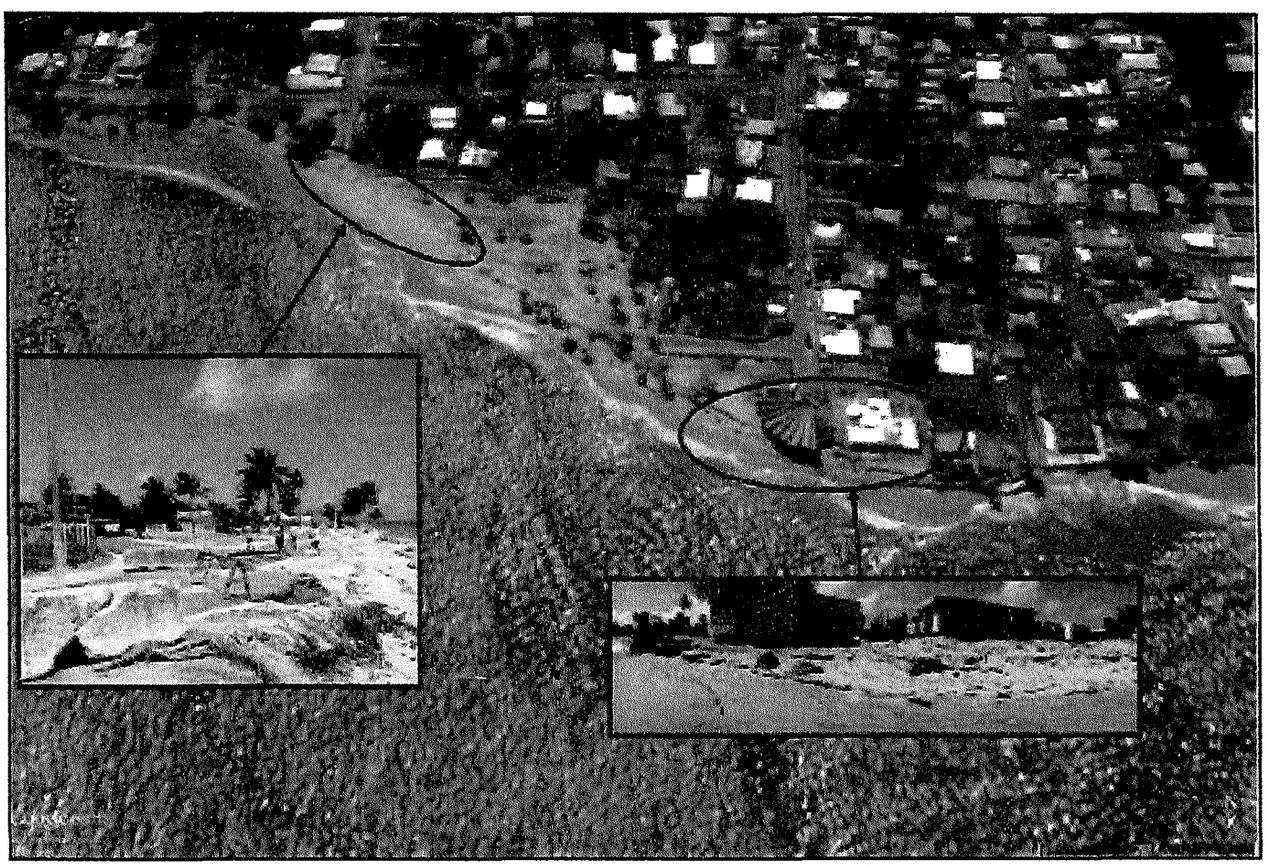
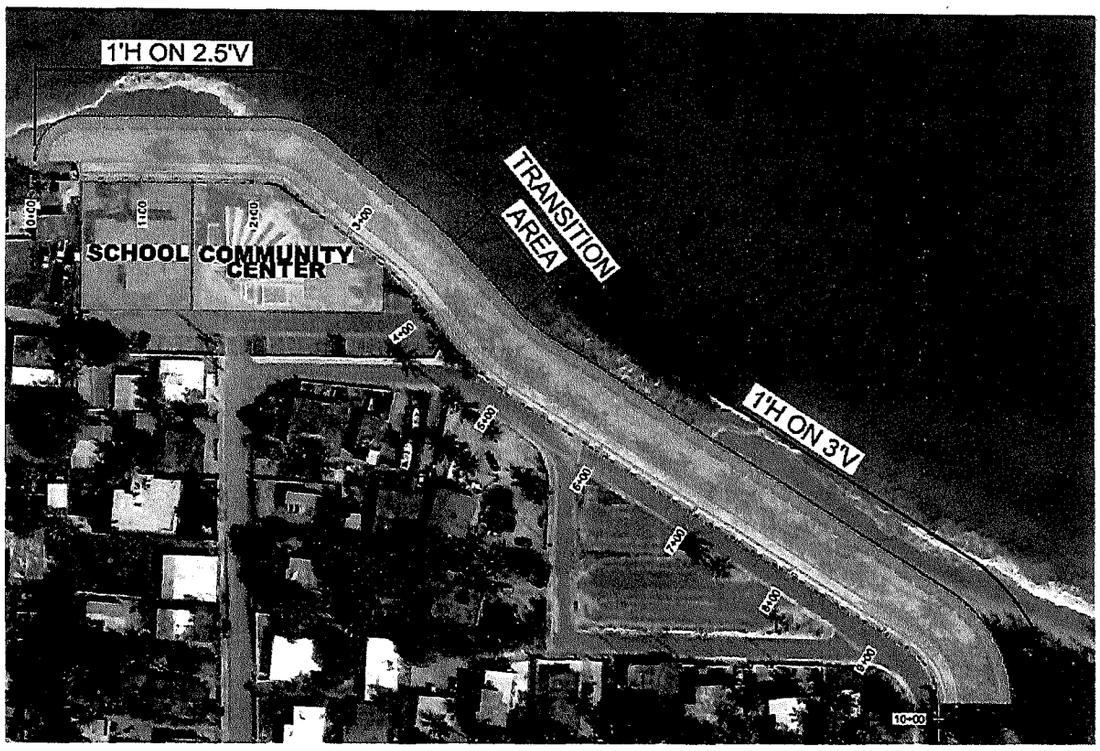
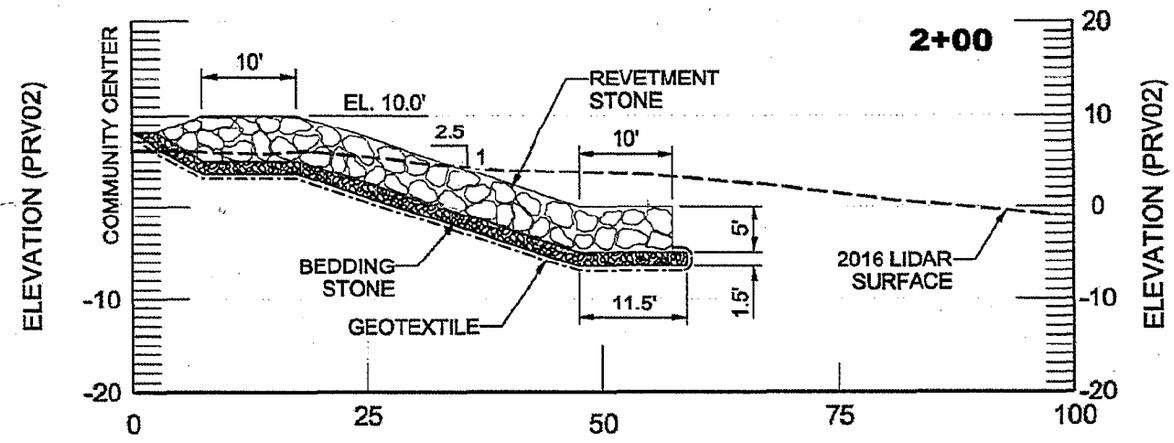


Figure 2: Shoreline Damage in the Study Area at Loíza Pre-Hurricane Irma


1'H ON 2.5'V
SCHOOL COMMUNITY CENTER
TRANSITION AREA
1'H ON 3'V


2+00
COMMUNITY CENTER
ELEVATION (PRV02)
10'
EL. 10.0'
2.5
1
REVETMENT STONE
10'
5'
1.5'
11.5'
BEDDING STONE
GEOTEXTILE
2016 LIDAR SURFACE
20
10
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-10
-20
0
25
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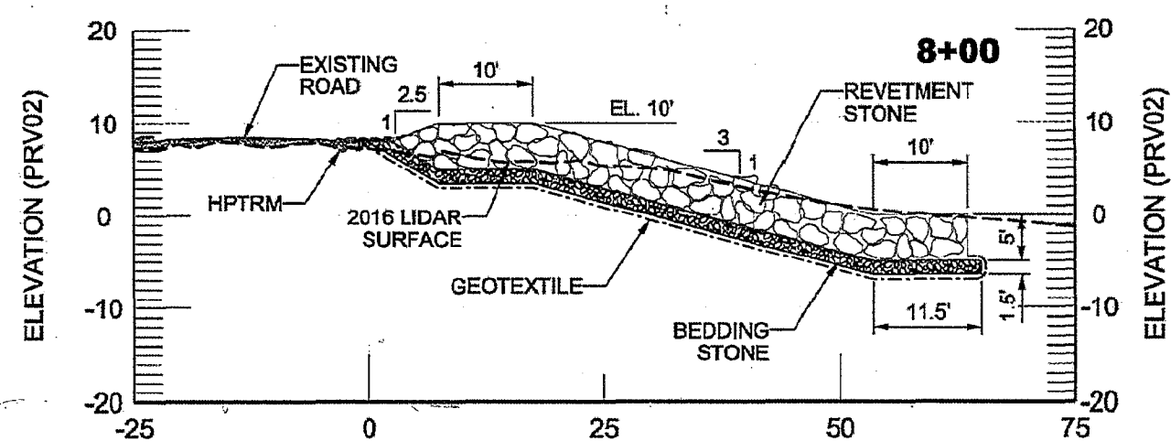
75
100


8+00
ELEVATION (PRV02)
EXISTING ROAD
2.5
1
10'
EL. 10'
3
1
REVETMENT STONE
10'
5'
1.5'
11.5'
HPTRM
2016 LIDAR SURFACE
GEOTEXTILE
BEDDING STONE
20
10
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-20
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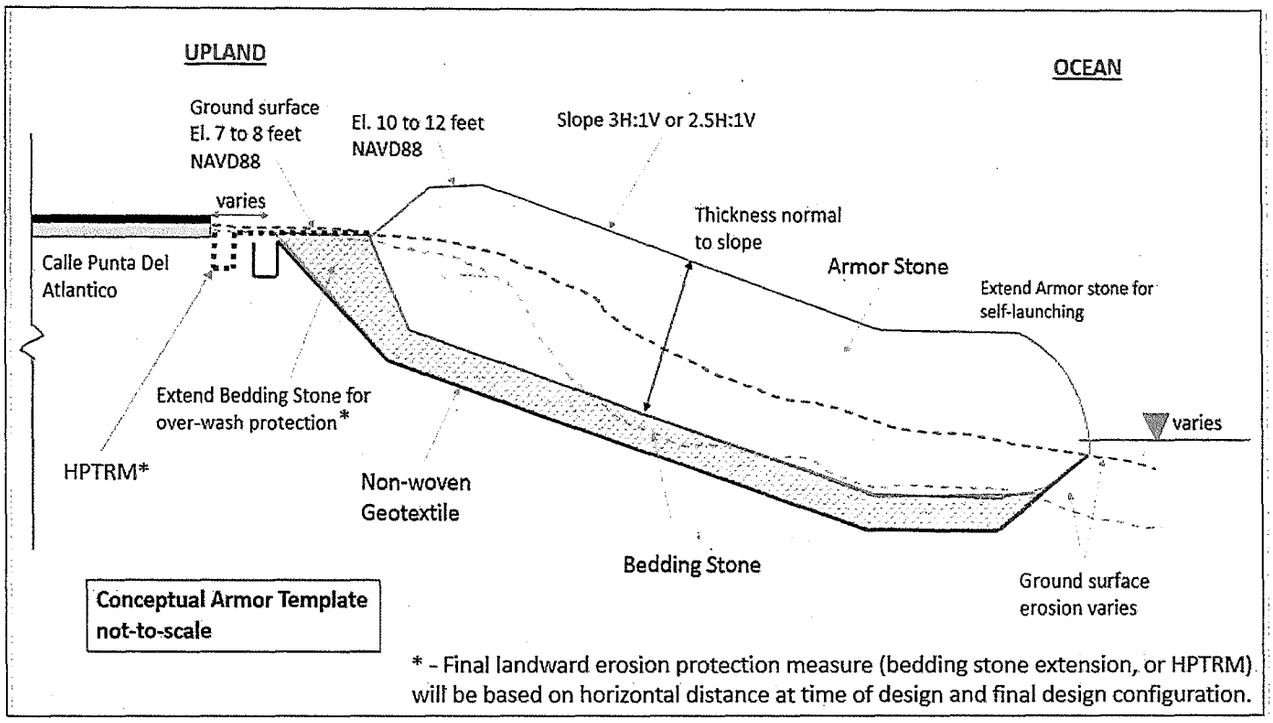


GOBIERNO DE PUERTO RICO
OFICINA DEL GOBERNADOR
JUNTA DE PLANIFICACIÓN

JP-815-RS
JUN 2003

Gobierno de Puerto Rico
Oficina del Gobernador
Junta de Planificación

CERTIFICACION DE NOTIFICACIONES

DESPACHADO
23 APR 2019
UNIDAD DE CORREO

Sello del Correo de la Junta de Planificación

Certifico que, las siguientes personas y/o Agencias u Oficinas han sido notificadas mediante Resolución, del acuerdo tomado por la Junta de Planificación con relación al

Caso Número: CZ-2018-0411-033 **Página: 1 de 3**

	NOMBRE	DIRECCION
1)	KRISTEN L. SCHELER REPRESENTANTE	U.S. ARMY CORPS OF ENGINEERS PO BOX 4970 JACKSONVILLE FL 32232-0019
2)	GINA PADUANO RALPH DUEÑO	U.S. ARMY CORPS OF ENGINEERS PO BOX 4970 JACKSONVILLE FL 32232-0019
3)	CARLOS RUIZ CORTES DIRECTOR EJECUTIVO INSTITUTO DE CULTURA PUERTORRIQUEÑA	APARTADO 9024184 SAN JUAN PR 00902-4184
4)	FERNANDO GIL ESEÑAT SECRETARIO DEPARTAMENTO DE LA VIVIENDA	PO BOX 21365 SAN JUAN PR 00928-1365
5)	HON. JULIA NAZARIO ALCALDESA MUNICIPIO DE LOIZA	PO BOX 508 LOIZA PR 00772-0508
6)	LCDA. TANIA VAZQUEZ PRESIDENTA JUNTA DE CALIDAD AMBIENTAL	PO BOX 11488 SAN JUAN PR 00910-2604
7)	SINDULFO CASTILLO CUERPO DE INGENIEROS DEL EJERCITO	ANNEX BUILDING, FUNDACION ANGEL R 2ND FLOOR SUITE 202 AVE ROOSEVELT SAN JUAN PR 00918
8)	SR. CARLOS RUBIO CANCELA DIRECTOR EJECUTIVO OFICINA ESTATAL DE CONSERVACION HISTORICA	PO BOX 9023935 SAN JUAN PR 00902-3935
9)	TANIA VAZQUEZ RIVERA SECRETARIA DEPARTAMENTO DE RECURSOS NATURALES Y AMBIENTALES	PO BOX 366147 SAN JUAN PR 00936
10)	DIRECTOR EJECUTIVO PROGRAMA DEL ESTUARIO DE LA BAHIA DE SAN JUAN	PO BOX 9509 SAN JUAN PR 00908-9509
11)	FRENTE LOICEÑOS UNIDOS (FLU)	PO BOX 178 LOIZA PR 00772-0178
12)	SRA. ROSE ORTIZ UNIDAD DE ZONA COSTANERA JUNTA DE PLANIFICACION	PO BOX 41119 MINILLAS STATION SAN JUAN PR 00940-1119
13)	SUSAN SILANDER ACTING FIELD SUPERVISOR US FISH & WILDLIFE SERVICE	CARIBBEAN FIELD OFFICE PO BOX 491 BOQUERON PR 00622-0491
14)	JOSE A. RIVERA - MARINE FISHERIES BIOLOGIST JOSE A. RIVERA - MARINE FISHERIES BIOLOGIST	NATIONAL MARINE FISHERIES SERVICE 400 AVE. FERNANDEZ JUNCOS SAN JUAN PR 00901
15)	AIDA RAMOS CEDENO	299 CALLE 11 PARCELAS SUAREZ LOIZA PR 00772
16)	ARRECIFES PRO CUIDAD INC.	PACO LOPEZ 6981 COND. PINE GROVE APT. 11 A CAROLINA PR 00979
17)	AURELIO MERCADO IRIZARRY	PHYSICAL OCENANOGRAPHY LAB CALL BOX 9000 DEPT. OF MARINE MAYAGÜEZ PR 00680
18)	CANGREJOS YACHT CLUB	PO BOX 6478 LOIZA STATION SANTURCE PR 00914

JP-815-RS
JUN 2003

Gobierno de Puerto Rico
Oficina del Gobernador
Junta de Planificación

CERTIFICACION DE NOTIFICACIONES

Sello del Correo de la Junta de Planificación

Caso Número: CZ-2018-0411-033

	NOMBRE	DIRECCION
19)	CHARLENE ALKA CASTILLO	303 CALLE 11 PARCELAS SUAREZ LOIZA PR 00772
20)	COMITE PRO DESARROLLO VILLA CANONA, INC.	RAFAEL RIVERA RIVERA HC-01 BOX 8948 LOIZA PR 00772
21)	CONSEJO PARA LA CONSERVACION DE SITIOS Y RECURSO	ARQUEOLOGICOS SUBACUATICOS PO BOX 9024184 SAN JUAN PR 00902-4184
22)	DOLORES RIVERA VEGA	5 CALLE 10 PARCELAS SUAREZ LOIZA PR 00772
23)	ERNESTO DIAZ	PROGRAMA MANEJO ZONA COSTANERA PO BOX 366147 SAN JUAN PR 00936
24)	ESCUELA DE ASUNTOS AMBIENTALES DE LA UMET	ALEX RODRIGUEZ - COORD. ESTUDUANT PO BOX 21150 SAN JUAN PR 00928-1150
25)	ESCUELA GRADUADA DE SALUD AMBIENTAL DE LA UPR-RCM	DR. J. SEGUINOT PO BOX 365067 SAN JUAN PR 00936-5067
26)	FERNANDO ALVARADO MUNOZ	ARQUELOGO CONSULTOR INDEPENDIEN HC-03 BPOX 10608 JUANA DIAZ PR 00795-9501
27)	FLORENTINO SANTANA CARRASQUILLO	297 CALLE 11 PARCELAS SUAREZ LOIZA PR 00772
28)	FRANCISCO CARABALLO ORTIZ	6 CALLE 10 PARCELAS SUAREZ LOIZA PR 00772
29)	HECTOR RUIZ	BIOLOGO MARINO PO BOX 1126 HORMIGUEROS PR 00660
30)	INICIATIVA PARA UN DESARROLLO SUSTENTABLE	LUIS JORGE RIVERA HERRERA PO BOX 9367704 SAN JUAN PR 00936-7704
31)	JESUS VEGA	VALLE ARRIBA HEIGHTS CALLE NOGAL AL4` CAROLINA PR 00983-3412
32)	JORGE E. CAPELLA	PROGRAMA CARICOOS PO BOX 3446 LAJAS PR 00667
33)	JUAN GONZALEZ LOPEZ	PO BOX 324 BOQUERON CABO ROJO PR 00622
34)	LUZ CARRASQUILLO PIZARRO	289 CALLE 1 PARCELS SUAREZ LOIZA PR 00772
35)	MARCOS CARRASQUILLO PIZARRO	296 CALLE 11 PARCELAS SUAREZ LOIZA PR 00772
36)	MARIA VILLANUEVA OSORIO	293 CALLE 2 PARCELAS SUAREZ LOIZA PR 00772

JP-815-RS
JUN 2003

Gobierno de Puerto Rico
Oficina del Gobernador
Junta de Planificación

CERTIFICACION DE NOTIFICACIONES

Sello del Correo de la Junta de Planificación

Caso Número: **CZ-2018-0411-033**

	NOMBRE	DIRECCION
37)	MARITZA BARRETO - ESC. GRAD. PLANIF. UPRRP	URB. ENTRERIOS ER 92, VIA ENRAMADA TRUJILLO ALTO PR 00976
38)	MATINA OSORIO FERNANDEZ	294 CALLE 1 PARCELAS SUAREZ LOIZA PR 00772
39)	MIGUEL CANALS	PO BOX 1254 RINCON PR 00677
40)	OLGA VICTORIA CALDERON ROBLES	38 A CALLE 10 PARCELAS SUAREZ LOIZA PR 00772
41)	RAFEL PIZARRO - ASOC. PESCADORES BOCA HERRERA	HC-01 BOX 4655 BO. MEDIANIA ALTA, SECTOR COLOBO LOIZA PR 00772
42)	RUPERTO CHAPARRO SERRANO	DIR. PROG. SEA GRANT PO BPOX 9011 MAYAGÜEZ PR 00681-9011
43)	SAMUEL E. SULEIMAN RAMOS	SOCIEDAD AMBIENTE MARINO PO BOX 22158 SAN JUAN PR 00931-215
44)	SOCIEDAD DE HISTORIA NATURAL DE PR	PO BOX 361036 SAN JUAN PR 00936-9103
45)	YEIDI M. ESCOBAR DEL VALLE	OFIC. PLANIF. Y DESARROLLO LOIZA PO BOX 508 LOIZA PR 00772
46)	ZAIDA L. CASTILLO VICENTE	7 CALLE 10 PARCELAS SUAREZ LOIZA PR 00772

Cantidad de Notificaciones: **46**

Edgardo Vazquez Rivera

Fecha de Notificación
y Archivo en Autos

Funcionario que Notifica

Loida Soto Nogueras

CERTIFICO: **Loida Soto Nogueras**
Secretaria

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 San Marco Boulevard
JACKSONVILLE, FLORIDA 32207-8175

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

MAR 12 2018

Ms. Rose Ortiz
Coastal Zone Management Consistency Office
Puerto Rico Planning Board
P.O. Box 41119, Minillas Station
San Juan, Puerto Rico 00940

Dear Ms. Ortiz:

Enclosed with this letter is the U.S. Army Corps of Engineers, Jacksonville District (Corps) Federal Consistency Determination for the Loiza section 14 Continuing Authorities Program Project. The Loiza Project is located in the Municipality of Loiza in Puerto Rico. The purpose of the project is to protect existing public infrastructure along the Loiza shoreline from erosion and storm damages. The Recommended Plan consists of the placement of a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, head start public school, and community center (Figure 1).

Figure 1. Study Area of Loiza, Puerto Rico.

Elevation of the revetment crest would be 12.0-ft (Puerto Rico Vertical Datum (PRVD) 2002). The remaining sidewalk may need to be demolished due to existing damages and replaced with the over-wash protection zone, which consists of high performance turf reinforcement mat keyed in between the existing road and revetment. By constructing the Recommended Plan, the existing public infrastructure will be protected from the continued erosion and storm damages.

Additional information, including a copy of the draft Integrated Feasibility Report and Environmental Assessment and associated appendices, will be available for review on the Corps' environmental planning website, under Puerto Rico. For your convenience, the website link is: http://www.saj.usace.army.mil/About/Divisions-Offices/Planning/Environmental-Branch/Environmental-Documents/

The Corps has determined that the proposed federal action is consistent to the maximum extent practicable with the enforceable policies of Puerto Rico's Coastal Zone Management Program. The Corps respectfully requests a letter of concurrence with our Federal Consistency Determination within 30 days of the date of this letter for the Loiza Project.

If you have any questions, or need additional information, please contact Kristen Scheler by email Kristen.L.Scheler@usace.army.mil or telephone 904-232-2918. Thank you for your assistance.

Sincerely,

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch

Enclosure

JP-833
Rev. MAR 2005

Commonwealth of Puerto Rico
Office of the Governor
Puerto Rico Planning Board
Physical Planning Area
Land Use Planning Bureau

Application for Certification of Consistency with the Puerto Rico Coastal Management Program

General Instructions:

A. Attach a 1:20,000 scale, U.S. Geological Survey topographic quadrangular base map of the site.

B. Attach a reasonably scaled plan or schematic design of the proposed object, indicating the following:

1. Peripheral areas

2. Bodies of water, tidal limit and natural systems.

C. You may attach any further information you consider necessary for proper evaluation of the proposal.

D. If any information requested in the questionnaire does not apply in your case, indicate by writing "N/A"(not applicable).

E. Submit a minimum of seven (7) copies of this application.

DO NOT WRITE IN THIS BOX

Type of application: _____ Application Number: _____

Date received: _____ Date of Certification: _____

Evaluation result: ☐ Objection ☐ Acceptance ☐ Negotiation

Technician: _____ Supervisor: _____

Comments: _____

1. Name of Federal Agency: US Army Corps of Engineers, Jacksonville District

2. Federal Program Catalog Number: _____

3. Type of Action:

☑ Federal Activity ☐ License or permit ☐ Federal Assistance

4. Name of Applicant: Gina Paduano Ralph, Ph.D., Chief, Environmental Branch

Postal Address: P.O. Box 4970, Jacksonville, FL 32232-0019

Telephone: 904-232-2336 Fax: 904-232-3442

5. Project name: Loiza section 14 Continuing Authorities Program (CAP) Project

6. Physical Description of Project Location (area, facilities such as vehicular access, drainage, storm and sanitary sewer placement, etc.): See attachment 2.

Lambert Coordinates: X = 18.434939 Y = 65.853411

7. Type of construction or other work proposed:

☐ drainage ☐ channeling ☐ landfill ☐ sand extraction

☐ pier ☐ bridge ☐ residential ☐ tourist

others (specify and explain) Continuous rock revetment along approximately 1,050 feet of Loiza shoreline

Description of proposed work: See attachment 2.

8. Natural, artificial, historic or cultural systems likely to be affected by the project

Place an X opposite any of the systems indicated below that are in the project area or its surroundings, which are likely to be affected by that activity. Indicate the distance from the project to any outside system that would likely be affected.

System	Within Project	Outside Project	Distance (meters)	Local name of affected system
beach, dunes	X			Loiza shoreline within the project footprint
marshes				
coral, reefs				
river, estuary				
bird sanctuary				
pond, lake, lagoon				
agricultural unit				
forest, wood				
cliff, breakwater				
cultural or tourist area	X			Loiza recreational beach access within the project footprint
other (explain)				

Describe the likely impact of the project on the identified system (s).

Positive ☐ Negative ☐

Explain:

Beach recreation is limited due to the shoreline erosion. No in-water work is required to construct this project; however, portions of the construction will occur on and adjacent to the shoreline, which may have temporary impacts to beach access and usage. No long-term effect to the beach or access to the beach is anticipated following construction completion.

9. Indicate permits, approvals and endorsements of the proposal by Federal and Puerto Rican government agencies. Evidence of such support should be attached to the proposal.

See attachment 1 for detailed information.	Yes	No	Pending	Application Number
a. Planning Board	☐	☐	☑	
b. Regulation and Permits Administration	☐	☐	☑	
c. Environmental Quality Board	☐	☐	☑	
d. Department of Natural Resources	☐	☐	☑	
e. State Historic Preservation Office	☐	☐	☑	
f. U.S. Army Corps of Engineers	☐	☑	☐	
g. U.S. Coast Guard	☐	☑	☐	
h. Other (s) (specify)	☐	☐	☐	

CERTIFICATION

I CERTIFY THAT (project name) Loiza section 14 CAP project is consistent with the Puerto Rico Coastal Zone Management Program, and that to the best of my knowledge the above information is true.

Gina Paduano Ralph, Ph.D.
Name (legible)

Signature

Chief, Environmental Branch
Position

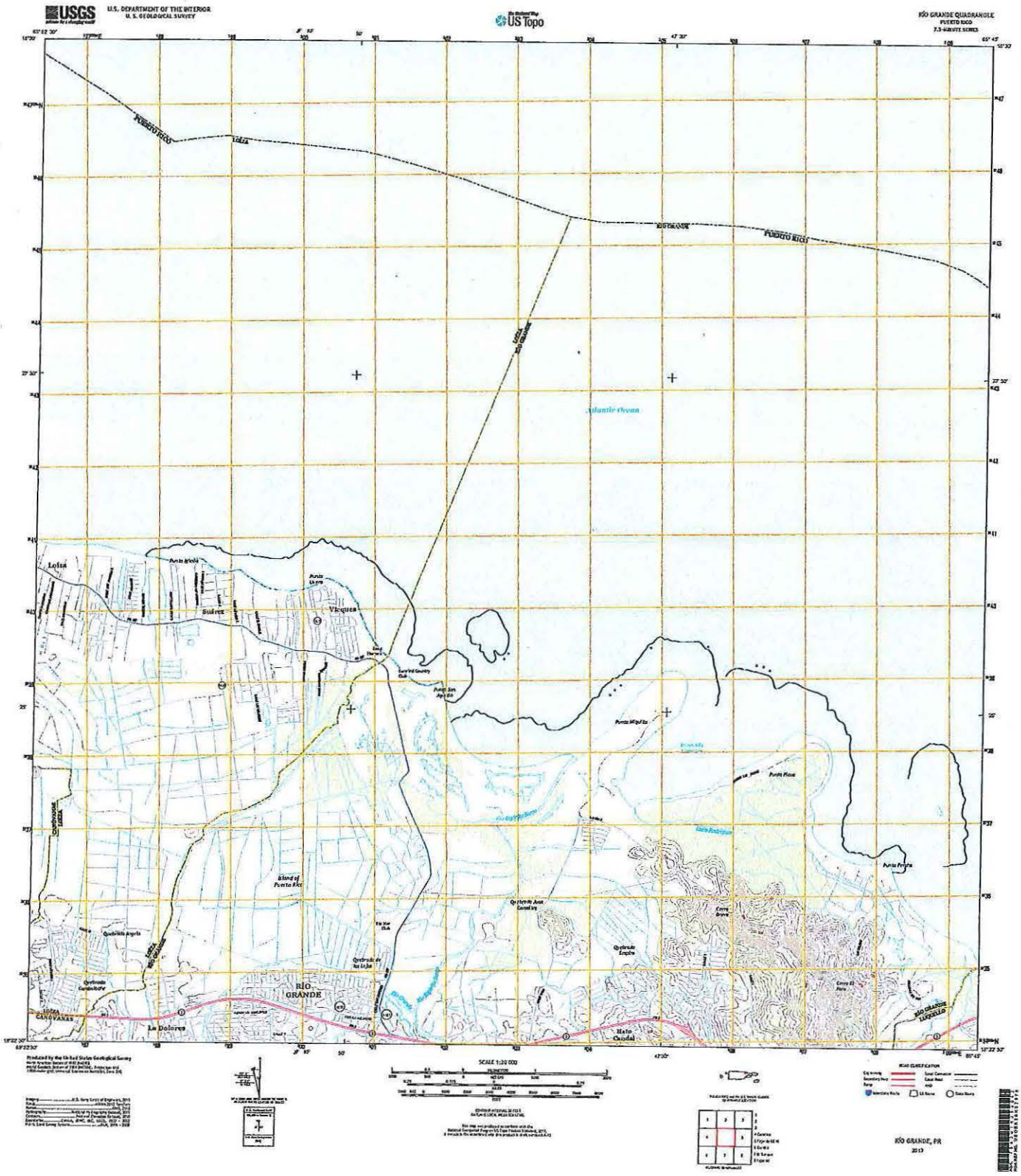
2/1/18
Date

Attachment 1

Loiza Section 14 Continuing Authorities Program (CAP) project

General Instructions A:

U.S. Geological Survey Topographic Quadrangular Base Map of the Site


USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
US Topo
RÍO GRANDE QUADRANGLE
PUERTO RICO
7.5-MINUTE SERIES
PUERTO RICO
LOÍZA
RÍO GRANDE
PUERTO RICO
Atlantic Ocean
Loíza
Vieques
Sidrón
Punta Grande
Punta Lupo
Punta San Agustín
Punta Miguelito
Punta Flora
Punta Pelícano
Punta Pelícano
Punta Pelícano
Island of Puerto Rico
Quebrada Angola
Quebrada Sandalio
Quebrada Jaca
Quebrada Angola
Cerro Grande
Cerro El Pozo
RÍO GRANDE
LOÍZA
CANÓVANAS
La Dolores
Hato Candal
RÍO GRANDE
LUQUILLO
SCALE 1:20 000
RÍO GRANDE, PR
2013

6. Physical Description of Project Location (area, facilities such as vehicular access, drainage, storm and sanitary sewer placement, etc.):

Loiza is located on Puerto Rico's northern Atlantic Coast, approximately 16 miles east of San Juan, Figure 1. The study area includes a community center, a head start public school, and a public roadway with a combined shoreline frontage of approximately 1,050 feet within the Municipality of Loiza, Puerto Rico (see **Figure 1**).

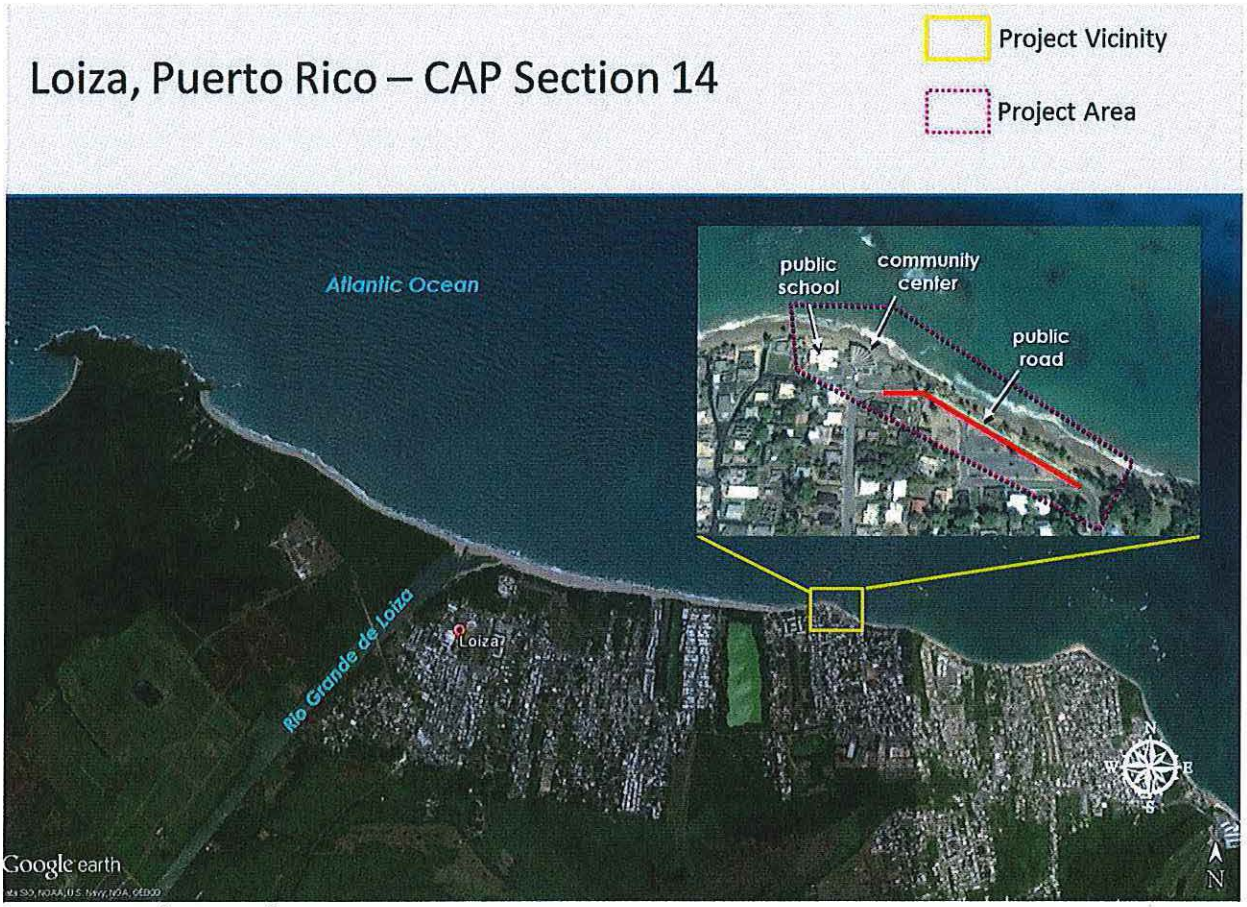


Figure 1. Study Area of Loiza, Puerto Rico.

The non-federal sponsor, Puerto Rico Department of Natural and Environmental Resources (DNER), will acquire the lands via a bank protection easement and certify that these lands are available for construction, operations and maintenance for the revetment. A staging area of approximately 4,356 square feet of land has been identified (see **Figure 2**). The non-Federal sponsor will certify the availability of the staging area via a temporary work area easement. Access to the site will be provided via public access roads. No borrow or disposal areas are required for construction of the subject project.

Figure 2. Access, proposed revetment, and staging area.

7. Description of proposed work:

The Recommended Plan consists of the placement of a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, head start public school, and community center. Elevation of the revetment crest would be 12.0-ft (Puerto Rico Vertical Datum (PRVD) 2002). The remaining sidewalk may need to be demolished due to existing damages and replaced with the over-wash protection zone, which consists of high performance turf reinforcement mat keyed in between the existing road and revetment. Construction is estimated to take approximately 11 months. By constructing the Recommended Plan, the existing public infrastructure will be protected from the continued erosion and storm damages. The Recommended Plan is economically justified because the costs to relocate the public road, head start school, and community center are higher than the Loiza Project costs.

9. Indicate permits, approvals and endorsements of the proposal by Federal and Puerto Rican government agencies. Evidence of such support should be attached to the proposal.

Consultation to comply with Section 106 responsibilities under the National Historic Preservation Act is ongoing and will be completed prior to project implementation. Additionally, coordination under Section 7 of the Endangered Species Act with the United States Fish and Wildlife Service is ongoing and will be completed prior to project implementation. This project will be performed in compliance with Puerto Rico's water quality standards. An application for a water quality certification will be submitted once final engineering designs are completed. All permits and approvals will be obtained prior to the start of construction.

From: Donofrio, Kristen L CIV USARMY CESAJ (US)
To: "Lopez, Felix"
Subject: RE: [EXTERNAL] RE: [Non-DoD Source] Loiza Sec 14 Project
Date: Tuesday, April 17, 2018 2:56:00 PM

Alright, sounds good. Thanks Felix!

-----Original Message-----
From: Lopez, Felix [mailto:felix_lopez@fws.gov]
Sent: Tuesday, April 17, 2018 2:53 PM
To: Donofrio, Kristen L CIV USARMY CESAJ (US) <Kristen.L.Scheler@usace.army.mil>
Subject: Re: [EXTERNAL] RE: [Non-DoD Source] Loiza Sec 14 Project

Yep, that's it in a nutshell.

On Tue, Apr 17, 2018 at 1:49 PM, Donofrio, Kristen L CIV USARMY CESAJ (US) <Kristen.L.Scheler@usace.army.mil <mailto:Kristen.L.Scheler@usace.army.mil> > wrote:

Ok, so if we are operating within an existing quarry with no expansion and using the Puerto Rico Boa standard conditions you provided in the previous email (07-FEB-2018), we are in concurrence with ESA for the Puerto Rican boa. If we are operating outside of an existing quarry or if we have to expand an existing quarry we will need to have a second consult for boas and possibly plants. Is that right?

Kristen Donofrio
2918

Please consider the environment before printing this email.

-----Original Message-----
From: Lopez, Felix [mailto:felix_lopez@fws.gov <mailto:felix_lopez@fws.gov>]
Sent: Tuesday, April 17, 2018 1:39 PM
To: Donofrio, Kristen L CIV USARMY CESAJ (US) <Kristen.L.Scheler@usace.army.mil <mailto:Kristen.L.Scheler@usace.army.mil> >
Subject: Re: [EXTERNAL] RE: [Non-DoD Source] Loiza Sec 14 Project

I guess you could use the concurrence letter for the project itself, and then a second consult for the quarry. We did something like that for Barceloneta flood control project.

On Tue, Apr 17, 2018 at 12:43 PM, Donofrio, Kristen L CIV USARMY CESAJ (US) <Kristen.L.Scheler@usace.army.mil <mailto:Kristen.L.Scheler@usace.army.mil> <mailto:Kristen.L.Scheler@usace.army.mil > > > wrote:

Hi Felix! The quarry location will be determined in the Design and Implementation (D&I) phase of the project, so we do not know the exact site yet.

Kristen Donofrio
2918

Please consider the environment before printing this email.

-----Original Message-----
From: Lopez, Felix [mailto:felix_lopez@fws.gov <mailto:felix_lopez@fws.gov> <mailto:felix_lopez@fws.gov > >]
Sent: Tuesday, April 17, 2018 11:35 AM
To: Donofrio, Kristen L CIV USARMY CESAJ (US) <Kristen.L.Scheler@usace.army.mil <mailto:Kristen.L.Scheler@usace.army.mil> <mailto:Kristen.L.Scheler@usace.army.mil > > >
Subject: Re: [EXTERNAL] RE: [Non-DoD Source] Loiza Sec 14 Project

Hi, when we were out there I asked Jose about the quarry, he said the Corps has used the same quarry for years, if its an existing quarry which does not need to expand to provide the Corps with the material, then standard boa conditions would apply. If they have to expand outside of the existing work area to provide the material, then some additional measures may have to be added, depending on the location. Do you have a map or photo of the quarry ??

On Tue, Apr 17, 2018 at 11:17 AM, Donofrio, Kristen L CIV USARMY CESAJ (US) <Kristen.L.Scheler@usace.army.mil <mailto:Kristen.L.Scheler@usace.army.mil> <mailto:Kristen.L.Scheler@usace.army.mil > > <mailto:Kristen.L.Scheler@usace.army.mil > <mailto:Kristen.L.Scheler@usace.army.mil > > > > wrote:

Hi Felix!

I just wanted to follow up with you briefly about the ESA coordination for the Puerto Rican boa on our Loíza Section 14 CAP project. I was just updating our report with the USFWS ESA concurrence information and wanted to make sure that the attached email is sufficient to cover our ESA concurrence for the boa since it wasn't specifically mentioned in the formal letter. I also attached my updated coordination request email in case you needed that too.

Thanks!

Kristen Donofrio
Biologist, Planning Division
U.S. Army Corps of Engineers
Jacksonville District (PD-EC)
P.O. Box 4970
Jacksonville, FL 32232-0019
(904) 232-2918 (O)
(904) 232-3442 (F)
Kristen.L.Donofrio@usace.army.mil <mailto:Kristen.L.Donofrio@usace.army.mil> <mailto:Kristen.L.Donofrio@usace.army.mil > > <mailto:Kristen.L.Donofrio@usace.army.mil > <mailto:Kristen.L.Donofrio@usace.army.mil > > >

Please consider the environment before printing this email.

-----Original Message-----
From: Lopez, Felix [mailto:felix_lopez@fws.gov <mailto:felix_lopez@fws.gov> <mailto:felix_lopez@fws.gov > > <mailto:felix_lopez@fws.gov > <mailto:felix_lopez@fws.gov > > >]

Sent: Wednesday, March 14, 2018 5:10 PM
To: Donofrio, Kristen L CIV USARMY CESAJ (US) <Kristen.L.Scheler@usace.army.mil <mailto:Kristen.L.Scheler@usace.army.mil> <mailto:Kristen.L.Scheler@usace.army.mil > > <mailto:Kristen.L.Scheler@usace.army.mil > <mailto:Kristen.L.Scheler@usace.army.mil > > > >; Ernesto Diaz <ediaz.czm@gmail.com <mailto:ediaz.czm@gmail.com> <mailto:ediaz.czm@gmail.com > > <mailto:ediaz.czm@gmail.com > <mailto:ediaz.czm@gmail.com > > > >; Tous, Jorge M CIV USARMY CESAJ (US) <Jorge.M.Tous@usace.army.mil <mailto:Jorge.M.Tous@usace.army.mil> <mailto:Jorge.M.Tous@usace.army.mil > > <mailto:Jorge.M.Tous@usace.army.mil > <mailto:Jorge.M.Tous@usace.army.mil > > > >
Subject: [Non-DoD Source] Loiza Sec 14 Project

Enclosed is our ESA concurrence and FWCA letter.

--

Felix Lopez
USFWS Caribbean Field Office
cel. 787 510-5208

No one seems to know what it is we do, but we are the only ones that can do it, and we do it well.

"People will generally accept facts as truth only if the facts agree with what they already believe."- Andy Rooney

---------- Forwarded message ----------
From: "Lopez, Felix" <felix_lopez@fws.gov <mailto:felix_lopez@fws.gov> <mailto:felix_lopez@fws.gov > > <mailto:felix_lopez@fws.gov > <mailto:felix_lopez@fws.gov > > > >
To: "Donofrio, Kristen L CIV USARMY CESAJ (US)" <Kristen.L.Scheler@usace.army.mil <mailto:Kristen.L.Scheler@usace.army.mil> <mailto:Kristen.L.Scheler@usace.army.mil > > <mailto:Kristen.L.Scheler@usace.army.mil > <mailto:Kristen.L.Scheler@usace.army.mil > > > >
Cc:
Bcc:
Date: Wed, 7 Feb 2018 16:26:45 +0000
Subject: [Non-DoD Source] Re: Loiza Project Section 14 CAP - protected road question (UNCLASSIFIED)

Thanks, enclosed is a map showing the section of road that could be eliminated since it is not serving any residential areas. Its about 350 feet long.

Got your message about the PR boa as well. Fema developed a really good pamphlet for PR boas, also here are our latest boa conservation measures.

Depending on where the quarry is and whether it needs to expand or can produce the needed material within its footprint, there may be listed plants involved as well.

On Wed, Feb 7, 2018 at 12:02 PM, Scheler, Kristen L CIV USARMY CESAJ (US) <Kristen.L.Scheler@usace.army.mil <mailto:Kristen.L.Scheler@usace.army.mil> <mailto:Kristen.L.Scheler@usace.army.mil > > <mailto:Kristen.L.Scheler@usace.army.mil > <mailto:Kristen.L.Scheler@usace.army.mil > > > > wrote:

CLASSIFICATION: UNCLASSIFIED

Hi Felix!

I just wanted to let you know I am talking with our project engineers today about your question! I'll keep you posted!

Thanks!

Kristen Scheler
Biologist (PD-EC)
(904) 232-2918

Please consider the environment before printing this email.

CLASSIFICATION: UNCLASSIFIED

--

Felix Lopez
USFWS Caribbean Field Office
cel. 787 510-5208

No one seems to know what it is we do, but we are the only ones that can do it, and we do it well.

"People will generally accept facts as truth only if the facts agree with what they already believe."- Andy Rooney

---------- Forwarded message ----------
From: "Donofrio, Kristen L CIV USARMY CESAJ (US)" <Kristen.L.Scheler@usace.army.mil <mailto:Kristen.L.Scheler@usace.army.mil> <mailto:Kristen.L.Scheler@usace.army.mil > > <mailto:Kristen.L.Scheler@usace.army.mil > <mailto:Kristen.L.Scheler@usace.army.mil > > > >
To: "'Lopez, Felix'" <felix_lopez@fws.gov <mailto:felix_lopez@fws.gov> <mailto:felix_lopez@fws.gov > > <mailto:felix_lopez@fws.gov > <mailto:felix_lopez@fws.gov > > > >
Cc: "Donofrio, Kristen L CIV USARMY CESAJ (US)" <Kristen.L.Scheler@usace.army.mil <mailto:Kristen.L.Scheler@usace.army.mil> <mailto:Kristen.L.Scheler@usace.army.mil > > <mailto:Kristen.L.Scheler@usace.army.mil > <mailto:Kristen.L.Scheler@usace.army.mil > > > >
Bcc:
Date: Wed, 7 Feb 2018 16:02:46 +0000
Subject: RE: For your action: ESA section 7 informal consultation request and FWCA MFR signature request for the Loiza Section 14 Continuing Authorities Program (CAP) project in Municipality of Loiza, Puerto Rico (UNCLASSIFIED)
CLASSIFICATION: UNCLASSIFIED

Hi Felix,

I had an update to the ESA section 7 informal consultation request:

The project will include mining and truck haul operations to bring rock in to the project site for the revetment construction. Although a rock mining site for the project has not yet been determined, I would like to add the Puerto Rican boa (Epicrates inornatus) to our coordination.

The Puerto Rican boa was listed as endangered in 1970 (35 FR 13519). It is the largest snake in Puerto Rico, averaging a length of 6 ½ feet. The color can be variable but typically ranges dark browns, grays, and blacks with a series of spots or black bars and a blackish belly. This boa is unique to Puerto Rico and is widespread in its distribution across the island. The species is abundant in protected and inaccessible areas. It can be found in a variety of habitats and is arboreal and terrestrial. Sub-adults and adults' diet consists of birds, small mammals, and lizards. The Puerto Rican boa is non-poisonous and generally harmless unless provoked. No DCH has been identified for the Puerto Rican boa. (REFERENCE: National Wildlife Federation (NWF). (1996). "Puerto Rican Boa." Accessed January 2018.
Blockedhttps://BlockedBlockedwww.nwf.org/Wildlife/Wildlife-Library/Amphibians-Reptiles-and-Fish/Puerto-Rican-Boa.aspx <Blockedhttp://Blockedwww.nwf.org/Wildlife/Wildlife-Library/Amphibians-Reptiles-and-Fish/Puerto-Rican-Boa.aspx> <Blockedhttp://Blockedwww.nwf.org/Wildlife/Wildlife-Library/Amphibians-Reptiles-and-Fish/Puerto-Rican-Boa.aspx <Blockedhttp://www.nwf.org/Wildlife/Wildlife-Library/Amphibians-Reptiles-and-Fish/Puerto-Rican-Boa.aspx> > <Blockedhttps://Blockedwww.nwf.org/Wildlife/Wildlife-Library/Amphibians-Reptiles-and-Fish/Puerto-Rican-Boa.aspx <Blockedhttp://Blockedwww.nwf.org/Wildlife/Wildlife-Library/Amphibians-Reptiles-and-Fish/Puerto-Rican-Boa.aspx> <Blockedhttp://Blockedwww.nwf.org/Wildlife/Wildlife-Library/Amphibians-Reptiles-and-Fish/Puerto-Rican-Boa.aspx <Blockedhttp://www.nwf.org/Wildlife/Wildlife-Library/Amphibians-Reptiles-and-Fish/Puerto-Rican-Boa.aspx> > >)

Mining of the rock and truck haul operations from the mine to the project site may occur in areas where Puerto Rican boas could be present. While it is likely that the snakes would avoid mining activities and urban roads, the project will incorporate and use the USFWS Puerto Rican boa standard conditions to minimize any potential effects to any snakes in the mining and/or transit area. Revetment construction activities will occur in an area where the Puerto Rican boa is not likely to be present. USACE has determined that by following the USFWS standard conditions developed for the Puerto Rican boa, the project may affect, but is not likely to adversely affect the species.

I have attached a copy of the most recent set of conditions I have available for the Puerto Rican boa. If there is a new set, please feel free to send them to me. In addition, please let me know if this information is sufficient to update the consultation documents.

Thank you so much!

Kristen Scheler
Biologist
USACE-Jacksonville District
(904) 232-2918

Please consider the environment before printing this email.

-----Original Message-----
From: Scheler, Kristen L CIV USARMY CESAJ (US)
Sent: Thursday, February 1, 2018 5:19 PM
To: edwin_muniz@fws.gov <mailto:edwin_muniz@fws.gov> <mailto:edwin_muniz@fws.gov > > <mailto:edwin_muniz@fws.gov > <mailto:edwin_muniz@fws.gov > > > ; Marelisa Rivera <marelisa_rivera@fws.gov <mailto:marelisa_rivera@fws.gov> <mailto:marelisa_rivera@fws.gov > > <mailto:marelisa_rivera@fws.gov > <mailto:marelisa_rivera@fws.gov > > > >
Cc: Scheler, Kristen L CIV USARMY CESAJ (US) <Kristen.L.Scheler@usace.army.mil <mailto:Kristen.L.Scheler@usace.army.mil> <mailto:Kristen.L.Scheler@usace.army.mil > > <mailto:Kristen.L.Scheler@usace.army.mil > <mailto:Kristen.L.Scheler@usace.army.mil > > > >
Subject: For your action: ESA section 7 informal consultation request and FWCA MFR signature request for the Loiza Section 14 Continuing Authorities Program (CAP) project in Municipality of Loiza, Puerto Rico (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

Good evening!

The Jacksonville District, U.S. Army Corps of Engineers requests Section 7 ESA informal consultation with USFWS and an informal understanding (documented via signed MFR) between USACE and USFWS to utilize the NEPA review and ESA consultation processes to complete coordination responsibilities under the FWCA on the Loiza Section 14 Continuing Authorities Program (CAP) project.

The Loiza project is an emergency shoreline protection project under Section 14 of CAP located in the Municipality of Loiza in Puerto Rico. The Recommended Plan consists of the placement of a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, head start public school, and community center. By constructing the Recommended Plan, the existing public infrastructure will be protected from the continued erosion and storm damages. The MFR agreement will avoid duplicate analysis and documentation as authorized under 40 CFR section 1500.4 (k), 1502.25, 1506.4, and is consistent with Presidential Executive Order for Improving Regulation and Regulatory Review, released January 18, 2011. For Section 7 ESA informal consultation, USACE has determined that the proposed project may affect, but is not likely to adversely affect the green sea turtle (Chelonia mydas), hawksbill sea turtle (Eretmochelys imbricata), leatherback sea turtle (Demochelys coriacea), and loggerhead sea turtle (Caretta caretta). USACE is requesting concurrence with the MANLAA determination.

Attached to this email is the USACE signed MFR and a signed section 7 ESA informal consultation package which includes additional information describing the project background, project location and proposed action, listed species under USFWS jurisdiction, potential effects to listed species, and efforts to avoid/eliminate impacts. The original hardcopies of the consultation package and USACE signed MFR will be mailed to your office (including a CD copy of the 2015 SPBO which is referenced in the consultation package).

If you have any questions or require additional information, please do not hesitate to reach out to me via email or phone. If this is the incorrect method of contact to initiate consultations, please let me know so I can correctly submit these documents for coordination as soon as possible.

Thank you,
Kristen Scheler
Biologist, Planning & Policy Division
U.S. Army Corps of Engineers
Jacksonville District (CESAJ-PD-PW)
P.O. Box 4970
Jacksonville, FL 32232-0019
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Please consider the environment before printing this email.
CLASSIFICATION: UNCLASSIFIED
CLASSIFICATION: UNCLASSIFIED

--

Felix Lopez
USFWS Caribbean Field Office
cel. 787 510-5208

CONSERVATION MEASURES FOR THE PUERTO RICAN BOA - USFWS

General Information:

The Endangered Puerto Rican boa (Epicrates inornatus) is an endemic species and it is the largest snake that inhabits the Puerto Rico Island Shelf. The color and pattern of the Puerto Rican boa is highly variable. The species color can range from tan to dark brown with irregular diffuse marking on the dorsum but some individuals lack marking and are uniformly dark. Juveniles have reddish brown ground color with numerous pronounced markings. The Puerto Rican boa can be found in the habitat range from the sea level to about 400 m of elevation. The boa tolerates a wide variety of habitat types ranging from wet montane to subtropical dry forest and can be found from virgin forest to areas that exhibit various degrees of human disturbance like roadside or out buildings. Boas are more active at night, remaining less active concealed or basking in the sun during the day. The U.S. Fish and Wildlife Service (Federal Register October 13, 1970) listed the Puerto Rican boa (Epicrates inornatus) as endangered in 1970 and it is protected by the Endangered Species Act of 1973, as amended. Any person that injures, captures, or kills a Puerto Rican boa is subject to penalties under federal law of up to $100,000, one year in prison or a combination of both.

Recommendations:

The U.S. Fish and Wildlife Service (hereafter the Service) has developed recommendations to avoid or minimize impacts on the boa during a project development in an area where the boa may occur. The recommendations are the following:

1. Prior to any earth movements or vegetation clearing, the boundaries of the project area, the buffer areas and areas to be protected should be clearly marked in the project plan and in the field.

2. A pre-construction meeting should be conducted to inform supervisors and employees about the conservation of protected species, as well as penalties for harassing or harming such species.

3. Prior to any use of machinery on areas where the boa may occur, the vegetation should be cleared by hand to provide time to the boa, if present, to be detected or move away from the area. All personnel involved in site clearing must be informed of the potential presence of the snake, and the importance of protecting the snakes.

4. Site personnel should be conscious of the possibility of boas sunning in open areas.

5. Before activities commence each workday during the vegetation clearing phase, the experienced personal in identifying and searching for boas should survey the areas to be cleared that day, to ensure that boas are not present or affected within the work area. If boas are found within the working area, activities should stop at the area where the boas are found until the boas move out of the area on their own. Activities at other work sites, where no boas have been found after surveying the area, may continue. If relocation of the species is necessary, any relocated boas should be transferred by authorized personnel of the Department of Natural and Environmental Resources (DNER) to appropriate habitat close to the project site. Any findings should be reported to the Service and to the DNER Ranger office so they can further assist you in developing sound conservation measures and specific recommendations to avoid, minimize and/or compensate for any impacts to this species.

6. Strict measures should be established to minimize boa casualties by motor vehicles or other equipment. Before operating or moving equipment and vehicles in staging areas near potential boa habitats (within 25 meters of potential boa habitat), these should be thoroughly inspected to ensure that no boas are lodged in the standing equipment or vehicles. If boas are found within vehicles or equipment, authorized personnel of DNER must be notified immediately for proper handling and relocation. Any relocated boas should be transferred to appropriate habitat close to the project site.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Caribbean Ecological Services
Field Office
P.O. Box 491
Boqueron, PR 00622

MAR 14 2018

In Reply Refer To:
FWS/R4/CESFO/72087-035

Dr. Gina Paduano Ralph
Chief, Environmental Branch
US Army Corps of Engineers, Jacksonville District
701 San Marco Boulevard
Jacksonville, Florida 32207-8175

Re: Loiza Section 14 Continuing Authorities

Dear Dr. Paduano:

This is in reply to your request for comments dated February 1, 2018 regarding the proposed shoreline protection in the Municipality of Loiza. Our comments are issued as technical assistance in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and the Endangered Species Act (16 U.S.C. 1531 et seq. as amended).

The Corps is proposing to place a continuous rock revetment along 1,050 feet of shoreline to minimize impacts from coastal storms and coastal erosion. Structures to be protected include a private residence, a headstart school and a community center located in Parcelas Suarez, Loiza. Other infrastructure to be protected includes a public coastal road.

A site visit was carried out on March 8, 2018, with Service biologist and Corps personnel. The entire project area was walked (See Attached Photos). The project will start on a headland at the end of Punta del Atlantico Street. All the structures are located on the shore and extend into the active beach (the part of the beach affected/largely built by waves). Based on the site visit, impacts from Hurricanes Irma and Maria were not considerable in this area. However, recent episodes of heavy surf severely impacted this section of coast.

The first structure is a private residence that has placed basket gabions around the toe of the property to stem erosion. This type of shoreline protection does not last very long and usually causes more impacts over time (broken baskets, rocks spread over beach, etc.). Immediately adjacent to the private residence is the former headstart school, this structure is currently abandoned. Previous attempts at protecting the shoreline in the form of rock armor and geotextile fabric were exposed along the seaward side of the structure. Wave action eroded areas behind the rock armor. The next structure is the community center. This structure has failed in several areas with the concrete walls and floor cracked. Coastal erosion has undermined the foundation of this structure.

The sidewalk and road immediately east of these structures was also severely impacted by recent heavy surf. The asphalt pavement was ripped out in several areas along with the sidewalk. A manhole and sewer pipe was exposed beneath the roadway due to the heavy surf event. There is an empty lot that faces this section of roadway and no residential structures were directly impacted by heavy surf. Further east is an existing exposed rock revetment into which the proposed project will tie into.

The beach area along this shoreline is highly dynamic with a narrow winter beach and a wider summer beach. Aerial photography shows that the beach is dynamic. For example in September 2009 there was about 63 feet of sand beach in front of the structures, in December 2010, there was practically no sand beach in the same area, and in May 2013, the sand had returned although several structures associated with the headstart structure had already been lost.

The Corps proposal is to place rock revetment along the dry part of the beach as close to the existing structures as possible and design it to allow wave run-up and avoid wave scouring at the toe of the revetment. A local quarry will provide the stones for the revetment.

Endangered Species

Although PR Department of Natural and Environmental Resources (DNER) has records of sea turtles nesting along beach areas of Loiza, there are no records of sea turtle nesting in the area of the proposed project. The developed nature of the coastline and residential lighting are not conducive to successful sea turtle nesting habitat making the beach not suitable for sea turtle nesting.

The Corps has identified the following listed sea turtle species and the possible impacts from the project.

Common Name	Scientific Name	Status	May Affect	No Effect
Reptiles				
Green sea turtle	*Chelonia mydas*	T	X	
Hawksbill sea turtle	*Eretmochelys imbricata*	E	X	
Leatherback sea turtle	*Demochelys coriacea*	E	X	
Loggerhead sea turtle	*Caretta caretta*	T	X	

The Corps has proposed several conservation measures to minimize potential impacts on sea turtle species. These measures were based on the Reasonable and Prudent Measures (RPMs) and Terms and Conditions (T&Cs) developed for the 2015 Statewide Programmatic Biological Opinion for projects in Florida. We have reviewed the proposed RPMs and have the following comments and recommendations:

1) RPM A15 - Construction equipment and materials should be stored off the beach. There is an empty lot adjacent to the coastal road that can serve as a staging area for the project.

2) RPM A16 and T&C A15 Deal with lighting on the beach. Conversations with COE personnel during the site visit indicated that night time construction activities probably would not occur. If so the appropriate sea turtle friendly lights should be utilized.

3) The source of the rock revetment material will be an existing quarry. If there is a need to expand an existing quarry, consultation should be re-initiated.

Effect Determination

The Corps has determined that the construction of the rock revetment along approximately 1,050 feet of shoreline in front of the public road, head start public school, and community center will occur within areas where nesting sea turtles could be present; however, by implementing the above measures, potential effects to listed sea turtles that may nest in or near the project area can be minimized. The Corps has determined that the proposed project may affect, but is not likely to adversely affect, green sea turtle (*Cheloia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Demochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*).

Based on the information provided and discussed above, we concur with the Corps' determination that the proposed project is not likely to adversely affect the listed turtle species. Nevertheless, if the project is modified or if information on impacts to listed species becomes available this office should be contacted concerning the need for the initiation of consultation under section 7 of the Act.

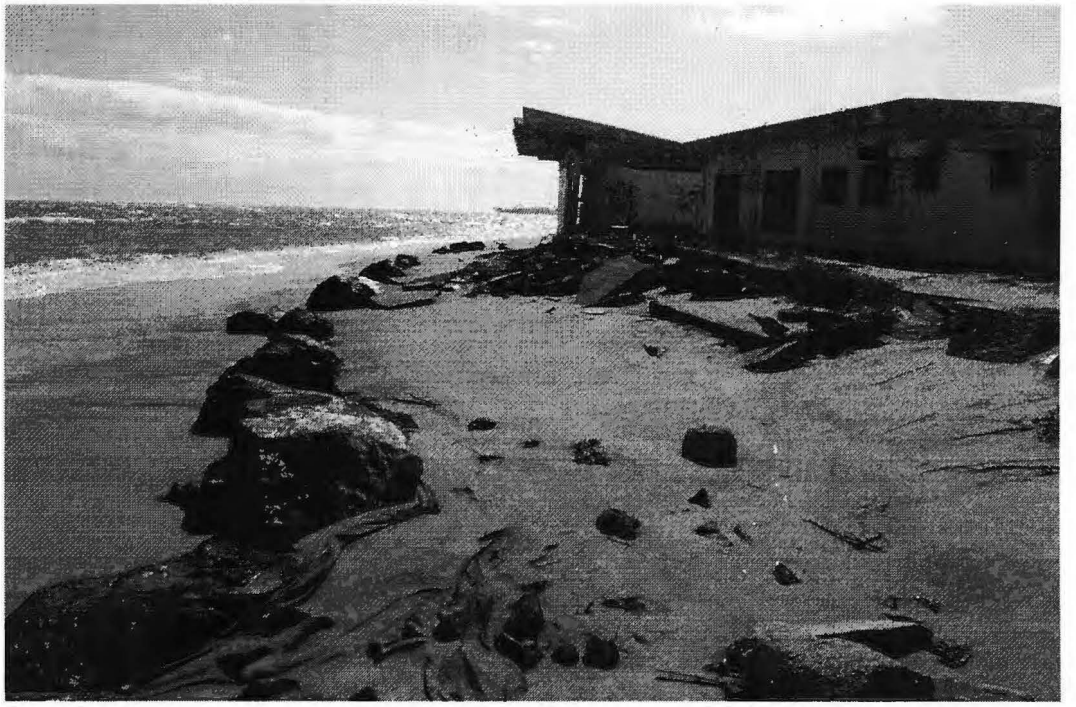
Thank you for the opportunity to comment on this project, if you have any questions please contact Felix Lopez of my staff at 787 851-7297 x 210.

Sincerely yours,

for Marlen Li
Edwin E. Muñiz
Field Supervisor

fhl
cc:
DNER, San Juan
EQB, San Juan
PRPB, San Juan

Loiza Section 14 Project Site showing location of school, community center and empty lot. This lot is about 1,831 sq yards or 0.3 acres in size and could provide a good staging area for equipment and materials; we recommend that the Corps work with the Municipality of Loiza to assure that this area is available for use.



Loiza, headstart school. Note line of rocks in a previous attempt at erosion control. Structure is currently abandoned and in disrepair.

Interior of Community Center seen through collapsed wall. This building is currently abandoned and in disrepair. Note collapsed flooring and exposed foundation due to high surf events during March 2018.

End of the street looking west towards the Community Center. Note the severe impacts to the roadway from the heavy surf event in March 2018.

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 San Marco Boulevard
JACKSONVILLE, FLORIDA 32207-8175

REPLY TO
ATTENTION OF

CESAJ-PD-E (ER 200-2-2)

FEB 01 2018

Memorandum For Record

SUBJECT: Coordination Act Report for the Loiza Section 14 Continuing Authorities Program (CAP) Project in the Municipality of Loiza, Puerto Rico.

Purpose: To document an informal understanding between the U.S. Army Corps of Engineers, Jacksonville District (Corps), and the U.S. Fish and Wildlife Service (Service), Caribbean Ecological Services Field Office.

Background. The Puerto Rico Department of Natural and Environmental Resources (DNER) requested that Corps provide assistance in addressing shoreline erosion problems along the coast of Loiza. Section 14 of the Flood Control Act of 1946, as amended, provides for implementation of projects to protect public facilities and facilities owned by non-profit organizations that are used to provide public services that are open to all on equal terms. The purpose of the Loiza Section 14 Continuing Authorities Program (CAP) project is to provide emergency shoreline protection to the approximately 1,050 feet of the Loiza shoreline. Hurricane and coastal storm damages along the Loiza shoreline, including erosion causing receding shorelines, contribute to public safety hazards and threaten existing infrastructure such as a public road, public buildings, commercial businesses, public school, public parkland, private homes, and recreational beach access. A number of these existing structures are located directly along the shoreline and have suffered damage from coastal storms, including the recent hurricanes, Irma and Maria. Despite efforts to maintain the facilities, the public community center is cracking and the earthen foundation is eroding. The public head start school, Parcela Suarez, is the only preschool center for the entire community. Local efforts to provide shoreline protection have been unsuccessful. The continued damages and safety concerns forced the Municipality of Loiza to temporarily displace the students at the school and the services offered by the community center. These temporary displacements of the public facilities are not adequate or a permanent solution, and the Municipality would like to return operations to this site pending implementation of emergency shoreline protection measures. In addition to the existing structures, a critical roadway is also located in the study area. A portion of the road has already failed, however, the critical portions of the road are still operational. Should these portions also fail, residents living adjacent to this roadway will have no way to access the connecting roads. Additionally, if the damages to the road continue, homes adjacent to the road will likely be impacted by erosion.

Recommended Plan. The Recommended Plan consists of the placement of a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, head start public school, and community center. Elevation of the revetment crest would be 12.0-ft (Puerto Rico Vertical Datum (PRVD) 2002). The remaining sidewalk may need to be demolished due to existing damages and replaced with the over-wash protection zone, which consists of high performance turf reinforcement mat keyed in between the existing road and revetment. By constructing the Recommended Plan, the existing public infrastructure will be protected from the continued erosion and storm damages.

Coordination. The Fish and Wildlife Coordination (FWCA; 16 U.S.C. 661 et seq., March 10, 1934, as amended 1946, 1958, 1978, and 1995) requires Federal agencies to consult with the Service regarding the impacts to fish and wildlife resources and the proposed measures to mitigate these impacts. Additional coordination authorities exist through the review process of the National Environmental Policy Act (NEPA; 42 U.S.C. 4321-4347, January 1, 1970, as amended 1975 and 1982) and the consultations required under the Endangered Species Act of 1973 (ESA; 7 U.S.C. 136, 16 U.S.C. 1531 et seq. December 28, 1973). The Service continues to coordinate and consult with the Corps through NEPA and the ESA in which impacts to fish and wildlife resources are adequately addressed via these two authorities. The Service will include comments relevant to FWCA in the Services response to the Corps' ESA coordination letter.

Agreement. The undersigned, Corps and the Service, agree to utilize the Loiza Section 14 CAP project NEPA review and ESA consultation processes to complete coordination responsibilities under the FWCA. This agreement will avoid duplicate analysis and documentation as authorized under 40 CFR section 1500.4 (k), 1502.25, 1506.4, and is consistent with Presidential Executive Order for Improving Regulation and Regulatory Review, released January 18, 2011.

for

Edwin Muñiz
Field Supervisor
Caribbean Ecological Services Field Office

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch
2/1/18

From:	Scheler, Kristen L CIV USARMY CESAJ (US)
To:	Lopez, Felix
Cc:	Scheler, Kristen L CIV USARMY CESAJ (US)
Subject:	RE: For your action: ESA section 7 informal consultation request and FWCA MFR signature request for the Loiza Section 14 Continuing Authorities Program (CAP) project in Municipality of Loiza, Puerto Rico (UNCLASSIFIED)
Date:	Wednesday, February 7, 2018 11:02:00 AM
Attachments:	Puerto Rican Boa Standard Conditions.pdf

CLASSIFICATION: UNCLASSIFIED

Hi Felix,

I had an update to the ESA section 7 informal consultation request:

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https://www.nwf.org/Wildlife/Wildlife-Library/Amphibians-Reptiles-and-Fish/Puerto-Rican-Boa.aspx)

Mining of the rock and truck haul operations from the mine to the project site may occur in areas where Puerto Rican boas could be present. While it is likely that the snakes would avoid mining activities and urban roads, the project will incorporate and use the USFWS Puerto Rican boa standard conditions to minimize any potential effects to any snakes in the mining and/or transit area. Revetment construction activities will occur in an area where the Puerto Rican boa is not likely to be present. USACE has determined that by following the USFWS standard conditions developed for the Puerto Rican boa, the project may affect, but is not likely to adversely affect the species.

I have attached a copy of the most recent set of conditions I have available for the Puerto Rican boa. If there is a new set, please feel free to send them to me. In addition, please let me know if this information is sufficient to update the consultation documents.

Thank you so much!

Kristen Scheler
Biologist
USACE-Jacksonville District
(904) 232-2918

Please consider the environment before printing this email.

-----Original Message-----
From: Scheler, Kristen L CIV USARMY CESAJ (US)
Sent: Thursday, February 1, 2018 5:19 PM
To: edwin_muniz@fws.gov; Marelisa Rivera <marelisa_rivera@fws.gov>
Cc: Scheler, Kristen L CIV USARMY CESAJ (US) <Kristen.L.Scheler@usace.army.mil>

Subject: For your action: ESA section 7 informal consultation request and FWCA MFR signature request for the Loiza Section 14 Continuing Authorities Program (CAP) project in Municipality of Loiza, Puerto Rico (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

Good evening!

The Jacksonville District, U.S. Army Corps of Engineers requests Section 7 ESA informal consultation with USFWS and an informal understanding (documented via signed MFR) between USACE and USFWS to utilize the NEPA review and ESA consultation processes to complete coordination responsibilities under the FWCA on the Loiza Section 14 Continuing Authorities Program (CAP) project.

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Attached to this email is the USACE signed MFR and a signed section 7 ESA informal consultation package which includes additional information describing the project background, project location and proposed action, listed species under USFWS jurisdiction, potential effects to listed species, and efforts to avoid/eliminate impacts. The original hardcopies of the consultation package and USACE signed MFR will be mailed to your office (including a CD copy of the 2015 SPBO which is referenced in the consultation package).

If you have any questions or require additional information, please do not hesitate to reach out to me via email or phone. If this is the incorrect method of contact to initiate consultations, please let me know so I can correctly submit these documents for coordination as soon as possible.

Thank you,
Kristen Scheler
Biologist, Planning & Policy Division
U.S. Army Corps of Engineers
Jacksonville District (CESAJ-PD-PW)
P.O. Box 4970
Jacksonville, FL 32232-0019
(904) 232-2918 (O)
(904) 232-3442 (F)
Kristen.L.Scheler@usace.army.mil

Please consider the environment before printing this email.
CLASSIFICATION: UNCLASSIFIED
CLASSIFICATION: UNCLASSIFIED

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 San Marco Boulevard
JACKSONVILLE, FLORIDA 32207-8175

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

FEB 01 2018

Edwin Muñiz
Field Supervisor
Caribbean Ecological Services Field Office
U.S. Fish and Wildlife Service
Road 301 Km 5.1
Boquerón, Puerto Rico 00622

Dear Mr. Muñiz:

In order to comply with Section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), the U.S. Army Corps of Engineers, Jacksonville District (Corps), respectfully requests a letter of concurrence from the U.S. Fish and Wildlife Service (USFWS) on the Loiza section 14 Continuing Authorities Program (CAP) Project.

The Loiza Project is located in the Municipality of Loiza in Puerto Rico. The Recommended Plan consists of the placement of a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, head start public school, and community center. Elevation of the revetment crest would be 12.0-ft (Puerto Rico Vertical Datum (PRVD) 2002). The remaining sidewalk may need to be demolished due to existing damages and replaced with the over-wash protection zone, which consists of high performance turf reinforcement mat keyed in between the existing road and revetment. By constructing the Recommended Plan, the existing public infrastructure will be protected from the continued erosion and storm damages.

The Corps has determined that the proposed project may affect, but is not likely to adversely affect, green sea turtle (*Cheloia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Demochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*). Included with this letter is additional information describing the project background, project location and proposed action, listed species under USFWS jurisdiction, potential effects to listed species, and efforts to eliminate/avoid impacts.

The Corps respectfully requests that USFWS provide a letter of concurrence within 30 days of the receipt of this letter. If you have any questions, or need additional information, please contact Kristen Scheler by email Kristen.L.Scheler@usace.army.mil or telephone 904-232-2918. Thank you for your assistance.

Sincerely,

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch

Enclosure

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 San Marco Boulevard
JACKSONVILLE, FLORIDA 32207-8175

REPLY TO
ATTENTION OF

CESAJ-PD-E (ER 200-2-2)

FEB 01 2018

Memorandum For Record

SUBJECT: Coordination Act Report for the Loiza Section 14 Continuing Authorities Program (CAP) Project in the Municipality of Loiza, Puerto Rico.

Purpose: To document an informal understanding between the U.S. Army Corps of Engineers, Jacksonville District (Corps), and the U.S. Fish and Wildlife Service (Service), Caribbean Ecological Services Field Office.

Background. The Puerto Rico Department of Natural and Environmental Resources (DNER) requested that Corps provide assistance in addressing shoreline erosion problems along the coast of Loiza. Section 14 of the Flood Control Act of 1946, as amended, provides for implementation of projects to protect public facilities and facilities owned by non-profit organizations that are used to provide public services that are open to all on equal terms. The purpose of the Loiza Section 14 Continuing Authorities Program (CAP) project is to provide emergency shoreline protection to the approximately 1,050 feet of the Loiza shoreline. Hurricane and coastal storm damages along the Loiza shoreline, including erosion causing receding shorelines, contribute to public safety hazards and threaten existing infrastructure such as a public road, public buildings, commercial businesses, public school, public parkland, private homes, and recreational beach access. A number of these existing structures are located directly along the shoreline and have suffered damage from coastal storms, including the recent hurricanes, Irma and Maria. Despite efforts to maintain the facilities, the public community center is cracking and the earthen foundation is eroding. The public head start school, Parcela Suarez, is the only preschool center for the entire community. Local efforts to provide shoreline protection have been unsuccessful. The continued damages and safety concerns forced the Municipality of Loiza to temporarily displace the students at the school and the services offered by the community center. These temporary displacements of the public facilities are not adequate or a permanent solution, and the Municipality would like to return operations to this site pending implementation of emergency shoreline protection measures. In addition to the existing structures, a critical roadway is also located in the study area. A portion of the road has already failed, however, the critical portions of the road are still operational. Should these portions also fail, residents living adjacent to this roadway will have no way to access the connecting roads. Additionally, if the damages to the road continue, homes adjacent to the road will likely be impacted by erosion.

Recommended Plan. The Recommended Plan consists of the placement of a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, head start public school, and community center. Elevation of the revetment crest would be 12.0-ft (Puerto Rico Vertical Datum (PRVD) 2002). The remaining sidewalk may need to be demolished due to existing damages and replaced with the over-wash protection zone, which consists of high performance turf reinforcement mat keyed in between the existing road and revetment. By constructing the Recommended Plan, the existing public infrastructure will be protected from the continued erosion and storm damages.

Coordination. The Fish and Wildlife Coordination (FWCA; 16 U.S.C. 661 et seq., March 10, 1934, as amended 1946, 1958, 1978, and 1995) requires Federal agencies to consult with the Service regarding the impacts to fish and wildlife resources and the proposed measures to mitigate these impacts. Additional coordination authorities exist through the review process of the National Environmental Policy Act (NEPA; 42 U.S.C. 4321-4347, January 1, 1970, as amended 1975 and 1982) and the consultations required under the Endangered Species Act of 1973 (ESA; 7 U.S.C. 136, 16 U.S.C. 1531 et seq. December 28, 1973). The Service continues to coordinate and consult with the Corps through NEPA and the ESA in which impacts to fish and wildlife resources are adequately addressed via these two authorities. The Service will include comments relevant to FWCA in the Services response to the Corps' ESA coordination letter.

Agreement. The undersigned, Corps and the Service, agree to utilize the Loiza Section 14 CAP project NEPA review and ESA consultation processes to complete coordination responsibilities under the FWCA. This agreement will avoid duplicate analysis and documentation as authorized under 40 CFR section 1500.4 (k), 1502.25, 1506.4, and is consistent with Presidential Executive Order for Improving Regulation and Regulatory Review, released January 18, 2011.

Edwin Muñiz
Field Supervisor
Caribbean Ecological Services Field Office

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch
2/1/18

Loiza Section 14 Continuing Authorities Program (CAP) project

In order to comply with Section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*), the U.S. Army Corps of Engineers, Jacksonville District (Corps), respectfully requests a letter of concurrence within 30 days of the date of this letter from the U.S. Fish and Wildlife Service (USFWS) on the Loiza section 14 Continuing Authorities Program (CAP) Project. The Corps has determined that the proposed project may affect, but is not likely to adversely affect the green sea turtle (*Cheloia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Demochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*).

Pursuant to our request, the Corps is providing the following information:

- Description of the Project Background;
- Description of the Project Location and Proposed Action;
- Listed Species Under USFWS Jurisdiction;
- Potential Effects to Listed Species and Efforts to Eliminate/Avoid Impacts;
- Effect Determination;

Description of the Project Background

The Puerto Rico Department of Natural and Environmental Resources (DNER) requested that the Corps provide assistance in addressing shoreline erosion problems along the coast of Loiza. Section 14 of the Flood Control Act of 1946, as amended, provides for implementation of projects to protect public facilities and facilities owned by non-profit organizations that are used to provide public services that are open to all on equal terms. The purpose of the Loiza Section 14 CAP Project is to provide emergency shoreline protection to the approximately 1,050 feet of the Loiza shoreline. Hurricane and coastal storm damages along the Loiza shoreline, including erosion causing receding shorelines, contribute to public safety hazards and threaten existing infrastructure such as a public road, public buildings, commercial businesses, public school, public parkland, private homes, and recreational beach access. A number of these existing structures are located directly along the shoreline and have suffered damage from coastal storms, including hurricanes Irma and Maria. Despite efforts to maintain the facilities, the public community center is cracking and the earthen foundation is eroding. The community center was significantly damaged by Hurricane Maria (see **Figure 1**).

Figure 1. Damages from Hurricane Maria to Loiza's community center.

The public head start school, Parcela Suarez, is the only preschool center for the entire community. Local efforts to provide shoreline protection have been unsuccessful. The continued damages and safety concerns forced the Municipality of Loiza to temporarily displace the students at the school and the services offered by the community center. These temporary displacements of the public facilities are not adequate or a permanent solution, and the Municipality would like to return operations to this site pending implementation of emergency shoreline protection measures. In addition to the existing structures, a critical roadway is also located in the study area. A portion of the road has already failed, however, the critical portions of the road are still operational. Should these portions also fail, residents living adjacent to this roadway will have no way to access the connecting roads. Additionally, if the damages to the road continue, homes adjacent to the road will likely be impacted by erosion.

Description of the Project Location and Proposed Action

The Loiza project is located in the Municipality of Loiza in Puerto Rico (see **Figure 2**). The Recommended Plan consists of the placement of a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, head start public school, and community center. Elevation of the revetment crest would be 12.0-ft (Puerto Rico Vertical Datum (PRVD) 2002). The remaining sidewalk may need to be demolished due to existing damages and replaced with the over-wash protection zone, which consists of high performance turf reinforcement mat keyed in between the existing road and revetment. By constructing the Recommended Plan, the existing public infrastructure will be protected from the continued erosion and storm damages. The Recommended Plan

is economically justified because the costs to relocate the public road, head start school, and community center are higher than the Loiza Project cost.

Figure 2. Study Area of Loiza, Puerto Rico.

Listed Species under USFWS Jurisdiction

Listed species which may occur in the vicinity of the proposed work and are under the jurisdiction of the USFWS:

Table 1. Status of USFWS threatened and endangered species potentially affected by the project and the USACE's affect determination.

Common Name	Scientific Name	Status	May Affect	No Effect
Reptiles				
Green sea turtle[1]	*Chelonia mydas*	T	√	
Hawksbill sea turtle	*Eretmochelys imbricata*	E	√	
Leatherback sea turtle	*Demochelys coriacea*	E	√	
Loggerhead sea turtle	*Caretta caretta*	T	√	

[1] North Atlantic distinct population segment

Potential Effects to Listed Species and Efforts to Eliminate/Avoid Impacts

Green Sea Turtle (Chelonia mydas)

The green sea turtle weighs up to 440 pounds and lives in tropical and sub-tropical waters. Green turtles occupy three habitat types: high energy oceanic beaches, convergence zones in the pelagic habitat, and benthic feeding grounds in the relatively shallow, protected waters. Green sea turtles forage in pastures of seagrasses and/or algae, but small green turtles can also be found over coral reefs, worm reefs, and rocky bottoms. Females deposit eggs on high energy beaches, usually on islands, where a deep nest cavity can be dug above the high water line. Hatchlings leave the beach and move in the open ocean. In March 2015, USFWS proposed to list 11 distinct population segments (DPS) of green sea turtles as either endangered or threatened under the ESA (80 Fed. Reg. 15271 (March 23, 2015)). On April 6, 2016, they finalized the listing of the 11 DPSs, eight as threatened and three as endangered (81 Fed. Reg. 20058). The analysis conducted by Seminoff et al. (2015) for the North Atlantic DPS is incorporated by reference and will not be repeated here. Critical habitat is defined under the ESA as specific areas within and/or outside a geographical area that are occupied by a species at the time of listing, that contain physical or biological features essential to the conservation of the species and therefore require special management considerations or protection for the benefit of the species. The National Marine Fisheries Service (NMFS) published green sea turtle designated critical habitat (DCH) in 1998 for coastal waters surrounding Culebra Island, Puerto Rico. The project area is not located in or near green sea turtle DCH, however, portions of the construction will occur on and adjacent to the shoreline, which may affect nesting sea turtle habitat.

Hawksbill Sea Turtle (Eretmochelys imbricata)

The hawksbill sea turtle is a small to medium-sized marine turtle weighing up to 176 pounds. The hawksbill lives in tropical and sub-tropical waters of the Atlantic, Pacific, and Indian Oceans. Hawksbill turtles use different habitat types at different stages of their life cycle. Post hatchlings take shelter in weed lines that accumulate at convergence zones. Coral reefs are the foraging habitat of juveniles, sub-adults, and adults. They are also known to inhabit mangrove-fringed bays and estuaries. Hawksbills feed predominantly on sponges and nest on low and high energy beaches, frequently sharing the high-energy beaches with green sea turtles. Nests are typically placed under vegetation and can be found on beaches throughout Puerto Rico. NMFS published hawksbill sea turtle DCH in 1998 for coastal waters surrounding Mona and Monito Islands in Puerto Rico. The project area is not located in or near hawksbill sea turtle DCH, however, portions of the construction will occur on and adjacent to the shoreline, which may affect nesting sea turtle habitat.

Leatherback Sea Turtle (Dermochelys coriacea)

Leatherbacks have the widest distribution and are the largest, deepest diving of all sea turtle species. Adults can reach four to eight feet in length and can weigh from 500 to 2,000 pounds. The carapace is a rubber-like texture, hence the name "leatherback". Leatherbacks typically feed on jellyfish, but are also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. Nesting grounds

are distributed worldwide on beaches in the tropics and sub-tropics. In Puerto Rico, the main nesting areas are on the main island at Fajardo and on the island of Culebra. NMFS published leatherback sea turtle DCH in 1998 for coastal waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands and again in 2012 for waters on the U.S. west coast. The project area is not located in or near leatherback sea turtle DCH, however, portions of the construction will occur on and adjacent to the shoreline, which may affect nesting sea turtle habitat.

Loggerhead Sea Turtle (Caretta caretta)
Loggerhead sea turtles inhabit the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Females select high energy beaches on barrier strands adjacent to continental land masses for nesting. Steeply sloped beaches with gradually sloped offshore approaches are favored. After leaving the beach, hatchlings swim directly offshore and eventually are found along drift lines. They migrate to the near-shore and estuarine waters along the continental margins and utilize those areas as the developmental habitat for the sub-adult stage. Loggerheads are predators of benthic invertebrates. NMFS published loggerhead sea turtle DCH in 2014 for waters in the northwest Atlantic. USFWS published loggerhead sea turtle critical terrestrial habitat in 2014 for beaches located on the east coast of the United States and along the Gulf of Mexico. The project area is not located in or near NMFS or USFWS loggerhead sea turtle DCH, however, portions of the construction will occur on and adjacent to the shoreline, which may affect nesting sea turtle habitat.

No in-water work is required to construct this project; however, portions of the construction will occur on and adjacent to the shoreline, which may affect nesting sea turtle habitat. Although the 2015 Statewide Programmatic Biological Opinion (SPBO) (see Attachment 1 – 2015 SPBO) was developed for projects in Florida, the Corps commitments listed for sea turtle protection are reasonable to apply to the Loiza project's Recommended Plan construction activities. These commitments include the following:

- Avoid construction during peak nesting and hatching season in high density beaches, and to the maximum extent practicable during all other nesting times and locations;
- Implement sea turtle nest monitoring and relocation plan during construction if nesting window cannot be adhered to;
- Escarpments that are identified prior to or during the nesting season that interfere with sea turtle nesting (exceed 18 inches in height for a distance of 100 feet) can be leveled to the natural beach for a given area. If it is determined that escarpment leveling is required during the nesting or hatching season, leveling actions should be directed to the USFWS. For Corps Civil Works projects, leveling of escarpments would be limited to the term of the construction or as otherwise may be authorized and funded;
- Temporary storage of pipes and equipment will be located off the beach to the maximum extent possible; and
- All lighting associated with the project construction will be minimized to the maximum extent possible, through reduction, shielding, angling, etc., while

maintaining compliance with all Corps, U.S. Coast Guard, and Occupational Safety and Health Administration safety requirements.

Although the terms and conditions (T&C) from the 2015 SPBO are for beach nourishment, sand bypass and sand backpass which are not components of the Recommended Plan, they are the most applicable to the proposed work that is taking place completely in the dry on a beach within potential sea turtle nesting habitat. Corps is proposing to utilize the applicable reasonable and prudent measures (RPM) and the implementing T&C from the 2015 SPBO to minimize potential effects to listed sea turtles that may nest in or near the project area. Specifically:

RPM A7 and T&C A6. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice. The Corps shall provide predator-proof trash receptacles for the construction workers. The Corps shall brief workers on the importance of not littering and keeping the project area trash and debris free.

RPM A8 and T&C A7. A meeting between representatives of the Applicant's or Corps, USFWS, DNER, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on this project. At least 10 business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle and beach mouse protection measures as well as additional guidelines when construction occurs during the sea turtle nesting season, and will include the following:

a. Staging locations, storing equipment including fuel stations;
b. Coordination with the Marine Turtle Permit Holder on nesting surveys and any night-time work;
c. Pipeline placement (between 5 to 10 feet from dune);
d. Minimizing driving;
e. Egg relocation- permit holder and location (must be approved by DNER);
f. Free-roaming cat observation (for projects in or near beach mouse habitat);
g. Follow up lighting surveys - dates and inspector;
h. Follow up coordination during construction and post construction;
i. Coordination on construction lighting including dredge lighting and travel within and adjacent to the work area;
j. Direction of the project including progression of sand placement along the beach;
k. Late season nests present in project area (if any);
l. Plans for compaction monitoring or tilling;
m. Plans for escarpment surveys.

RPM A15. Construction equipment and materials including pipes shall be stored off the beach in a manner that will minimize impacts to nesting and hatchling sea turtles.

T&C A14. Staging areas for construction equipment shall be located off the beach during early (before April 30) and late (after November 1) nesting season for Brevard through

Broward counties (see table 14) and peak nesting season (May 1 through October 31) for the remaining counties. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach shall be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune if the width of the beach allows. Temporary storage of pipes shall be off the beach to the maximum extent possible. If the pipes are stored on the beach, they shall be placed in a manner that will minimize the impact to nesting habitat and shall not compromise the integrity of the dune systems. If the pipes placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune during nesting and hatching season, the Corps must reinitiate consultation with USFWS as this represents adverse effects not addressed in this SPBO. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

RPM A16. Lighting associated with the project construction shall be minimized to reduce the possibility of disrupting and disorienting nesting and hatchling sea turtles.

T&C A15. Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area during early (before April 30) and late (after November 1) nesting season and shall comply with safety requirements. A light management plan for the dredge and the work site shall be submitted for approval by USFWS and DNER prior to the pre-construction meeting. In accordance with this plan, lighting on all equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing on dredge and land-based lights and be large enough to block light from all lamps from being transmitted outside the construction area or to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 3**).

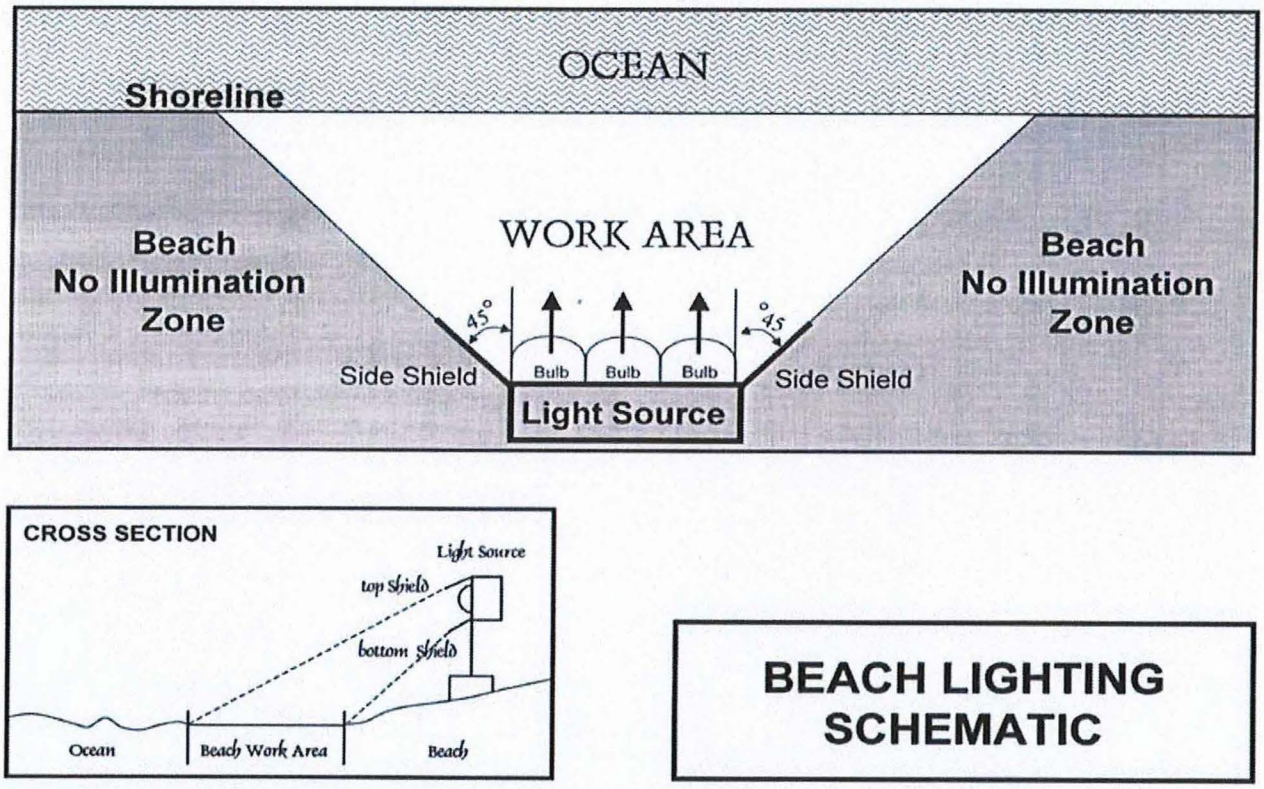

Figure 3. Beach lighting schematic.

RPM A24. The USFWS shall be notified if a sea turtle adult, hatchling, or egg is harmed or destroyed as a direct or indirect result of the project.

T&C A23. In the event a sea turtle nest is excavated during construction activities, the project turtle permit holder responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site. Upon locating a dead or injured sea turtle adult, hatchling, egg that may have been harmed or destroyed as a direct or indirect result of the project, the Corps, Applicant shall be responsible for notifying the appropriate USFWS Field Office immediately. Care shall be taken in handling injured sea turtles, eggs or beach mice to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

Effect Determination

Construction of the rock revetment along approximately 1,050 feet of shoreline in front of the public road, head start public school, and community center will occur within areas where nesting sea turtles could be present; however, by utilizing the applicable RPMs and the implementing T&Cs from the 2015 SPBO, potential effects to listed sea turtles that may nest in or near the project area can be minimized (see Attachment 1 – 2015 SPBO). The Corps has determined that the proposed project may affect, but is not likely to adversely affect, green sea turtle (*Cheloia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Demochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*).

References:

USFWS, 10 July 2014. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Northwest Atlantic Ocean Distinct Population Segment of the Loggerhead Sea Turtle. 50 CFR 17.

USFWS, 13 March 2015. Statewide Programmatic Biological Opinion. USFWS, South Florida Ecological Services Office, Vero Beach, Florida.

USFWS, 2017. ECOS Environmental Conservation Online System: Green sea turtle (*Cheloia mydas*). Accessed 21 September 2017. https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=6199

USFWS, 2017. ECOS Environmental Conservation Online System: Hawksbill sea turtle (*Eretmochelys imbricata*). Accessed 21 September 2017. https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=3656

USFWS, 2017. ECOS Environmental Conservation Online System: Leatherback sea turtle (*Dermochelys coriacea*). Accessed 29 September 2017. https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=1493

USFWS, 2017. ECOS Environmental Conservation Online System: Loggerhead sea turtle (*Caretta caretta*). Accessed 21 September 2017. https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=1110

NMFS, 30 October 2014. Hawksbill Turtle (*Eretmochelys imbricata*). Accessed 21 September 2017. www.nmfs.noaa.gov/pr/species/turtles/hawksbill.html

NMFS, 10 February 2016. Leatherback Turtle (*Dermochelys coriacea*). Accessed 29 September 2017. www.nmfs.noaa.gov/pr/species/turtles/leatherback.html

NMFS, 6 April 2016. Green Turtle (*Chelonia mydas*). Accessed 21 September 2017. www.nmfs.noaa.gov/pr/species/turtles/green.html

NMFS, 22 February 2017. Loggerhead Turtle (*Caretta caretta*). Accessed 21 September 2017. www.nmfs.noaa.gov/pr/species/turtles/green.html

Seminoff, Jeffrey A. et al., March 2015. Status Review of the Green Turtle (*Chelonia mydas*) under the Endangered Species Act. Retrieved from http://www.nmfs.noaa.gov/pr/species/Status%20Reviews/green_turtle_sr_2015.pdf

Loiza Section 14 Continuing Authorities Program (CAP) Project

ATTACHMENT 1 – CD-ROM

2015 Statewide Programmatic Biological Opinion (SPBO)

GOBIERNO DE PUERTO RICO
Oficina Estatal de Conservación Histórica

October 6, 2017

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch
Department of the Army
Jacksonville District Corps of Engineers
701 San Marco Boulevard
Jacksonville, Florida 32207-0019

SHPO 10-03-17-01 SECTION 14 (EMERGENCY STREAM BANK AND SHORELINE PROTECTION) STUDY, LOÍZA, PUERTO RICO

Dear Ms. Paduano Ralph,

Our office has received and reviewed the above referenced project in accordance with 54 U.S.C. 306108 (commonly known as Section 106 of the National Historic Preservation Act) and 36 CFR Part 800: Protection of Historic Properties from the Advisory Council on Historic Preservation. The State Historic Preservation Officer (SHPO) is to advise and assist federal agencies and other responsible entities when identifying historic properties, assessing effects upon them, and considering alternatives to avoid or reduce the project's effects.

Our records support your finding of **no historic properties affected** within the project's area of potential effects.

Please note that should the agency discover other historic properties at any point during project implementation, you should notify the SHPO immediately. If you have question regarding this matter, please contact Archaeologist Miguel A. Bonini, (787)721-3737 or mbonini@prshpo.pr.gov.

Sincerely,

Carlos A. Rubio-Cancela
State Historic Preservation Officer

CARC/GMO/BRS/MB/eds

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-0019

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

SEP 20 2017

Mr. Carlos Rubio-Cancela
State Historic Preservation Officer
Office of the Governor
P.O. Box 9023935
San Juan, Puerto Rico 00902-3935

Re: Loíza Puerto Rico, Section 14 (Emergency Stream Bank and Shoreline Protection) Study

Dear Mr. Rubio-Cancela:

The U.S. Army Corps of Engineers, Jacksonville District (Corps), is studying the environmental effects of providing emergency shoreline protection along the coast of Loíza, Puerto Rico. The purpose of the Loíza Section 14 project is to develop an implementable and acceptable plan to reduce damages to infrastructure from storm impacts, including waves, inundation, and erosion. The Loíza shoreline is severely eroded; chronic erosion has already impacted and continues to threaten impacts to public infrastructure and facilities along the shoreline. The study area includes a community center (Centro Comunal Parcelas Suarez), a public school (Parcel Suarez head start school), and a public road (Calle Punta Del Atlántico) within the Municipality of Loíza, Puerto Rico (Figure 1).

As a result of the study, a Tentatively Selected Plan (TSP) for the project was chosen which includes the placement of a continuous rock revetment along approximately 1,000 feet of shoreline in front of Calle Punta Del Atlántico, the school, and the Centro Comunal Parcelas Suarez (Figure 2). Approximately 220 feet of Calle 2 will be replaced in order to maintain resident access and re-connect the evacuation route. A damaged public sidewalk will also be demolished and replaced with a "Greenway" (high performance turf reinforcement mat) between the road and revetment to eliminate erosion from overwash and storm runoff. Staging and/or lay down areas for project construction will be located in previously paved and disturbed areas within the project area of potential effects (APE).

In February 2017, the Corps project archaeologist conducted a visual reconnaissance of the study area to identify historic properties within the APE. The archaeologist examined the ground surface and inspected the erosional profile of the beach for cultural resources (Figure 3). Additionally, a historic building survey was undertaken within the APE and historic aerials were reviewed for pertinent information regarding the construction date of buildings within or adjacent to the APE.

As a result of the cultural resources assessment, no archaeological materials were identified within the APE. All structures identified within the APE were constructed after 1977, including the Centro Comunal Parcelas Suarez and the public school (Figures 4 and 5). These structures were built between 1977 and 1978 during the administration of the first Mayor of Loiza, Gabriel Santo Lopez as part of the "Proyecto Pesquero Parcelas Suarez". Although these structures demonstrate unique design characteristics, specifically the scallop-shaped roof of the Centro Comunal Parcelas Suarez, they have not achieved significance within the past 50 years to be considered eligible for the National Register of Historic Places (NRHP) as defined by 36 CFR 60.4 [a-d].

Based on the assessment described above, the Corps has determined that the TSP will have no effect on historic properties listed or eligible for listing in the NRHP. Additionally, the Corps believes that the proposed revetment will benefit historic buildings adjacent to the Loíza shoreline by minimizing the potential for future erosion. Pursuant to the National Environmental Policy Act and Section 106 of the National Historic Preservation Act (54 USC 300101) and it's implementing regulations (36 CFR 800), the Corps kindly requests your comments on the determination of no effect. If there are any questions, please contact Ms. Meredith Moreno at 904-232-1577 or e-mail at Meredith.A.Moreno@usace.army.mil.

Sincerely,

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch

Enclosure

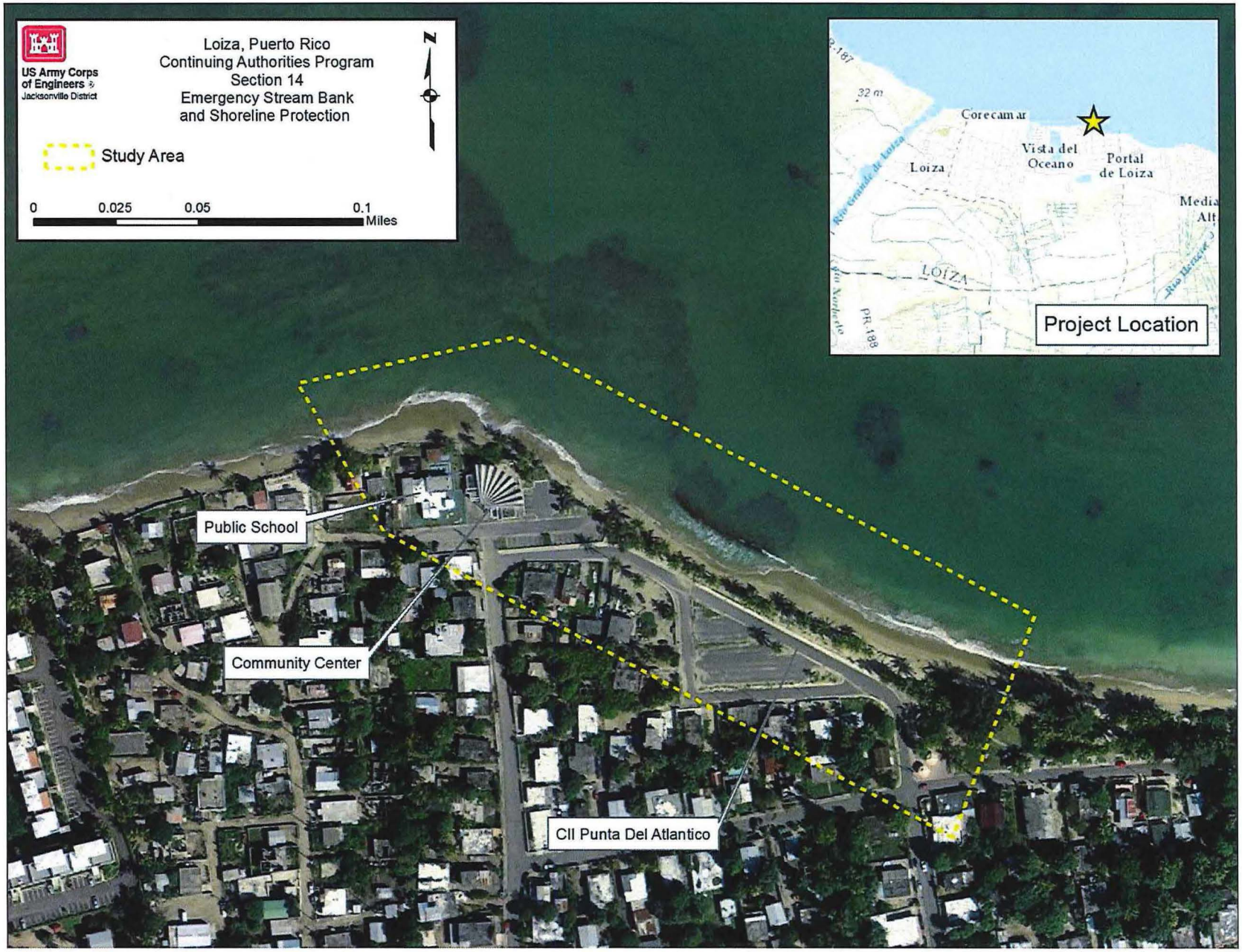

Figure 1. Loiza Section 14 project study area.

Figure 2. Loiza Section 14 proposed project features.

Figure 3. Southeast view of beach placement area.

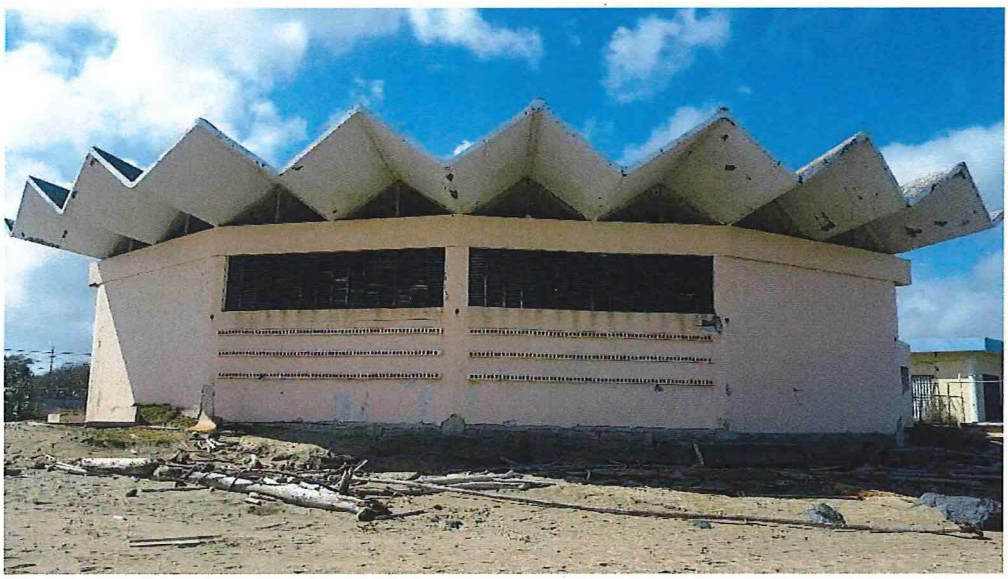

Figure 4. Southwest view of the community center, northeast façade.

Figure 5. Northwest view of the school, east façade.

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 San Marco Boulevard
JACKSONVILLE, FLORIDA 32207-8175

REPLY TO
ATTENTION OF

Planning and Policy Division
Environmental Branch

MAR 12 2018

To Whom It May Concern:

Pursuant to the National Environmental Policy Act and the U.S. Army Corps of Engineers (Corps) Regulation (33 CFR 230.11), this letter constitutes the Notice of Availability of the Draft Integrated Feasibility Report/Environmental Assessment (IFR/EA) for the Loíza Section 14 Continuing Authorities Program (CAP) Project located in the Municipality of Loíza in Puerto Rico.

The purpose of the project is to protect existing public infrastructure along the Loíza shoreline from erosion and storm damages. The Recommended Plan consists of the placement of a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, head start public school, and community center, **Figure 1**.

Figure 1. Study Area of Loiza, Puerto Rico.

Elevation of the revetment crest would be 12.0-ft (Puerto Rico Vertical Datum (PRVD) 2002). The remaining sidewalk may need to be demolished due to existing damages and replaced with the over-wash protection zone, which consists of high performance turf reinforcement mat keyed in between the existing road and revetment. By constructing the Recommended Plan, the existing public infrastructure will be protected from the continued erosion and storm damages.

The Draft IFR/EA, Proposed Finding of No Significant Impact, and associated appendices are available for your review on the Jacksonville District's Environmental planning website, under Puerto Rico:

http://www.saj.usace.army.mil/About/Divisions-Offices/Planning/Environmental-Branch/Environmental-Documents/

Questions or comments can be submitted to Kristen Donofrio at the letterhead address, or via email to Kristen.L.Donofrio@usace.army.mil within 30 days from the date of this Notice of Availability. Ms. Donofrio may also be reached by telephone at 904-232-2918.

Sincerely,

Gina Paduano Ralph, Ph.D.
Chief, Environmental Branch

APPENDIX D
ENVIRONMENTAL

D-2: 2015 Statewide Programmatic Biological Opinion (SPBO)

Integrated Feasibility Report and Environmental Assessment for Continuing Authorities Program Section 14 Emergency Streambank and Shoreline Protection project in Loiza, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960

Service Log Number: 41910-2011-F-0170

March 13, 2015

Alan M. Dodd, Colonel
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Dear Colonel Dodd:

This letter transmits the U.S. Fish and Wildlife Service's revised Statewide Programmatic Biological Opinion (SPBO) for the U.S. Army Corps of Engineers (Corps) Civil Works and Regulatory sand placement activities in Florida and their effects on the following sea turtles: Northwest Atlantic Ocean distinct population segment (NWAO DPS) of loggerhead (*Caretta caretta*) and its designated terrestrial critical habitat; green (*Chelonia mydas);* leatherback (*Dermochelys coriacea*); hawksbill (*Eretmochelys imbricata*); and Kemp's ridley (*Lepidochelys kempii*) ; and the following beach mice: southeastern (*Peromyscus polionotus niveiventris*); Anastasia Island (*Peromyscus polionotus phasma*); Choctawhatchee (*Peromyscus polionotus allophrys*); St. Andrews (*Peromyscus polionotus peninsularis*); and Perdido Key (*Peromyscus polionotus trissyllepsis*) and their designated critical habitat. It does not address effects of these activities on the non-breeding piping plover (*Charadrius melodus*) and its designated critical habitat or for the red knot (*Calidris canutus rufa*). Effects of Corps planning and regulatory shore protection activities on the non-breeding piping plover and its designated critical habitat within the North Florida Ecological Services office area of responsibility and the South Florida Ecological Services office area of responsibility are addressed in the Service's May 22, 2013, Programmatic Piping Plover Biological Opinion. Effects of shore protection activities for the piping plover in the Panama City Ecological Services office area of responsibility will be addressed on a project by project basis.

Each proposed project will undergo an evaluation process by the Corps to determine if it properly fits within a programmatic approach. The project description will determine if the project is appropriate to apply to this programmatic consultation. If it is determined that the minimization measures, Reasonable and Prudent Measures, and Terms and Conditions in the SPBO are applicable to the project, it will be covered by this programmatic consultation. If not, the Corps will consult separately on individual projects that do not fit within this programmatic approach.

We will meet annually during the fourth week of August to review the sand placement projects, assess new data, identify information needs, and scope methods to address those needs, including, but not limited to, evaluations and monitoring specified in this SPBO, reviewing results, formulating or amending actions that minimize take of listed species, and monitoring the effectiveness of those actions.

The entire programmatic consultation will be reviewed every five years or sooner if new information concerning the projects or protected species occurs. Reinitiation of formal consultation is also required 10 years after the issuance of this SPBO.

We are available to meet with agency representatives to discuss the remaining issues with this consultation. If you have any questions, please contact Peter Plage at the North Florida Ecological Services Office at (904) 731-3085, Jeffrey Howe at the South Florida Ecological Services Office at (772) 469-4283, or Lisa Lehnhoff at the Panama City Ecological Services Office at (850) 769-0552, extension 241.

Sincerely,

for Larry Williams
State Supervisor

Shore Protection Activities along the Coast of Florida

Statewide Programmatic Biological Opinion

(Revised)

February 27, 2015

Prepared by:
U.S. Fish and Wildlife Service

TABLE OF CONTENTS

INTRODUCTION **1**

MIGRATORY BIRDS **13**

CONSULTATION HISTORY **14**

BIOLOGICAL OPINION **17**

DESCRIPTION OF THE PROPOSED ACTION **17**

- **Corps Commitments** **18**
- **Sea Turtles** **18**
- **Beach Mice** **19**

ACTION AREA **19**

STATUS OF THE SPECIES/CRITICAL HABITAT **21**

- **LOGGERHEAD SEA TURTLE** **21**
- **GREEN SEA TURTLE** **22**
- **LEATHERBACK SEA TURTLE** **23**
- **HAWKSBILL SEA TURTLE** **25**
- **KEMP'S RIDLEY SEA TURTLE** **25**

LIFE HISTORY **26**

- **LOGGERHEAD SEA TURTLE** **26**
- **GREEN SEA TURTLE** **30**
- **LEATHERBACK SEA TURTLE** **30**
- **HAWKSBILL SEA TURTLE** **30**
- **KEMP'S RIDLEY SEA TURTLE** **30**

POPULATION DYNAMICS **31**

- **LOGGERHEAD SEA TURTLE** **31**
- **GREEN SEA TURTLE** **32**
- **LEATHERBACK SEA TURTLE** **32**
- **HAWKSBILL SEA TURTLE** **33**
- **KEMP'S RIDLEY SEA TURTLE** **33**

ANALYSIS OF THE SPECIES/CRITICAL HABITAT LIKELY TO BE AFFECTED **43**

ENVIRONMENTAL BASELINE **45**

EFFECTS OF THE ACTION **56**

- **Factors to be considered** **56**
- **ANALYSES FOR EFFECTS OF THE ACTION** **57**
  - ***Beneficial Effects*** **57**
  - ***Direct Effects*** **58**
  - **Indirect Effects** **60**

SPECIES' RESPONSE TO A PROPOSED ACTION **64**

STATUS OF THE SPECIES/CRITICAL HABITAT **65**

SPECIES/CRITICAL HABITAT DESCRIPTION 65
LIFE HISTORY (ALL SUBSPECIES OF BEACH MICE) 82
POPULATION DYNAMICS 86
STATUS AND DISTRIBUTION 92
Recovery Criteria 98
ANALYSIS OF THE SPECIES/CRITICAL HABITAT LIKELY TO BE AFFECTED 107
ENVIRONMENTAL BASELINE 108
STATUS OF THE SPECIES/CRITICAL HABITAT WITHIN THE ACTION AREA (ALL SUBSPECIES OF BEACH MICE) 108
FACTORS AFFECTING THE SPECIES ENVIRONMENT WITHIN THE ACTION AREA 108
EFFECTS OF THE ACTION 110
FACTORS TO BE CONSIDERED 110
SPECIES' RESPONSE TO A PROPOSED ACTION 113
CUMULATIVE EFFECTS 114
CONCLUSION 115
SEA TURTLES 115
BEACH MICE 116
INCIDENTAL TAKE STATEMENT 117
EFFECT OF THE TAKE 120
REASONABLE AND PRUDENT MEASURES (RPM) 121
TERMS AND CONDITIONS 124
CONSERVATION RECOMMENDATIONS 160
LITERATURE CITED 164
APPENDIX A 196
APPENDIX B 2
APPENDIX C 2
APPENDIX D 2

LIST OF FIGURES

FIGURE 1. LIFE HISTORY STAGES OF A LOGGERHEAD TURTLE. THE BOXES REPRESENT LIFE STAGES AND THE CORRESPONDING ECOSYSTEMS, SOLID LINES REPRESENT MOVEMENTS BETWEEN LIFE STAGES AND ECOSYSTEMS, AND DOTTED LINES ARE SPECULATIVE. 27
FIGURE 2. MAP OF THE DISTRIBUTION OF THE LOGGERHEAD RECOVERY UNITS. 35
FIGURE 3. DISTRIBUTION OF LOGGERHEAD NESTING IN THE PFRU AND NGMRU IN FLORIDA..... 47
FIGURE 4. DISTRIBUTION OF GREEN TURTLE NESTING IN FLORIDA. 48
FIGURE 5. DISTRIBUTION OF LEATHERBACK TURTLE NESTING IN FLORIDA. 49
FIGURE 6. REVIEW OF SEA TURTLE NESTING SITE SELECTION FOLLOWING NOURISHMENT..... 62
FIGURE 7. THE DISTRIBUTION OF THE SOUTHEASTERN BEACH MOUSE. 67
FIGURE 8. THE DISTRIBUTION OF THE ANASTASIA ISLAND BEACH MOUSE. 68
FIGURE 9. HISTORICAL RANGE OF GULF COAST BEACH MOUSE SUBSPECIES. 70
FIGURE 10. CRITICAL HABITAT UNITS DESIGNATED FOR THE PERDIDO KEY BEACH MOUSE. 71
FIGURE 11. CRITICAL HABITAT UNITS DESIGNATED FOR THE CHOCTAWHATCHEE BEACH MOUSE. 76
FIGURE 12. CRITICAL HABITAT UNITS DESIGNATED FOR THE ST. ANDREW BEACH MOUSE. 80
FIGURE 13. RECOMMENDED SLOPE ON A HIGH EROSION BEACH FOR SAND PLACEMENT PROJECTS THAT INCLUDE THE CREATION OF A DUNE. 127
FIGURE 14. RECOMMENDED SLOPE ON A LOW EROSION BEACH FOR SAND PLACEMENT PROJECTS THAT INCLUDE THE CREATION OF A DUNE. 127
FIGURE 15. BEACH LIGHTING SCHEMATIC. 138
FIGURE 16. EQUIPMENT PLACEMENT FOR PROJECTS OCCURRING IN BEACH MOUSE OCCUPIED HABITAT. 140

LIST OF TABLES

TABLE 1. STATUS OF FEDERALLY LISTED SPECIES WITHIN THE ACTION AREA THAT MAY BE ADVERSELY AFFECTED BY THE SHORE PROTECTION ACTIVITIES. 2
TABLE 2. SPECIES AND CRITICAL HABITAT EVALUATED FOR EFFECTS AND THOSE WHERE THE SERVICE HAS CONCURRED WITH A "MAY AFFECT, NOT LIKELY TO ADVERSELY AFFECT (MANLAA)" DETERMINATION. 3
TABLE 3. FWS ECOLOGICAL SERVICES (ES) OFFICES AND AREAS OF RESPONSIBILITY (COUNTIES). 5
TABLE 4. LIST OF NWAO DPS LOGGERHEAD CRITICAL HABITAT IN THE TERRESTRIAL HABITAT FLORIDA AND OWNERSHIP. 6
TABLE 5. TYPICAL VALUES OF LIFE HISTORY PARAMETERS FOR LOGGERHEADS NESTING IN THE U.S. (NMFS AND SERVICE 2008). 28
TABLE 6. LOGGERHEAD SEA TURTLE NESTING AND HATCHING SEASON FOR FLORIDA. 47
TABLE 7. GREEN SEA TURTLE NESTING AND HATCHING SEASON FOR FLORIDA. 49
TABLE 8. LEATHERBACK SEA TURTLE NESTING AND HATCHING SEASON FOR FLORIDA. 50
TABLE 9. HAWKSBILL SEA TURTLE NESTING AND HATCHING SEASON FOR FLORIDA. 50
TABLE 10. DOCUMENTED DISORIENTATIONS ALONG THE FLORIDA COAST (FWC 2007A). 53
TABLE 11. CRITICAL HABITAT UNITS DESIGNATED FOR THE PERDIDO KEY BEACH MOUSE. 71
TABLE 12. CRITICAL HABITAT UNITS DESIGNATED FOR THE CHOCTAWHATCHEE BEACH MOUSE. . 76
TABLE 13. CRITICAL HABITAT UNITS DESIGNATED FOR THE ST. ANDREW BEACH MOUSE. 80
TABLE 14. PERDIDO KEY BEACH MOUSE HABITAT ON PERDIDO KEY IN FLORIDA AND ALABAMA 95
TABLE 15. PREVIOUS BIOLOGICAL OPINIONS WITHIN FLORIDA THAT HAVE BEEN ISSUED FOR PROJECTS THAT HAD ADVERSE IMPACT TO THE NESTING BEACH MICE. 99
TABLE 16. BEACH SAND PLACEMENT AND SEA TURTLE NEST MONITORING/RELOCATION WINDOWS, BREVARD THROUGH BROWARD COUNTIES, COAST OF FLORIDA. 129
TABLE 17. BEACH SAND PLACEMENT AND SEA TURTLE NEST MONITORING/RELOCATION WINDOWS, OUTSIDE OF BREVARD THROUGH BROWARD COUNTIES, COAST OF FLORIDA. 130
TABLE 18. POST-CONSTRUCTION SEA TURTLE MONITORING. 134
TABLE 19. DATES FOR COMPACTION MONITORING AND ESCARPMENT SURVEYS BY COUNTY. .. 135
TABLE 20. INFORMATION TO INCLUDE IN THE REPORT FOLLOWING THE PROJECT COMPLETION. . 141
TABLE 21. SEA TURTLE MONITORING FOLLOWING SAND PLACEMENT ACTIVITY. 142
TABLE 22. INFORMATION TO INCLUDE IN THE REPORT FOLLOWING THE PROJECT COMPLETION. . 160

Acronyms

ABM	Alabama Beach Mouse
Act	Endangered Species Act
AFB	Air Force Base
AIBM	Anastasia Island Beach Mouse
ASP	Anastasia State Park
BO	Biological Opinion
CBM	Choctawhatchee Beach Mouse
CBRA	Coastal Barrier Resources Act
CCAFS	Cape Canaveral Air Force Station
CFR	Code of Federal Regulations
CH	Critical Habitat
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Corps	U.S. Army Corps of Engineers
DOI	U.S. Department of the Interior
DTRU	Dry Tortugas Recovery Unit
F	Fahrenheit
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FMNM	Fort Matanzas National Monument
FR	*Federal Register*
FWC	Florida Fish and Wildlife Conservation Commission

FWC/FWRI	Florida Fish and Wildlife Conservation Commission's Florida Fish and Wildlife Research Institute
GCRU	Greater Caribbean Recovery Unit
GINS	Gulf Islands National Seashore
GTMNERR	Guana Tolomato Matanzas National Estuarine Research Reserve
HCP	Habitat Conservation Plan
IMA	Important Manatee Areas
INBS	Index Nesting Beach Survey
IPCC	Intergovernmental Panel on Climate Change
ITP	Incidental Take Permit
K	Carrying Capacity
MANLAA	May Affect, but is Not Likely to Adversely Affect
MHW	Mean High Water
MHWL	Mean High Water Line
MMPA	Marine Mammal Protection Act
mtDNA	Mitochondrial Deoxyribonucleic Acid
NGMRU	Northern Gulf of Mexico Recovery Unit
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRU	Northern Recovery Unit
NWAO DPS	Northwest Atlantic Ocean Distinct Population Segment
NWR	National Wildlife Refuge
PBA	Programmatic Biological Assessment
PCE	Primary Constituent Elements

PFRU	Peninsular Florida Recovery Unit
PHVA	Population and Habitat Viability Analysis
PKBM	Perdido Key Beach Mouse
PKSP	Perdido Key State Park
PSI	Per Square Inch
PVA	Population Viability Analysis
SABM	St. Andrews Beach Mouse
SAJ	South Atlantic Jacksonville
SAM	South Atlantic Mobile
SAV	submerged aquatic vegetation
SEBM	Southeastern Beach Mouse
Service	U.S. Fish and Wildlife Service
SNBS	Statewide Nesting Beach Survey
SPBO	Statewide Programmatic Biological Opinion
SR	State Road
TED	Turtle Excluder Device
TEWG	Turtle Expert Working Group
U.S.C.	United States Code
U.S.	United States

March 13, 2015

Alan M. Dodd, Colonel
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Federal Activity No:	41910-2010-F-0284
Applicant:	U.S. Army Corps of Engineers
Date Started:	May 30, 2007
Project Title:	Shore Protection Activities
Ecosystem:	Florida Coastline
Counties:	Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, Escambia.

Dear Colonel Dodd:

This document is the U.S. Fish and Wildlife Service's (Service) Statewide Programmatic Biological Opinion (SPBO) for the U.S. Army Corps of Engineers (Corps) planning and regulatory shore protection activities in Florida and their effects on the Northwest Atlantic Ocean distinct population (NWAO DPS) of loggerhead (*Caretta caretta*) and its designated terrestrial critical habitat, green (*Chelonia mydas)*, leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*) sea turtles, and southeastern (*Peromyscus polionotus niveiventris*), Anastasia Island (*Peromyscus polionotus phasma*), Choctawhatchee (*Peromyscus polionotus allophrys*), St. Andrews (*Peromyscus polionotus peninsularis*), and Perdido Key (*Peromyscus polionotus trissyllepsis*) beach mice and designated critical habitat (CH) for the Perdido Key beach mouse (PKBM), Choctawhatchee beach mouse (CBM), and St. Andrews beach mouse (SABM) **(Table 1)**. This SPBO is provided in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). We have assigned Service Federal Activity number 41910-2010-F-0284 for this consultation.

The Corps determined that the proposed project "may affect and is likely to adversely affect the above listed species (**Table 1)**. The Corps also has determined that the proposed project "may affect, but is not likely to adversely affect" (MANLAA) the West Indian (Florida) manatee (*Trichechus manatus latirostris*), the roseate tern (*Sterna dougallii dougallii*), the beach jacquemontia (*Jacquemontia reclinata*), and the Garber's spurge (*Chamaesyce garberi*) **(Table 2)**. Based on our review of the project plans and the incorporation of the minimization measures listed

in the final Programmatic Biological Assessment (PBA) as conditions of the projects where these species are known to exist, we concur with these determinations.

Table 1. Status of federally listed species within the Action Area that may be adversely affected by the shore protection activities.

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	STATUS/CH
Mammals		
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	Endangered(CH)
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	Threatened
Anastasia Island beach mouse	*Peromyscus polionotus phasma*	Endangered
St. Andrews beach mouse	*Peromyscus polionotus peninsularis*	Endangered (CH)
Perdido Key beach mouse	*Peromyscus polionotus trissyllepsis*	Endangered (CH)
Birds		
Piping Plover*	*Charadrius melodus*	Threatened
Red Knot*	*Calidris canutus rufa*	Proposed
Reptiles		
Green sea turtle	*Chelonia mydas*	Endangered
Hawksbill turtle	*Eretmochelys imbricata*	Endangered
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle (Northwest Atlantic Ocean population)	*Caretta caretta*	Threatened (CH)

* Not covered by the revised SPBO

Table 2. Species and critical habitat evaluated for effects and those where the Service has concurred with a "may affect, not likely to adversely affect (MANLAA)" determination.

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	STATUS/CH	PRESENT IN ACTION AREA	MANLAA
Florida manatee	*Trichechus manatus latirostris*	Endangered (CH)	Yes	Yes
Roseate tern	*Sterna dougallii dougallii*	Threatened	Yes	Yes
Beach jacquemontia	*Jacquemontia reclinata*	Endangered	Yes	Yes
Garber's spurge	*Chamaesyce garberi*	Threatened	Yes	Yes

Florida Manatee

For all dredging activities, including offshore dredging activities associated with submerged borrow areas and navigational channel maintenance:

The Corps has determined that the proposed projects "may affect, but are not likely to adversely affect" the Florida manatee. The Service has reviewed the draft PBA and concurs that, if the 2011 Standard Manatee In-water Construction Conditions are made a condition of the issued permit or Corps project plan and implemented, these activities are not likely to adversely affect the Florida manatee. We also conclude that these activities will not adversely modify its critical habitat. These findings fulfill section 7 requirements of the Act in regard to manatees. In addition, because no incidental take of manatees is anticipated, no such authorization under the Marine Mammal Protection Act (MMPA) is needed. The web link to these conditions: http://www.fws.gov/northflorida/Manatee/Manate_Key_Programmatic/20130425_gd_Appendix%20B_2011_Standard%20Manatee%20Construction%20Conditions.pdf.

For all dredging activities within estuaries and adjacent to the shore, inlets, and/or inshore areas including channels associated with submerged borrow areas and navigational channels:

If the 2011 Standard Manatee In-water Construction Conditions <u>and</u> the following additional conditions are made a condition of the issued permit or Corps project plan and implemented, the Service would be able to concur with a determination by the Corps that these activities are not likely to adversely affect the Florida manatee. We also conclude that these activities will not

adversely modify its critical habitat. These findings fulfill section 7 requirements of the Act in regard to manatees. In addition, because no incidental take of manatees is anticipated, no such authorization under the Marine Mammal Protection Act (MMPA) is needed.

Additional conditions:

1. Barges shall install mooring bumpers that provide a minimum 4-foot standoff distance under maximum compression between other moored barges and large vessels, when in the vicinity of inlets, river mouths, and large estuaries where manatees are known to congregate.

2. Pipelines shall be positioned such that they do not restrict manatee movement to the maximum extent possible. Plastic pipelines shall be weighted or floated. Pipelines transporting dredged material within the vicinity of inlets, river mouths, and large estuaries where manatees are known to congregate shall be weighted or secured to the bottom substrate as necessary to prevent movement of the pipeline and to prevent manatee entrapment or crushing.

3. In the event that such positioning has the potential to impact submerged aquatic vegetation (SAV) or nearshore hardbottom, the pipeline may be elevated or secured to the bottom substrate to minimize impacts to SAV.

For dredging activities located within Important Manatee Areas (IMAs), including Warm Water Aggregation Areas (WWAAs):

Important Manatee Areas (IMAs) are areas where large numbers of manatees occur because of the presence of warm water sites (including power plants, springs, etc.), feeding sites, drinking water sites, and other attractants. Manatees congregate at these sites to shelter from the cold, rest, feed and drink, travel, and engage in other activities. Current IMA maps, including maps of Warm Water Aggregation Areas (WWAAs) and areas of inadequate protection (AIPs), can be found at the Corps' weblink: http://www.saj.usace.army.mil/Missions/Regulatory/SourceBook.aspx.

Dredging activities that occur within the IMA sites (including WWAAs) are not included in this SPBO. For dredging activities within IMAs, the Corps shall contact the appropriate FWS Ecological Services Office for project-specific conditions. See Table 3.

Table 3. FWS Ecological Services (ES) offices and areas of responsibility (counties).

County	Service ES Office	Address	Telephone
Brevard, Citrus, Dixie, Duval, Flagler, Hernando, Hillsborough, Levy, Manatee, Nassau, Pasco, Pinellas, St Johns, Taylor, Volusia	North Florida ES Office	7915 Baymeadows Way Jacksonville, FL 32256	(904) 731-3336
Broward, Charlotte, Collier, Indian River, Lee, Martin, Miami-Dade, Monroe, Palm Beach, St Lucie, Sarasota	South Florida ES Office	1339 20th Street Vero Beach, FL 32960	(772) 562-3909
Bay, Escambia, Franklin, Gulf, Jefferson, Okaloosa, Santa Rosa, Taylor, Wakulla, Walton,	Panama City ES Office	1601 Balboa Avenue Panama City, FL 32405	(850) 769-0552

Although this does not represent a biological opinion for the manatee as described in section 7 of the Act, it does fulfill the requirements of the Act and no further action is required regarding manatees. It also fulfills the requirements of the MMPA. If modifications are made in the programmatic action or additional information becomes available, re-initiation of consultation may be required.

Loggerhead Terrestrial Critical Habitat

The Corps has determined that the proposed projects "may affect, but are not likely to adversely affect" the terrestrial critical habitat of the Northwest Atlantic Ocean loggerhead sea turtle population. The Service concurs with the Corps' determination and furthermore concludes that the proposed projects will not adversely modify the terrestrial critical habitat of the Northwest Atlantic Ocean loggerhead sea turtle population.Designated Critical Habitat: The Service has designated terrestrial critical habitat for Northwest Atlantic loggerhead population on July 10, 2014. NOTE: The proposed rule was dated March 25, 2013 (78 FR 18000) and the notice of availability of the economic analysis for the proposed rule (78 FR 42921) was dated July 18, 2013. The final rule of terrestrial critical habitat includes 88 units encompassing approximately 1,102 kilometers (685 miles) of mapped shoreline along the coasts of North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi: http://www.fws.gov/northflorida/SeaTurtles/2014_Loggerhead_CH/Maps/2014_NWA_Loggerhead_Terrestrial_CH_index_maps.pdf.

Table 4. List of NWAO DPS loggerhead critical habitat in the terrestrial habitat Florida and ownership.

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-01: South Duval County Beaches–County line at Duval and St. Johns Counties	11.5 (7.1)	0 (0)	0 (0)	11.5 (7.1)
LOGG-T-FL-02: Fort Matanzas National Monument, St. Johns County	1.4 (0.9)	1.4 (0.9)	0 (0)	0 (0)
LOGG-T-FL-03: River to Sea Preserve at Marineland — North Peninsula State Park, Flagler and Volusia Counties	31.8 (19.8)	0 (0)	6.1 (3.8) North Peninsula State Park, Washington Oaks Garden State Park (in Guana Tolomato Matanzas NERR), and Gamble Rogers Memorial State Recreation Area at Flagler Beach	25.7 (16.0)
LOGG-T-FL-04: Canaveral National Seashore North, Volusia County	18.2 (11.3)	18.2 (11.3) Canaveral National Seashore	0 (0)	0 (0)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-05: Canaveral National Seashore South — Merritt Island NWR-Kennedy Space, Brevard County	28.4 (17.6)	28.4 (17.6) includes Canaveral National Seashore (Brevard portion) and Merritt Island NWR/KSC	0 (0)	0 (0)
LOGG-T-FL-06: Central Brevard Beaches, Brevard County	19.5 (12.1)	0 (0)	0 (0)	19.5 (12.1)
LOGG-T-FL-07: South Brevard Beaches, Brevard County	20.8 (12.9)	4.2 (2.6) Archie Carr NWR	1.5 (1.0) Sebastian Inlet State Park	15.0 (9.3)
LOGG-T-FL-08: Sebastian Inlet — Indian River Shores, Indian River County	4.1 (2.5)	0.9 (0.6) Archie Carr NWR	3.2 (2.0) Sebastian Inlet State Park	0 (0)
LOGG-T-FL-09: Fort Pierce Inlet — St. Lucie Inlet, St. Lucie and Martin Counties	35.2 (21.9)	0 (0)	0 (0)	35.2 (21.9)
LOGG-T-FL-10: St. Lucie Inlet — Jupiter Inlet, Martin and Palm Beach Counties	24.9 (15.5)	4.8 (3.0) Hobe Sound NWR	3.7 (2.3) St. Lucie Inlet Preserve State Park	16.4 (10.2)
LOGG-T-FL-11: Jupiter Inlet — Lake Worth Inlet, Palm Beach County	18.8 (11.7)	0 (0)	2.5 (1.5) John D. MacArthur Beach State Park	16.3 (10.1)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-12: Lake Worth Inlet — Boynton Inlet, Palm Beach County	24.3 (15.1)	0 (0)	0 (0)	24.3 (15.1)
LOGG-T-FL-13: Boynton Inlet — Boca Raton Inlet, Palm Beach County	22.6 (14.1)	0 (0)	0 (0)	22.6 (14.1)
LOGG-T-FL-14: Boca Raton Inlet — Hillsboro Inlet, Palm Beach and Broward Counties	8.3 (5.2)	0 (0)	0 (0)	8.3 (5.2)
LOGG-T-FL-15: Long Key, Monroe County	4.2 (2.6)	0 (0)	4.2 (2.6) Long Key State Park	0 (0)
LOGG-T-FL-16: Bahia Honda Key, Monroe County	3.7 (2.3)	0 (0)	3.7 (2.3) Bahia Honda Key State Park	0 (0)
LOGG-T-FL-17: Longboat Key, Manatee and Sarasota Counties	16.0 (9.9)	0 (0)	0 (0)	16.0 (9.9)
LOGG-T-FL-18: Siesta and Casey Keys, Sarasota County	20.8 (13.0)	0 (0)	0 (0)	20.8 (13.0)
LOGG-T-FL-19: Venice Beaches and Manasota Key, Sarasota and Charlotte Counties	26.0 (16.1)	0 (0)	1.9 (1.2) Stump Pass Beach State Park	24.1 (15.0)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-20: Knight, Don Pedro, and Little Gasparilla Islands, Charlotte County	10.8 (6.7)	0 (0)	1.9 (1.2) Don Pedro Island State Park	8.9 (5.5)
LOGG-T-FL-21: Gasparilla Island, Charlotte and Lee Counties	11.2 (6.9)	0 (0)	1.5 (1.0) Gasparilla Island State Park	9.6 (6.0)
LOGG-T-FL-22: Cayo Costa, Lee County	13.5 (8.4)	0 (0)	13.2 (8.2) Cayo Costa State Park	0.3 (0.2)
LOGG-T-FL-23: Captiva Island, Lee County	7.6 (4.7)	0 (0)	0 (0)	7.6 (4.7)
LOGG-T-FL-24: Sanibel Island West, Lee County	12.2 (7.6)	0 (0)	0 (0)	12.2 (7.6)
LOGG-T-FL-25: Little Hickory Island, Lee and Collier Counties	8.7 (5.4)	0 (0)	0 (0)	8.7 (5.4)
LOGG-T-FL-26: Wiggins Pass — Clam Pass, Collier County	7.7 (4.8)	0 (0)	2.0 (1.2) Delnor-Wiggins Pass State Park	5.7 (3.6)
LOGG-T-FL-27: Clam Pass — Doctors Pass, Collier County	4.9 (3.0)	0 (0)	0 (0)	4.9 (3.0)
LOGG-T-FL-28: Keewaydin Island and Sea Oat Island, Collier County	13.1 (8.1)	0 (0)	12.4 (7.7) Rookery Bay NERR	0.7 (0.5)
LOGG-T-FL-29: Cape Romano, Collier County	9.2 (5.7)	0 (0)	7.2 (4.5) Rookery Bay NERR	2.0 (1.2)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-30: Ten Thousand Islands North, Collier County	7.8 (4.9)	2.9 (1.8) Ten Thousand Islands NWR	4.9 (3.1) Rookery Bay NERR	0 (0)
LOGG-T-FL-31: Highland Beach, Monroe County	7.2 (4.5)	7.2 (4.5) Everglades National Park	0 (0)	0 (0)
LOGG-T-FL-32: Graveyard Creek — Shark Point, Monroe County	0.9 (0.6)	0.9 (0.6) Everglades National Park	0 (0)	0 (0)
LOGG-T-FL-33: Cape Sable, Monroe County	21.3 (13.2)	21.3 (13.2) Everglades National Park	0 (0)	0 (0)
LOGG-T-FL-34: Dry Tortugas, Monroe County	5.7 (3.6)	5.7 (3.6) Dry Tortugas National Park	0 (0)	0 (0)
LOGG-T-FL-35: Marquesas Keys, Monroe County	5.6 (3.5)	5.6 (3.5) Key West NWR	0 (0)	0 (0)
LOGG-T-FL-36: Boca Grande Key, Monroe County	1.3 (0.8)	1.3 (0.8) Key West NWR	0 (0)	0 (0)
LOGG-T-FL-37: Woman Key, Monroe County	1.3 (0.8)	1.3 (0.8) Key West NWR	0 (0)	0 (0)
LOGG-T-FL-38: Perdido Key, Escambia County	20.2 (12.6)	11.0 (6.8) Gulf Islands National Seashore	2.5 (1.6) Perdido Key State Park	6.7 (4.2)
LOGG-T-FL-39: Mexico Beach and St. Joe Beach, Bay and Gulf Counties	18.7 (11.7)	0 (0)	0 (0)	18.7 (11.7)

Critical Habitat Unit	Length of Unit in kilometers (miles)	Federal Lands	State Lands	Private and Other (counties and municipalities)
LOGG-T-FL-40: St. Joseph Peninsula, Gulf County	23.5 (14.6)	0 (0)	15.5 (9.7) T.H. Stone Memorial St. Joseph Peninsula State Park and St. Joe Bay State Buffer Preserve	8.0 (4.9)
LOST-T-FL-41: Cape San Blas, Gulf County	11.0 (6.8)	0 (0)	0.1 (0.1) St. Joseph Bay State Buffer Preserve	10.8 (6.7)
LOGG-T-FL-42: St. Vincent Island, Franklin County	15.1 (9.4)	15.1 (9.4) St. Vincent NWR	0 (0)	0 (0)
LOGG-T-FL-43: Little St. George Island, Franklin County	15.4 (9.6)	0 (0)	15.4 (9.6) Apalachicola NERR	0 (0)
LOGG-T-FL-44: St. George Island, Franklin County:	30.7 (19.1)	0 (0)	14.0 (8.7) Dr. Julian G. Bruce St. George Island State Park	16.7 (10.4)
LOGG-T-FL-45: Dog Island, Franklin County	13.1 (8.1)	0 (0)	0 (0)	13.1 (8.1)
Florida State Totals	**637.1 (396.4)**	**130.3 (81.0)**	**117.4.0 (72.9)**	**390.3 (242.6)**

The primary constituent elements (PCEs) for loggerhead terrestrial critical habitat are those specific elements of the biological and physical features (BPF) that provide for the species' life-history processes and are essential to the conservation of the species. PBFs include those habitat components that support foraging, roosting, and sheltering and the physical features necessary for maintaining the natural processes that support these habitat components. The PBFs and PCEs are described as follows:

Physical and Biological Features (PBF):

PBF 1: Sites for Breeding, Reproduction, or Rearing (or Development) of Offspring

PBF 2: Habitats Protected from Disturbance or Representative of the Historical, Geographic, and Ecological Distributions of the Species

Primary Constituent Elements (PCE):

(1) Suitable nesting beach habitat that has (a) relatively unimpeded nearshore access from the ocean to the beach for nesting females and from the beach to the ocean for both post-nesting females and hatchlings and (b) is located above MHW to avoid being inundated frequently by high tides.

(2) Sand that (a) allows for suitable nest construction, (b) is suitable for facilitating gas diffusion conducive to embryo development, and (c) is able to develop and maintain temperatures and a moisture content conducive to embryo development.

(3) Suitable nesting beach habitat with sufficient darkness to ensure nesting turtles are not deterred from emerging onto the beach and allows hatchlings and post-nesting females to orient successfully to the sea.

(4) Natural coastal processes or artificially created or maintained habitat mimicking natural conditions.

Substantial amounts of sand are deposited along Gulf of Mexico and Atlantic Ocean beaches to protect coastal properties in anticipation of preventing erosion and to mimic what otherwise would be natural processes of overwash and island migration. Constructed beaches tend to differ from natural beaches in several important ways for sea turtles. They are typically wider, flatter, and more compacted, and the sediments are moister than those on natural beaches (Nelson *et al*. 1987; Ackerman *et al.* 1991; Ernest and Martin 1999).

Regarding PCE 1 and PCE 4 for sand placement projects, construction on the beach during sea turtle nesting and hatching season can obstruct nesting females from accessing the beach and hatchlings from entering the water unimpeded. To minimize these impacts, the Corps has agreed to avoid construction during peak nesting and hatching season in the higher density beaches within the entire NWAO DPS of the loggerhead sea turtle as described. This SPBO includes required terms and conditions that minimize incidental take of turtles and reduces the impacts to the PCE 3 by limiting activities at night and placing equipment and staging areas off the nesting beach.

More nests are washed out on the wide, flat beaches resulting from sand placement than narrower steeply sloped natural beaches. This phenomenon may persist through the second postconstruction year and results from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping occur as the beach equilibrates to a more natural contour.

A study performed for the Florida Department of Environmental Protection (FDEP) promoted the test construction of a more “turtle-friendly” beach. The Service, along with the National Fish and Wildlife Foundation and the Florida Fish and Wildlife Conservation Commission (FWC), began a study to determine if statistically significant improvements in nesting success, nest densities, and/or hatchling production can be achieved through modifications to the traditional construction template for beach nourishment projects. It is anticipated that a more natural beach profile will reduce the incidence of scarping, improve nesting success, and reduce the proportion of nests placed along the seaward portion of the berm (those at increased risk of being lost to erosion

during profile equilibration), relative to a traditionally built beach. The Corps remains committed to incorporating the results of this study into future design templates.

A significantly larger proportion of turtles emerging on engineered beaches abandon their nesting attempts than turtles emerging on natural or prenourished beaches, even though more nesting habitat is available (Trindell *et al*. 1998; Ernest and Martin 1999; Herren 1999), with nesting success approximately 10 to 34 percent lower on nourished beaches than on control beaches during the first year post-nourishment. This reduction in nesting success is most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics (beach profile, sediment grain size, beach compaction, frequency and extent of escarpments) associated with the nourishment project (Ernest and Martin 1999). This directly impacts PCE 2 above; however, on severely eroded sections of beach, where little or no suitable nesting habitat exists, and sand placement can result in increased nesting (Ernest and Martin 1999). The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (i.e., grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may benefit sea turtles more than the eroding beach it replaces.

Regarding PCE 3, during construction, any lights directly visible on the beach during the nesting and hatching seasons are minimized by shielding and directing the lights downward and away from the nesting beach as required in the Terms and Conditions of this SPBO.

The newly created wider and flatter beach berm exposes sea turtles and their nests to lights that were less visible, or not visible, from nesting areas before the sand placement activity leading to a higher probability of hatchling mortality due to disorientation. Changing to sea turtle compatible lighting can be accomplished at the local level through voluntary compliance or by adopting appropriate regulations. The Terms and Conditions in the Biological Opinion require a lighting survey prior to construction and post construction to determine the additional level of impacts as a result of the proposed project. The Terms and Conditions include working with the local sponsor to minimize the impacts of lighting as a result of the proposed project.

The Service has determined that with the incorporation of the conservation measures as described above, that the proposed projects will not adversely affect nor adversely modify the terrestrial critical habitat of the Northwest Atlantic Ocean loggerhead sea turtle population.

Migratory Birds

In order to comply with the Migratory Bird Treaty Act (16 U.S.C. 701 *et seq*.) and reduce the potential for this project to impact nesting shorebirds, the Corps or the Applicant should follow the latest Florida Fish and Wildlife Conservation Commission (FWC) standard guidelines to protect

against impacts to nesting shorebirds during implementation of this project during the periods from February 15 to August 31.

Consultation History

1980s and 1990s — Beach nourishment projects in Florida began to occur frequently in the late 1980s and early 1990s. During that time, sea turtle protection measures were developed based on research findings available at that time. These measures addressed sand compaction, escarpment formation, and timing restrictions for projects in six south Florida counties with high nesting densities. In the mid-1990s, a sea turtle Biological Opinion (BO) template was developed that included protection measures and information on the status of sea turtles. In 1995, an expanded version of the sea turtle template BO was developed to incorporate new guidance on the required format for BOs and a biological rationale for the Terms and Conditions to be imposed. This document underwent review by four State conservation agencies and the Corps, and was subsequently revised. The primary purposes of the template BO were to: (1) incorporate a standardized format and language required for use in all BOs based on guidance from the Service's Washington Office, (2) assist Service biologists in the preparation of BOs, (3) increase consistency among Service field offices, and (4) increase consistency between the Service and the State agencies.

March 7 and 8, 2006 — The Corps met with the Services' three Florida field office representatives, a representative of the FWC, and a representative of the FDEP. The purpose of that meeting was to begin discussions about a regional consultation for sand placement activities along the coast of Florida and preparation of a PBA for sand placement activities in Florida. In addition to sea turtles, other Federal and state protected species were included in the discussions. At that meeting, the following topics were discussed:

1. Sand placement activities;
2. Sand source and placement methods;
3. Species and habitat;
4. Geographic scope;
5. Information availability; and
6. Minimization of impacts.

July 13, 2006 — A second meeting was held to further discuss the draft PBA. The Service provided the Corps with copies of the latest BO templates for each species to be considered. The Service held conference calls with the species recovery leads during August 2006.

October 16, 2006 The Service received the draft PBA via email from the Corps for sand placement activities along the coast of Florida.

October 27, 2006 The Service provided the Corps with draft comments on the PBA via email.

October 31, 2006 The Corps provided a response to the Service's comments on the PBA via email.

November 9, 2006 The Service and the Corps held a conference call to discuss the comments.

December 20, 2006 The Service sent the Corps a letter with the final comments on the draft PBA.

September 18 and 19, 2007
The Corps met with the Services' three Florida field office representatives, a representative of the FWC, and a representative of the FDEP. The purpose of this meeting was to discuss the Terms and Conditions to be included in the BO.

October 5, 2007 The Service sent the Corps, via email, the modifications to the draft Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice as discussed in the previous meeting.

November 1, 2007 The Corps provided the Service with comments via email on the revised Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice.

March 31, 2008 The Service revised the Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice. The Service also revised the minimization measures for the manatee. The revisions were sent to the Corps.

September 16, 2008 The Service sent the Corps via mail the draft SPBO.

October 2, 2008 The Corps provided the Service via email with a summary of the remaining issues concerning the Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice.

October 15, 2008 The Service sent the Corps, via email, the modifications to the draft Reasonable and Prudent Measures and Terms and Conditions for the sea turtles and beach mice as discussed in the previous email.

March 11, 2009	The Service received via email examples of previous agreements between the Corps and the local sponsor to carry out the Terms and Conditions in previous BOs.
April 7, 2009	The Service sent an email to the Corps with an update of the progress of our analysis of including piping plovers in the SPBO.
August 26, 2009	The Service sent to the Corps via email the latest Terms and Conditions for sea turtles and beach mice.
September 17, 2009	The Corps sent an email to the Service describing the actions to be taken for the completion and submittal of the PBA.
January 6, 2010	The Corps and the Service participated in a meeting to finalize the draft SPBO.
January 21, 2010	The Corps sent to the Service via email the revised draft PBA.
March 25, 2010	The Corps and the Service participated in an implementation meeting and submittal of the final PBA.
February 22, 2011	The Corps submitted the final PBA to the Service.
April 18, 2011	The Service sent the final Statewide PBO to the Corps.
June 21, 2010	The Corps provided written concerns with the final Statewide PBO
June 30, 2011	The Service revised the final Statewide PBO.
July 18, 2011	The Corps provided written agreement with the changes that were made and asked for additional changes.
July 22, 2011	The Service made additional revisions per the Corps request.
July 25, 2011	The Corps provided written agreement with the additional revisions.
March 25, 2013	The Service published the proposed rule for loggerhead terrestrial critical habitat.
March 3, 2014	The Corps contacted the Service on revising the SPBO to include loggerhead critical habitat in the terrestrial environment.
August 25, 2014	The Service provided the Corps with a Draft Revised SPBO

September 4, 2014	The Corps and Service met and discussed the Draft Revised SPBO at the annual SPBO meeting.
October 23, 2014	The Service received a letter from the Corps requesting the SPBO be revised to include loggerhead critical habitat.
November 3, 2014	The Service sent a draft Revised SPBO to the Corps for review and comment
November 20, 2014	The Corps agreed with the changes made to the draft Revised SPBO
November 24, 2014	The Corps submitted proposed section 7(a)(1) conservation recommendations
January 30, 2014	The Corps and Service agreed on proposed section 7(a)(1) conservation recommendations and finalized draft revised SPBO

This SPBO is based on the PBA, and information provided during meetings and discussions with the Corps' representatives and information from the Florida Fish and Wildlife Conservation Commission's Florida Fish and Wildlife Research Institute (FWC/FWRI) sea turtle databases. A complete administrative record of this consultation is on file in the Service's North Florida, Panama City, and South Florida Ecological Services Offices.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action includes all activities associated with the placement of compatible sediment on beaches of the Atlantic and Gulf coasts of Florida encompassing both South Atlantic Jacksonville (SAJ) and South Atlantic Mobile (SAM) Corps Districts. Additionally, the proposed action includes the replacement and rehabilitation of groins that are included as design components of beach projects for longer retention time and stabilization of associated sediment placed on the beach. This SPBO includes projects authorized through the Corps Regulatory Program, and funded or carried out as part of its Civil Works program. Corps Regulatory activities may include the involvement of other Federal agencies, such as the Department of Defense, Bureau of Ocean Energy Management, and the Federal Emergency Management Agency (FEMA). The shore protection activities covered in the SPBO encompass the following shore protection activities:

1. Sand placement originating from Dredged Material Management Areas (DMMAs), offshore borrow sites, and other compatible sand sources;
2. Sand placement as an associated authorization of sand extraction from the outer continental shelf by the Bureau of Ocean Energy Management;

3. Sand washed onto the beach from being placed in the swash zone;
4. Sand by-passing/back-passing (sand discharge on beach);
5. Current Operations and Maintenance (O&M) dredging of navigation channels with beach disposal (does not include new navigation projects or expansion (deepening or widening) of existing authorized navigation projects); and
6. Groins and jetty repair or replacement.

For nearshore borrow sites, the Corps must provide information to the Service on the sand flow when this sand is removed from these nearshore areas. If removal of sand from these nearshore areas is shown to cause increased erosion on the adjacent beach, a separate consultation will be required.

A detailed description of each activity is found in the final PBA. The history of shore protection activities throughout the Atlantic and Gulf Coasts of Florida is extensive and consists of a myriad of actions performed by local, State, and Federal entities. Future beach placement actions addressed in this SPBO may include maintenance of these existing projects or beaches that have not experienced a history of beach placement activities.

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment. This SPBO only addresses activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. NMFS will assess and consult with the Corps concerning potential impacts to sea turtles in the marine environment and the shoreline updrift and downdrift area of the project.

Corps Commitments as listed in the final PBA

The following paragraph from the final PBA summarizes the Corps' Commitments as listed below:

"For Corps projects, please note that "fish and wildlife enhancement" activities (which are beyond mitigation of project impacts) must be authorized as a project purpose or project feature or must be otherwise approved through Corps headquarters (Engineer Regulation ER 1105-2-100 Appendix G, Amendment #1, 30 Jun 2004). At the present time, no beach fill placement or shore protection activity in Florida has fish and wildlife enhancement as a project purpose or project feature. Since adding fish and wildlife enhancement as a project purpose or feature is not a budgetary priority (ER 1105-2-100 22 Apr 2000, Appendix C, part C-3b.(3)), authorization and funding for such is not expected."

<u>Sea Turtles</u>

1. Avoid construction during the peak nesting and hatching season in the higher density beaches, and to the maximum extent practicable during all other nesting times and locations;

2. Except for O&M disposal actions, implement sea turtle nest monitoring and relocation plan during construction if nesting window cannot be adhered to;

3. Except for O&M disposal actions, escarpments that are identified prior to or during the nesting season that interfere with sea turtle nesting (exceed 18 inches in height for a distance of 100 feet) can be leveled to the natural beach for a given area. If it is determined that escarpment leveling is required during the nesting or hatching season, leveling actions should be directed by the Service. For Corps Civil Works projects, leveling of escarpments would be limited to the term of the construction or as otherwise may be authorized and funded;

4. Placement of pipe parallel to the shoreline and as far landward as possible so that a significant portion of available nesting habitat can be utilized, nest placement is not subject to inundation or washout, and turtles do not become trapped landward of the pipe;

5. Temporary storage of pipes and equipment will be located off the beach to the maximum extent possible;

6. The Corps will continue to work with the FDEP to identify aspects of beach nourishment construction templates that negatively impact sea turtles and develop and implement alternative design criteria that may minimize these impacts;

7. Except for O&M disposal actions, Service compaction assessment guidelines will be followed and tilling will be performed where appropriate. For Corps Civil Works projects, assessment of compaction and tilling will be limited to the term of the construction or as otherwise may be authorized and funded; and

8. All lighting associated with project construction will be minimized to the maximum extent possible, through reduction, shielding, angling, etc., while maintaining compliance with all Corps, U.S. Coast Guard, and OSHA safety requirements.

<u>Beach Mice</u>

1. Pipeline routes for beach construction projects will avoid identified primary constituent elements for beach mouse critical habitat to the maximum extent practicable;

2. Implementation of a trapping and relocation plan if avoidance alternatives of occupied habitat are not practical; and

3. Implementation of a lighting plan to reduce, shield, lower, angle, etc. light sources in order to minimize illumination impacts on nocturnal beach mice during construction.

Action Area

The Service has described the action area to include sandy beaches of the Atlantic Coast of Florida (Key West to Fernandina/Kings Bay) and the Gulf Coast (Ten Thousand Islands to Alabama State

Line) for reasons that will be explained and discussed in the "EFFECTS OF THE ACTION" section of this consultation.

Underlying Dynamics of a Barrier Island

Of all the states and provinces in North America, Florida is most intimately linked with the sea. Florida's 1,200-mile coastline (exclusive of the Keys) is easily the longest in the continental U.S. Of the 1,200 miles, 745 miles are sandy and mostly in the form of barrier islands. The coastline is dynamic and constantly changing as a result of waves, wind, tides, currents, sea level change, and storms. The entire state lies within the coastal plain, with a maximum elevation of about 400 feet, and no part is more than 60 miles from the Atlantic Ocean or Gulf of Mexico.

The east coast of Florida consists of a dynamic shoreline, with a relatively sloped berm, coarse-grained sand, and moderate to high surf (Witherington 1986). The southeast coast of Florida consists of continuous, narrow, sandy barrier islands bordering a narrow continental shelf (Wanless and Maier 2007). The dynamics of the east coast shoreline are due to the occurrence of storm surges and seas from tropical storms that occur mainly during August through early October. More erosion events can also occur during late September through March due to nor'easters. The impacts of these two types of storms may vary from event to event and year to year.

Northwest (panhandle) and Southwest Florida beaches are considered to be low energy beaches with a gradual offshore slope and low sloped fine grained quartz sand beaches. As along the east coast of Florida, the shoreline dynamics are shaped by tropical storms and hurricanes. Although Gulf beaches may experience winter erosion, they are largely protected from the severe nor'easters.

Coasts with greater tidal ranges are more buffered against storm surges than are those with low tidal ranges, except when the storm strikes during high tide. Mean tidal ranges decrease southward along the Atlantic coast from a mean of seven feet at the Florida-Georgia line to less than two feet in Palm Beach County. The mean tidal range along the Gulf Coast is less than three feet (microtidal) except in the extreme south where it ranges from three to four feet. Because of its lower elevation and lower wave energy regime, the West Coast of the peninsula is subject to greater changes during storm events than is the east coast.

Microtidal coasts have a high vulnerability to sea level rise and barrier islands respond by migrating landward. Migration occurs as a result of overwash from extreme storms that flatten topography and deposit sand on the backside of the island, extending the island landward (Young 2007). Significant widening can occur from a single storm event. For example, Dauphin Island, a barrier island in Alabama, has nearly doubled its width following Hurricanes Ivan and Katrina in 2004 and 2005, respectively.

Sea level has risen globally approximately 7.1 inches in the past century (Douglas 1997). Climate models predict a doubling of the rate of sea level rise over the next 100 years (Pendleton *et al.* 2004). Recent studies indicate a trend toward increasing hurricane number and intensity (Emanuel

2005, Webster *et al.* 2005). Barrier islands need to be able to move and respond to these conditions. By locking in a barrier island's location with infrastructure, the island loses its ability to migrate to higher elevations which can lead to its eventual collapse (Moore 2007).

Overwash from less intense storms can positively affect island topography. Low natural berms can develop along beach fronts, but generally can be exceeded by overwash from frontal storms. The berm is an accretionary feature at the landward extreme of wave influence. Sediment is transported over the berm crest and is deposited in a nearshore overwash fan and in breach corridors. Overwash deposition provides source sand for re-establishing dunes. Onshore winds transport the sediment from overwash fans to the dunes, gradually building back dune elevation during storm-free periods.

The interaction between the biology and geomorphology of barrier islands is complex. Just as the barrier island undergoes a process of continual change, so do the ecological communities present. Vegetation zones gradually re-establish following storms, and in turn affect physical processes such as sand accretion, erosion, and overwash. The beach front, dunes, and overwash areas all provide important habitat components. Many barrier island species are adapted to respond positively to periodic disturbance. As the island widens, new feeding habitat (sand/mud flats) is created for shorebirds such as the piping plover. The beaches provide nesting habitat for sea turtles. Early colonizer plants are favored as a food source by beach mice. These barrier island habitats are becoming increasingly rare as our Nation's coastlines rapidly develop and are stabilized.

SEA TURTLES

STATUS OF THE SPECIES/CRITICAL HABITAT

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment. This SPBO addresses nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. Five species of sea turtles are analyzed in this SPBO: the loggerhead, green, leatherback, hawksbill, and Kemp's ridley.

<u>Loggerhead Sea Turtle</u>

The loggerhead sea turtle was federally listed as a threatened species on July 28, 1978 (43 *Federal Register* [*FR*] 32800). The Service and the National Marine Fisheries Service (NMFS) listed the Northwest Atlantic Ocean distinct population segment (DPS) of the loggerhead sea turtle as threatened on September 22, 2011 (76 *FR* 58868). The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans.

The loggerhead sea turtle grows to an average weight of about 200 pounds and is characterized by a large head with blunt jaws. Adults and subadults have a reddish-brown carapace. Scales on the top of the head and top of the flippers are also reddish-brown with yellow on the borders. Hatchlings are a dull brown color (NMFS 2009a). The loggerhead feeds on mollusks, crustaceans, fish, and other marine animals.

The loggerhead may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas.

Within the Northwest Atlantic, the majority of nesting activity occurs from April through September, with a peak in June and July (Williams-Walls *et al*. 1983, Dodd 1988, Weishampel *et al*. 2006). Nesting occurs within the Northwest Atlantic along the coasts of North America, Central America, northern South America, the Antilles, Bahamas, and Bermuda, but is concentrated in the southeastern U.S. and on the Yucatán Peninsula in Mexico on open beaches or along narrow bays having suitable sand (Sternberg 1981, Ehrhart 1989, Ehrhart *et al*. 2003, NMFS and Service 2008).

Critical habitat has been designated for the NWAO DPS of the loggerhead sea turtle. **Table 4** has the list of the critical habitat units within the project area.

Green Sea Turtle

The green sea turtle was federally listed on July 28, 1978 (43 *FR* 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered; all other populations are listed as threatened. The green sea turtle has a worldwide distribution in tropical and subtropical waters.

The green sea turtle grows to a maximum size of about four feet and a weight of 440 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. The carapace is smooth and colored gray, green, brown and black. Hatchlings are black on top and white on the bottom (NMFS 2009b). Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrasses and marine algae.

Major green turtle nesting colonies in the Atlantic occur on Ascension Island, Aves Island, Costa Rica, and Surinam. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NMFS and Service 1991). Nesting also has been documented along the Gulf coast of Florida from Escambia County through Santa Rosa County in northwest Florida and from Pinellas County through Collier County in southwest Florida (FWC 2009a).

Most green turtles spend the majority of their lives in coastal foraging grounds. These areas include fairly shallow waters both open coastline and protected bays and lagoons. While in these

areas, green turtles rely on marine algae and seagrass as their primary diet constituents, although some populations also forage heavily on invertebrates. These marine habitats are often highly dynamic and in areas with annual fluctuations in seawater and air temperatures, which can cause the distribution and abundance of potential green turtle food items to vary substantially between seasons and years (Carballo *et al.*, 2002). Many prey species that are abundant during winter and spring periods become patchy during warm summer periods. Some species may altogether vanish during extreme temperatures, such as those that occur during El Niño Southern Oscillation events (Carballo *et al.*, 2002).

Open beaches with a sloping platform and minimal disturbance are required for nesting.

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys.

Leatherback Sea Turtle

The leatherback sea turtle was federally listed as an endangered species on June 2, 1970 (35 *FR* 8491). Leatherbacks have the widest distribution of the sea turtles; nonbreeding animals have been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Foraging leatherback excursions have been documented into higher-latitude subpolar waters. They have evolved physiological and anatomical adaptations (Frair *et al.* 1972, Greer *et al.* 1973) that allow them to exploit waters far colder than any other sea turtle species would be capable of surviving.

The adult leatherback can reach four to eight feet in length and weigh 500 to 2,000 pounds. The carapace is distinguished by a rubber-like texture, about 1.6 inches thick, made primarily of tough, oil-saturated connective tissue. Hatchlings are dorsally mostly black and are covered with tiny scales; the flippers are edged in white, and rows of white scales appear as stripes along the length of the back (NMFS 2009c). Jellyfish are the main staple of its diet, but it is also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. This is the largest, deepest diving of all sea turtle species.

Leatherback turtle nesting grounds are distributed worldwide in the Atlantic, Pacific and Indian Oceans on beaches in the tropics and sub-tropics. The Pacific Coast of Mexico historically supported the world's largest known concentration of nesting leatherbacks.

The leatherback turtle regularly nests in the U.S. Caribbean in Puerto Rico and the U.S. Virgin Islands. Along the U.S. Atlantic coast, most nesting occurs in Florida (NMFS and Service 1992). Leatherback nesting has also been reported on the northwest coast of Florida (LeBuff 1990, FWC 2009a); and in southwest Florida a false crawl (nonnesting emergence) has been observed on Sanibel Island (LeBuff 1990). Nesting has also been reported in Georgia, South Carolina, and North Carolina (Rabon *et al.* 2003) and in Texas (Shaver 2008).

Adult females require sandy nesting beaches backed with vegetation and sloped sufficiently so the distance to dry sand is limited. Their preferred beaches have proximity to deep water and generally rough seas.

Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands (50 Code of Federal Regulations (CFR) 17.95).

Hawksbill Sea Turtle

The hawksbill sea turtle was federally listed as an endangered species on June 2, 1970 (35 *FR* 8491). The hawksbill is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean.

Data collected in the Wider Caribbean reported that hawksbills typically weigh around 176 pounds or less; hatchlings average about 1.6 inches straight length and range in weight from 0.5 to 0.7 ounces. The carapace is heart shaped in young turtles, and becomes more elongated or egg-shaped with maturity. The top scutes are often richly patterned with irregularly radiating streaks of brown or black on an amber background. The head is elongated and tapers sharply to a point. The lower jaw is V-shaped (NMFS 2009d).

Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Miami-Dade Counties) and the Florida Keys (Monroe County) (Meylan 1992, Meylan *et al.* 1995). However, hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors. Therefore, surveys in Florida likely underestimate actual hawksbill nesting numbers (Meylan *et al.* 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NMFS and Service 1993).

Critical habitat for the hawksbill sea turtle has been designated for selected beaches and/or waters of Mona, Monito, Culebrita, and Culebra Islands, Puerto Rico.

Kemp’s Ridley Sea Turtle

The Kemp’s ridley sea turtle was federally listed as endangered on December 2, 1970 (35 *FR* 18320). The Kemp's ridley, along with the flatback sea turtle (*Natator depressus*), has the most geographically restricted distribution of any sea turtle species. The range of the Kemp’s ridley includes the Gulf coasts of Mexico and the U.S., and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland.

Adult Kemp's ridleys, considered the smallest sea turtle in the world, weigh an average of 100 pounds with a carapace measuring between 24-28 inches in length. The almost circular carapace has a grayish green color while the plastron is pale yellowish to cream in color. The carapace is often as wide as it is long. Their diet consists mainly of swimming crabs, but may also include fish, jellyfish, and an array of mollusks.

The majority of nesting for the entire species occurs on the primary nesting beach at Rancho Nuevo, Mexico (Marquez-Millan 1994). Outside of nesting, adult Kemp's ridleys are believed to spend most of their time in the Gulf of Mexico, while juveniles and subadults also regularly occur along the eastern seaboard of the U.S. (Service and NMFS 1992). There have been rare instances when immature ridleys have been documented making transatlantic movements (Service and NMFS 1992). It was originally speculated that ridleys that make it out of the Gulf of Mexico might be lost to the breeding population (Hendrickson 1980), but data indicate that many of these

turtles are capable of moving back into the Gulf of Mexico (Henwood and Ogren 1987). In fact, there are documented cases of ridleys captured in the Atlantic that migrated back to the nesting beach at Rancho Nuevo (Schmid and Witzell 1997, Schmid 1998, Witzell 1998).

Hatchlings, after leaving the nesting beach, are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 7.9 inches in length, at which size they enter coastal shallow water habitats (Ogren 1989).

No critical habitat has been designated for the Kemp's ridley sea turtle.

Life history

Loggerhead Sea Turtle

Loggerheads are long-lived, slow-growing animals that use multiple habitats across entire ocean basins throughout their life history. This complex life history encompasses terrestrial, nearshore, and open ocean habitats. The three basic ecosystems in which loggerheads live are the:

1. Terrestrial zone (supralittoral) - the nesting beach where both oviposition (egg laying) and embryonic development and hatching occur.

2. Neritic zone - the inshore marine environment (from the surface to the sea floor) where water depths do not exceed 656 feet (200 meters). The neritic zone generally includes the continental shelf, but in areas where the continental shelf is very narrow or nonexistent, the neritic zone conventionally extends to areas where water depths are less than 656 feet.

3. Oceanic zone - the vast open ocean environment (from the surface to the sea floor) where water depths are greater than 656 feet.

Maximum intrinsic growth rates of sea turtles are limited by the extremely long duration of the juvenile stage and fecundity. Loggerheads require high survival rates in the juvenile and adult stages, common constraints critical to maintaining long-lived, slow-growing species, to achieve positive or stable long-term population growth (Congdon *et al.* 1993, Heppell 1998, Crouse 1999, Heppell *et al.* 1999, 2003, Musick 1999).

The generalized life history of Atlantic loggerheads is shown in **Figure 1** (from Bolten 2003).

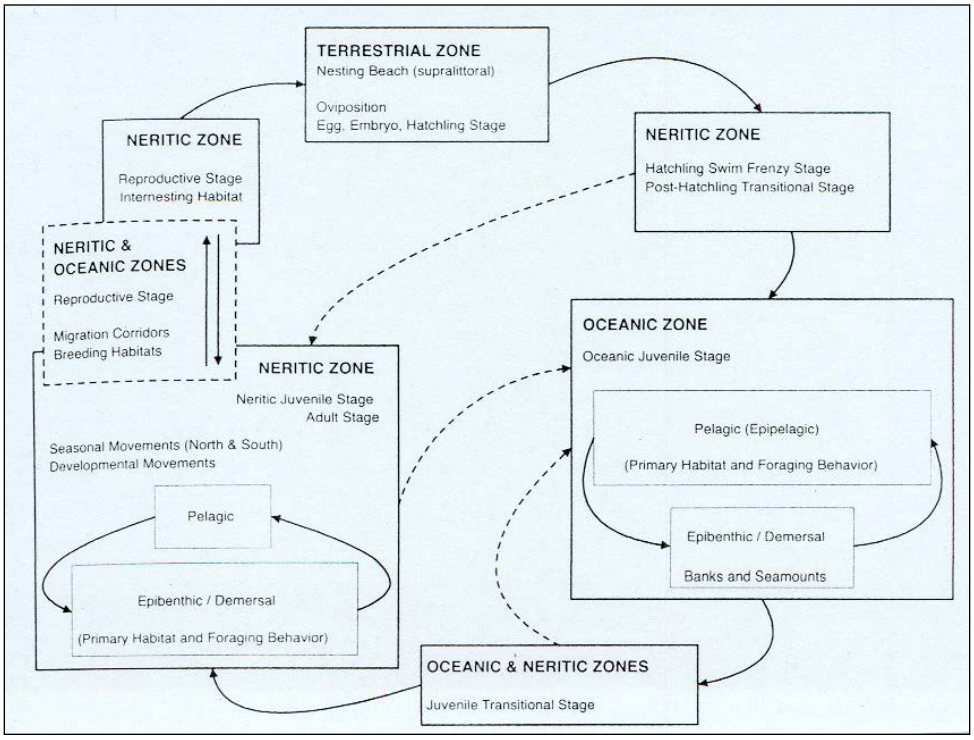

Figure 1. Life history stages of a loggerhead turtle. The boxes represent life stages and the corresponding ecosystems, solid lines represent movements between life stages and ecosystems, and dotted lines are speculative (Bolten 2003).

Numbers of nests and nesting females are often highly variable from year to year due to a number of factors including environmental stochasticity, periodicity in ocean conditions, anthropogenic effects, and density-dependent and density-independent factors affecting survival, somatic growth, and reproduction (Meylan 1982, Hays 2000, Chaloupka 2001, Solow *et al.* 2002). Despite these sources of variation, and because female turtles exhibit strong nest site fidelity, a nesting beach survey can provide a valuable assessment of changes in the adult female population, provided that the study is sufficiently long and effort and methods are standardized (Meylan 1982, Gerrodette and Brandon 2000, Reina *et al*. 2002). **Table 4** summarizes key life history characteristics for loggerheads nesting in the U.S.

Table 5. Typical values of life history parameters for loggerheads nesting in the U.S. (NMFS and Service 2008).

Life History Trait	Data
Clutch size (mean)	100-126 eggs[1]
Incubation duration (varies depending on time of year and latitude)	Range = 42-75 days[2,3]
Pivotal temperature (incubation temperature that produces an equal number of males and females)	84˚F[5]
Nest productivity (emerged hatchlings/total eggs) x 100 (varies depending on site specific factors)	45-70 percent[2,6]
Clutch frequency (number of nests/female/season)	3-4 nests[7]
Internesting interval (number of days between successive nests within a season)	12-15 days[8]
Juvenile (<34 inches Curved Carapace Length) sex ratio	65-70 percent female[4]
Remigration interval (number of years between successive nesting migrations)	2.5-3.7 years[9]
Nesting season	late April-early September
Hatching season	late June-early November
Age at sexual maturity	32-35 years[10]
Life span	>57 years[11]

[1] Dodd (1988).
[2] Dodd and Mackinnon (1999, 2000, 2001, 2002, 2003, 2004).
[3] Witherington (2006) (information based on nests monitored throughout Florida beaches in 2005, n = 865).
[4] National Marine Fisheries Service (2001); Foley (2005).
[5] Mrosovsky (1988).
[6] Witherington (2006) (information based on nests monitored throughout Florida beaches in 2005, n = 1,680).
[7] Murphy and Hopkins (1984); Frazer and Richardson (1985); Hawkes *et al*. 2005; Scott 2006.
[8] Caldwell (1962), Dodd (1988).
[9] Richardson *et al.* (1978); Bjorndal *et al.* (1983).
[10] Snover (2005).
[11] Dahlen *et al.* (2000).

Loggerheads nest on ocean beaches and occasionally on estuarine shorelines with suitable sand. Nests are typically laid between the high tide line and the dune front (Routa 1968, Witherington

1986, Hailman and Elowson 1992). Wood and Bjorndal (2000) evaluated four environmental factors (slope, temperature, moisture, and salinity) and found that slope had the greatest influence on loggerhead nest-site selection on a beach in Florida. Loggerheads appear to prefer relatively narrow, steeply sloped, coarse-grained beaches, although nearshore contours may also play a role in nesting beach site selection (Mortimer 1982; Provancha and Ehrhart 1987).

The warmer the sand surrounding the egg chamber, the faster the embryos develop (Mrosovsky and Yntema 1980). Sand temperatures prevailing during the middle third of the incubation period also determine the sex of hatchling sea turtles (Mrosovsky and Yntema 1980). Incubation temperatures near the upper end of the tolerable range produce only female hatchlings while incubation temperatures near the lower end of the tolerable range produce only male hatchlings.

Loggerhead hatchlings pip and escape from their eggs over a one to three day interval and move upward and out of the nest over a two to four day interval (Christens 1990). The time from pipping to emergence ranges from four to seven days with an average of 4.1 days (Godfrey and Mrosovsky 1997). Hatchlings emerge from their nests en masse almost exclusively at night, and presumably using decreasing sand temperature as a cue (Hendrickson 1958, Mrosovsky 1968, Witherington *et al.* 1990). Moran *et al*. (1999) concluded that a lowering of sand temperatures below a critical threshold, which most typically occurs after nightfall, is the most probable trigger for hatchling emergence from a nest. After an initial emergence, there may be secondary emergences on subsequent nights (Carr and Ogren 1960, Witherington 1986, Ernest and Martin 1993, Houghton and Hays 2001).

Hatchlings use a progression of orientation cues to guide their movement from the nest to the marine environments where they spend their early years (Lohmann and Lohmann 2003). Hatchlings first use light cues to find the ocean. On naturally lighted beaches without artificial lighting, ambient light from the open sky creates a relatively bright horizon compared to the dark silhouette of the dune and vegetation landward of the nest. This contrast guides the hatchlings to the ocean (Daniel and Smith 1947, Limpus 1971, Salmon *et al.* 1992, Witherington and Martin 1996, Witherington 1997, Stewart and Wyneken 2004).

Loggerheads in the Northwest Atlantic display complex population structure based on life history stages. Based on mitochondrial deoxyribonucleic acid (mtDNA), oceanic juveniles show no structure, neritic juveniles show moderate structure and nesting colonies show strong structure (Bowen *et al*. 2005). In contrast, a survey using microsatellite (nuclear) markers showed no significant population structure among nesting populations (Bowen *et al*. 2005), indicating that while females exhibit strong philopatry, males may provide an avenue of gene flow between nesting colonies in this region.

Green Sea Turtle

Green sea turtles deposit from one to nine clutches within a nesting season, but the overall average is about 3.3 nests. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997). Mean clutch size varies widely among populations. Average clutch size reported for Florida was 136 eggs in 130 clutches (Witherington and Ehrhart 1989). Only occasionally do females produce clutches in successive years. Usually two or more years intervene between breeding seasons (NMFS and Service 1991). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Leatherback Sea Turtle

Leatherbacks nest an average of five to seven times within a nesting season, with an observed maximum of 11 nests (NMFS and Service 1992). The interval between nesting events within a season is about nine to 10 days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Nesting migration intervals of two to three years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald and Dutton 1996). Leatherbacks are believed to reach sexual maturity in six to 10 years (Zug and Parham 1996).

Hawksbill Sea Turtle

Hawksbills nest on average about 4.5 times per season at intervals of approximately 14 days (Corliss *et al.* 1989). In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (NMFS and Service 1993). On the basis of limited information, nesting migration intervals of two to three years appear to predominate. Hawksbills are recruited into the reef environment at about 14 inches in length and are believed to begin breeding about 30 years later. However, the time required to reach 14 inches in length is unknown and growth rates vary geographically. As a result, actual age at sexual maturity is unknown.

Kemp’s Ridley Sea Turtle

Nesting occurs from April into July during which time the turtles appear off the Tamaulipas and Veracruz coasts of Mexico. Precipitated by strong winds, the females swarm to mass nesting emergences, known as “arribadas or arribazones,” to nest during daylight hours. The period between Kemp's ridley arribadas averages approximately 25 days (Rostal *et al.* 1997), but the precise timing of the arribadas is highly variable and unpredictable (Bernardo and Plotkin 2007). Clutch size averages 100 eggs and eggs typically take 45 to 58 days to hatch depending on temperatures (Marquez-Millan 1994, Rostal 2007).

Some females breed annually and nest an average of one to four times in a season at intervals of 10 to 28 days. Analysis by Rostal (2007) suggested that ridley females lay approximately 3.1 nests per nesting season. Interannual remigration rate for female ridleys is estimated to be

approximately 1.8 (Rostal 2007) to 2.0 years (Marquez-Millan *et al.* 1989). Age at sexual maturity is believed to be between 10 to 17 years (Snover *et al*. 2007).

Population dynamics

Loggerhead Sea Turtle

The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. However, the majority of loggerhead nesting is at the western rims of the Atlantic and Indian Oceans. The most recent reviews show that only two loggerhead nesting beaches have greater than 10,000 females nesting per year (Baldwin *et al.* 2003, Ehrhart *et al.* 2003, Kamezaki *et al.* 2003, Limpus and Limpus 2003, Margaritoulis *et al.* 2003): South Florida (U.S.) and Masirah (Oman). Those beaches with 1,000 to 9,999 females nesting each year are Georgia through North Carolina (U.S.), Quintana Roo and Yucatán (Mexico), Cape Verde Islands (Cape Verde, eastern Atlantic off Africa), and Western Australia (Australia). Smaller nesting aggregations with 100 to 999 nesting females annually occur in the Northern Gulf of Mexico (U.S.), Dry Tortugas (U.S.), Cay Sal Bank (Bahamas), Sergipe and Northern Bahia (Brazil), Southern Bahia to Rio de Janerio (Brazil), Tongaland (South Africa), Mozambique, Arabian Sea Coast (Oman), Halaniyat Islands (Oman), Cyprus, Peloponnesus (Greece), Island of Zakynthos (Greece), Turkey, Queensland (Australia), and Japan.

The loggerhead is commonly found throughout the North Atlantic including the Gulf of Mexico, the northern Caribbean, the Bahamas archipelago, and eastward to West Africa, the western Mediterranean, and the west coast of Europe.

The major nesting concentrations in the U.S. are found in South Florida. However, loggerheads nest from Texas to Virginia. Total estimated nesting in Florida, where 90 percent of nesting occurs, has fluctuated between 52,374 and 98,602 nests per year from 2009-2013 (FWC 2014, http://myfwc.com/media/2786250/loggerheadnestingdata09-13.pdf). About 80 percent of loggerhead nesting in the southeast U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties). Adult loggerheads are known to make considerable migrations between foraging areas and nesting beaches (Schroeder *et al.* 2003, Foley *et al.* 2008). During non-nesting years, adult females from U.S. beaches are distributed in waters off the eastern U.S. and throughout the Gulf of Mexico, Bahamas, Greater Antilles, and Yucatán.

From a global perspective, the U.S. nesting aggregation is of paramount importance to the survival of the species as is the population that nests on islands in the Arabian Sea off Oman (Ross 1982, Ehrhart 1989). The status of the Oman loggerhead nesting population, reported to be the largest in the world (Ross 1979), is uncertain because of the lack of long-term standardized nesting or foraging ground surveys and its vulnerability to increasing development pressures near major nesting beaches and threats from fisheries interaction on foraging grounds and migration routes (Possardt 2005). The loggerhead nesting aggregations in Oman and the U.S. account for the majority of nesting worldwide.

Green Sea Turtle

The majority of nesting occurs along the Atlantic coast of eastern central Florida, with an average of 10,377 each year from 2008 to 2012 (B. Witherington, Florida Fish and Wildlife Conservation Commission, pers. comm., 2013). In the U.S. Pacific, over 90 percent of nesting throughout the Hawaiian archipelago occurs at the French Frigate Shoals, where about 200 to 700 females nest each year (NMFS and Service 1998b). Elsewhere in the U.S. Pacific, nesting takes place at scattered locations in the Commonwealth of the Northern Marianas, Guam, and American Samoa. In the western Pacific, the largest green turtle nesting aggregation in the world occurs on Raine Island, Australia, where thousands of females nest nightly in an average nesting season (Limpus *et al.* 1993). In the Indian Ocean, major nesting beaches occur in Oman where 30,000 females are reported to nest annually (Ross and Barwani 1995).

Leatherback Sea Turtle

A dramatic drop in nesting numbers has been recorded on major nesting beaches in the Pacific. Spotila *et al.* (2000) have highlighted the dramatic decline and possible extirpation of leatherbacks in the Pacific.

The East Pacific and Malaysia leatherback populations have collapsed. Spotila *et al.* (1996) estimated that only 34,500 females nested annually worldwide in 1995, which is a dramatic decline from the 115,000 estimated in 1980 (Pritchard 1982). In the eastern Pacific, the major nesting beaches occur in Costa Rica and Mexico. At Playa Grande, Costa Rica, considered the most important nesting beach in the eastern Pacific, numbers have dropped from 1,367 leatherbacks in 1988-1989 to an average of 188 females nesting between 2000-2001 and 2003-2004. In Pacific Mexico, 1982 aerial surveys of adult female leatherbacks indicated this area had become the most important leatherback nesting beach in the world. Tens of thousands of nests were laid on the beaches in 1980s, but during the 2003-2004 seasons a total of 120 nests was recorded. In the western Pacific, the major nesting beaches lie in Papua New Guinea, Papua, Indonesia, and the Solomon Islands. These are some of the last remaining significant nesting assemblages in the Pacific. Compiled nesting data estimated approximately 5,000 to 9,200 nests annually with 75 percent of the nests being laid in Papua, Indonesia.

However, the most recent population size estimate for the North Atlantic alone is a range of 34,000 to 94,000 adult leatherbacks (TEWG 2007). In Florida, the number of nests has been increasing since 1979 (Stewart *et al.* 2011). The average annual number of nests in the 1980s was 63 nests, which rose to 263 nests in the 1990s and to 754 nests in the 2000s (Stewart *et al.* 2011). In 2012, 1,712 nests were recorded statewide (http://myfwc.com/research/wildlife/sea-turtles/nesting/).

Nesting in the Southern Caribbean occurs in the Guianas (Guyana, Suriname, and French Guiana), Trinidad, Dominica, and Venezuela. The largest nesting populations at present occur in the western Atlantic in French Guiana with nesting varying between a low of 5,029 nests in 1967 to a high of 63,294 nests in 2005, which represents a 92 percent increase since 1967 (TEWG 2007). Trinidad supports an estimated 6,000 leatherbacks nesting annually, which represents more than 80

percent of the nesting in the insular Caribbean Sea. Leatherback nesting along the Caribbean Central American coast takes place between Honduras and Colombia. In Atlantic Costa Rica, at Tortuguero, the number of nests laid annually between 1995 and 2006 was estimated to range from 199 to 1,623.

In Puerto Rico, the main nesting areas are at Fajardo on the main island of Puerto Rico and on the island of Culebra. Between 1978 and 2005, annual population growth rate was estimated to be 1.10 percent (TEWG 2007). Recorded leatherback nesting on the Sandy Point National Wildlife Refuge on the island of St. Croix, U.S. Virgin Islands between 1990 and 2005, ranged from a low of 143 in 1990 to a high of 1,008 in 2001 (Garner *et al*. 2005). In the British Virgin Islands, annual nest numbers have increased in Tortola from zero to six nests per year in the late 1980s to 35 to 65 nests per year in the 2000s (TEWG 2007).

The most important nesting beach for leatherbacks in the eastern Atlantic lies in Gabon, Africa. It was estimated there were 30,000 nests along 60 miles of Mayumba Beach in southern Gabon during the 1999-2000 nesting season (Billes *et al*. 2000). Some nesting has been reported in Mauritania, Senegal, the Bijagos Archipelago of Guinea-Bissau, Turtle Islands and Sherbro Island of Sierra Leone, Liberia, Togo, Benin, Nigeria, Cameroon, Sao Tome and Principe, continental Equatorial Guinea, Islands of Corisco in the Gulf of Guinea and the Democratic Republic of the Congo, and Angola. In addition, a large nesting population is found on the island of Bioko (Equatorial Guinea) (Fretey *et al*. 2007). .

Hawksbill Sea Turtle

About 15,000 females are estimated to nest each year throughout the world with the Caribbean accounting for 20 to 30 percent of the world's hawksbill population. Only five regional populations remain with more than 1,000 females nesting annually (Seychelles, Mexico, Indonesia, and two in Australia) (Meylan and Donnelly 1999). Mexico is now the most important region for hawksbills in the Caribbean with about 3,000 nests per year (Meylan 1999). In the U.S. Pacific, hawksbills nest only on main island beaches in Hawaii, primarily along the east coast of the island of Hawaii. Hawksbill nesting has also been documented in American Samoa and Guam (NMFS and Service 1998c).

Kemp's Ridley Sea Turtle

Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a small number of Kemp's ridleys nest consistently along the Texas coast (TEWG 1998). In addition, rare nesting events have been reported in Alabama, Florida, Georgia, South Carolina, and North Carolina. Historical information indicates that tens of thousands of ridleys nested near Rancho Nuevo, Mexico, during the late 1940s (Hildebrand 1963). The Kemp's ridley population experienced a devastating decline between the late 1940s and the mid 1980s. The total number of nests per nesting season at Rancho Nuevo remained below 1,000 throughout the 1980s, but gradually began to increase in the 1990s. In 2009, 16,273 nests were documented along the 18.6 miles of coastline patrolled at Rancho Nuevo, and the total number of nests

documented for all the monitored beaches in Mexico was 21,144 (Service 2009). In 2010, a total of 13,302 nests were documented in Mexico (Service 2010). In addition, 207 and 153 nests were recorded during 2009 and 2010, respectively, in the U.S., primarily in Texas.

Status and distribution

Loggerhead Sea turtle

Five recovery units have been identified in the Northwest Atlantic based on genetic differences and a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries (NMFS and Service 2008). Recovery units are subunits of a listed species that are geographically or otherwise identifiable and essential to the recovery of the species. Recovery units are individually necessary to conserve genetic robustness, demographic robustness, important life history stages, or some other feature necessary for long-term sustainability of the species. The five recovery units identified in the Northwest Atlantic (**Figure 2**) are:

1. Northern Recovery Unit (NRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through southern Virginia (the northern extent of the nesting range);

2. Peninsula Florida Recovery Unit (PFRU) - defined as loggerheads originating from nesting beaches from the Florida-Georgia border through Pinellas County on the west coast of Florida, excluding the islands west of Key West, Florida;

3. Dry Tortugas Recovery Unit (DTRU) - defined as loggerheads originating from nesting beaches throughout the islands located west of Key West, Florida;

4. Northern Gulf of Mexico Recovery Unit (NGMRU) - defined as loggerheads originating from nesting beaches from Franklin County on the northwest Gulf coast of Florida through Texas; and

5. Greater Caribbean Recovery Unit (GCRU) - composed of loggerheads originating from all other nesting assemblages within the Greater Caribbean (Mexico through French Guiana, The Bahamas, Lesser Antilles, and Greater Antilles).

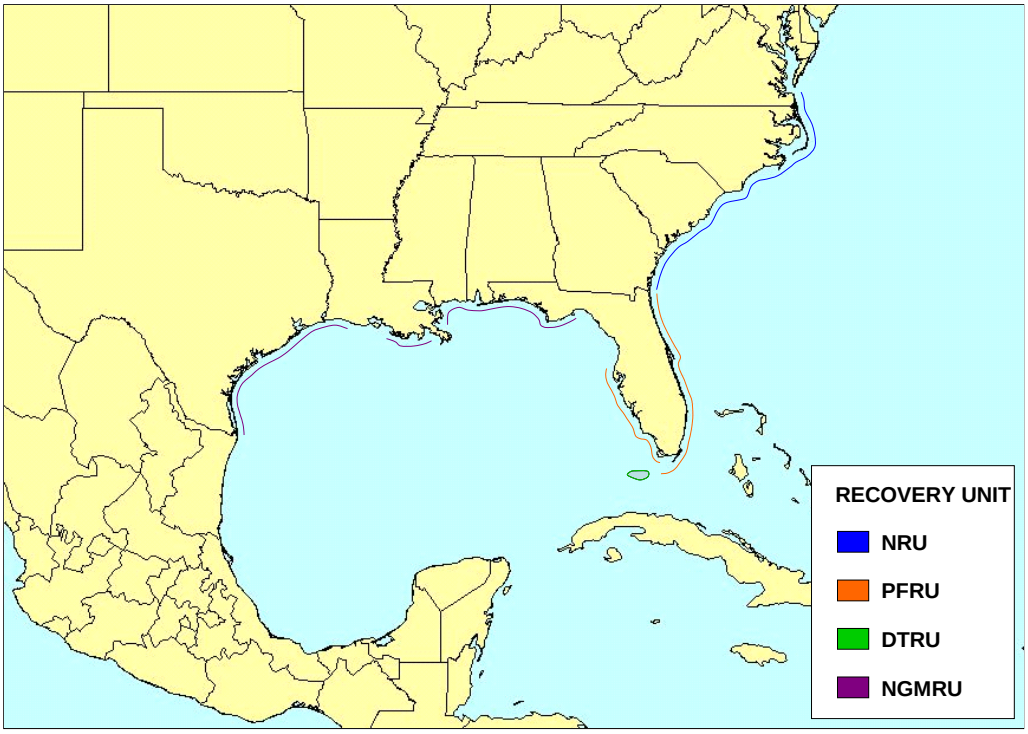

Figure 2. Map of the distribution of the loggerhead recovery units.

The mtDNA analyses show that there is limited exchange of females among these recovery units (Ehrhart 1989, Foote *et al.* 2000, NMFS 2001, Hawkes *et al.* 2005). Based on the number of haplotypes, the highest level of loggerhead mtDNA genetic diversity in the Northwest Atlantic has been observed in females of the GCRU that nest at Quintana Roo, Mexico (Encalada *et al.* 1999, Nielsen *et al*. 2012).

Nuclear DNA analyses show that there are no substantial subdivisions across the loggerhead nesting colonies in the southeastern U.S. Male-mediated gene flow appears to be keeping the subpopulations genetically similar on a nuclear DNA level (Francisco-Pearce 2001).

Historically, the literature has suggested that the northern U.S. nesting beaches (NRU and NGMRU) produce a relatively high percentage of males and the more southern nesting beaches (PFRU, DTRU, and GCRU) a relatively high percentage of females (e.g., Hanson *et al.* 1998, NMFS 2001, Mrosovsky and Provancha 1989). The NRU and NGMRU were believed to play an important role in providing males to mate with females from the more female-dominated subpopulations to the south. However, in 2002 and 2003, researchers studied loggerhead sex ratios

for two of the U.S. nesting subpopulations, the northern and southern subpopulations (NGU and PFRU, respectively) (Blair 2005, Wyneken *et al.* 2005). The study produced interesting results. In 2002, the northern beaches produced more females and the southern beaches produced more males than previously believed. However, the opposite was true in 2003 with the northern beaches producing more males and the southern beaches producing more females in keeping with prior literature. Wyneken *et al.* (2005) speculated that the 2002 result may have been anomalous; however, the study did point out the potential for males to be produced on the southern beaches. Although this study revealed that more males may be produced on southern recovery unit beaches than previously believed, the Service maintains that the NRU and NGMRU play an important role in the production of males to mate with females from the more southern recovery units.

The NRU is the second largest loggerhead nesting aggregation in the Northwest Atlantic. Annual nest totals from northern beaches averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (NMFS and Service 2008), representing approximately 1,272 nesting females per year (4.1 nests per female, Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3 percent annually. Nest totals from aerial surveys conducted by the South Carolina Department of Natural Resources showed a 1.9 percent annual decline in nesting in South Carolina since 1980. Overall, there is strong statistical data to suggest the NRU has experienced a long-term decline (NMFS and Service 2008).

The PFRU is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census of the PFRU undertaken from 1989 to 2007 reveals a mean of 64,513 loggerhead nests per year representing approximately 15,735 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC 2008d). This near-complete census provides the best statewide estimate of total abundance, but because of variable survey effort, these numbers cannot be used to assess trends. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. In 1979, the Statewide Nesting Beach Survey (SNBS) program was initiated to document the total distribution, seasonality, and abundance of sea turtle nesting in Florida. In 1989, the INBS program was initiated in Florida to measure seasonal productivity, allowing comparisons between beaches and between years (FWC 2009b). Of the 190 SNBS surveyed areas, 33 participate in the INBS program (representing 30 percent of the SNBS beach length).

INBS nest counts from 1989–2010 show a shallow decline. However, recent trends (1998–2010) in nest counts have shown a 25 percent decline, with increases only observed in the most recent 6-year period, 2008–2013 although there was no trend observed (FWC/FWRI 2014). The analysis that reveals this decline uses nest-count data from 345 representative Atlantic-coast index zones (total length = 187 miles) and 23 representative zones on Florida's southern Gulf coast (total length = 14.3 miles). The spatial and temporal coverage (annually, 109 days and 368 zones) accounted for an average of 70 percent of statewide loggerhead nesting activity between 1989 and 2010.

The NGMRU is the third largest nesting assemblage among the four U.S. recovery units. Nesting surveys conducted on approximately 186 miles of beach within the NGMRU (Alabama and Florida only) were undertaken between 1995 and 2007 (statewide surveys in Alabama began in 2002). The mean nest count during this 13-year period was 906 nests per year, which equates to about 221 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984; FWC 2008d). Evaluation of long-term nesting trends for the NGMRU is difficult because of changed and expanded beach coverage. Loggerhead nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time. There are 12 years (1997-2008) of Florida INBS data for the NGMRU (FWC 2008d). A log-linear regression showed a significant declining trend of 4.7 percent annually (NMFS and Service 2008).

The DTRU, located west of the Florida Keys, is the smallest of the identified recovery units. A near-complete nest census of the DTRU undertaken from 1995 to 2004, excluding 2002, (nine years surveyed) reveals a mean of 246 nests per year, which equates to about 60 females nesting per year (4.1 nests per female, Murphy and Hopkins 1984) (FWC 2008d). Surveys after 2004 did not include principal nesting beaches within the recovery unit (*i.e.*, Dry Tortugas National Park). The nesting trend data for the DTRU are from beaches that are not part of the INBS program, but are part of the SNBS program. There are nine years of data for this recovery unit. A simple linear regression accounting for temporal autocorrelation revealed no trend in nesting numbers. Because of the annual variability in nest totals, a longer time series is needed to detect a trend (NMFS and Service 2008).

The GCRU is composed of all other nesting assemblages of loggerheads within the Greater Caribbean. Statistically valid analyses of long-term nesting trends for the entire GCRU are not available because there are few long-term standardized nesting surveys representative of the region. Additionally, changing survey effort at monitored beaches and scattered and low-level nesting by loggerheads at many locations currently precludes comprehensive analyses. The most complete data are from Quintana Roo and Yucatán, Mexico, where an increasing trend was reported over a 15-year period from 1987-2001 (Zurita *et al.* 2003). However, since 2001, nesting has declined and the previously reported increasing trend appears not to have been sustained (NMFS and Service 2008). Other smaller nesting populations have experienced declines over the past few decades (e.g., Amorocho 2003).

Recovery Criteria (only the Demographic Recovery Criteria are presented below; for the Listing Factor Recovery Criteria, please see NMFS and Service 2008)

1. Number of Nests and Number of Nesting Females
   a. Northern Recovery Unit
      i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is 2 percent or greater resulting in a total annual number of nests of 14,000 or greater for this recovery unit (approximate distribution of nests is North Carolina =14 percent [2,000 nests], South Carolina =66 percent [9,200 nests], and Georgia =20 percent [2,800 nests]); and

ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

b. Peninsular Florida Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is statistically detectable (one percent) resulting in a total annual number of nests of 106,100 or greater for this recovery unit; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

c. Dry Tortugas Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is three percent or greater resulting in a total annual number of nests of 1,100 or greater for this recovery unit; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

d. Northern Gulf of Mexico Recovery Unit
   i. There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is three percent or greater resulting in a total annual number of nests of 4,000 or greater for this recovery unit (approximate distribution of nests (2002-2007) is Florida= 92 percent [3,700 nests] and Alabama =8 percent [300 nests]); and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

e. Greater Caribbean Recovery Unit
   i. The total annual number of nests at a minimum of three nesting assemblages, averaging greater than 100 nests annually (e.g., Yucatán, Mexico; Cay Sal Bank, Bahamas) has increased over a generation time of 50 years; and
   ii. This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

2. Trends in Abundance on Foraging Grounds
   A network of in-water sites, both oceanic and neritic, across the foraging range is established and monitoring is implemented to measure abundance. There is statistical confidence (95 percent) that a composite estimate of relative abundance from these sites is increasing for at least one generation.

3. Trends in Neritic Strandings Relative to In-water Abundance
   Stranding trends are not increasing at a rate greater than the trends in in-water relative abundance for similar age classes for at least one generation.

The Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle was signed in 2008 (NMFS and Service 2008), and the Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle was signed in 1998 (NMFS and Service 1998e).

Green Sea Turtle

Annual nest totals documented as part of the Florida SNBS program from 1989-2008 have ranged from 435 nests laid in 1993 to 12,752 in 2007. The nest count for 2013 was more than twice the count from 2007 with a total of 36,195 nests recorded (http://myfwc.com/research/wildlife/sea-turtles/nesting/statewide/). Nesting occurs in 26 counties with a peak along the east coast, from Volusia through Broward Counties. Although the SNBS program provides information on distribution and total abundance statewide, it cannot be used to assess trends because of variable survey effort. Therefore, green turtle nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time (1989-2009). Green sea turtle nesting in Florida is increasing based on 19 years (1989-2009) of INBS data from throughout the state (FWC 2009a). The increase in nesting in Florida is likely a result of several factors, including: (1) a Florida statute enacted in the early 1970s that prohibited the killing of green turtles in Florida; (2) the species listing under the Act afforded complete protection to eggs, juveniles, and adults in all U.S. waters; (3) the passage of Florida's constitutional net ban amendment in 1994 and its subsequent enactment, making it illegal to use any gillnets or other entangling nets in State waters; (4) the likelihood that the majority of Florida green turtles reside within Florida waters where they are fully protected; (5) the protections afforded Florida green turtles while they inhabit the waters of other nations that have enacted strong sea turtle conservation measures (e.g., Bermuda); and (6) the listing of the species on Appendix I of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which stopped international trade and reduced incentives for illegal trade from the U.S.

Recovery Criteria

The U.S. Atlantic population of green sea turtles can be considered for delisting if, over a period of 25 years, the following conditions are met:

1. The level of nesting in Florida has increased to an average of 5,000 nests per year for at least six years. Nesting data must be based on standardized surveys;

2. At least 25 percent (65 miles) of all available nesting beaches (260 miles) is in public ownership and encompasses at least 50 percent of the nesting activity;

3. A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds; and

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for U.S. Population of Atlantic Green Turtle was signed in 1991 (NMFS and Service 1991), the Recovery Plan for U.S. Pacific Populations of the Green Turtle was signed in 1998 (NMFS and Service 1998b), and the Recovery Plan for U.S. Pacific Populations of the East Pacific Green Turtle was signed in 1998 (NMFS and Service 1998a).

Leatherback Sea Turtle

Declines in leatherback nesting have occurred over the last two decades along the Pacific coasts of Mexico and Costa Rica. The Mexican leatherback nesting population, once considered to be the world's largest leatherback nesting population (historically estimated to be 65 percent of the worldwide population), is now less than one percent of its estimated size in 1980. Spotila *et al.* (1996) estimated the number of leatherback sea turtles nesting on 28 beaches throughout the world from the literature and from communications with investigators studying those beaches. The estimated worldwide population of leatherbacks in 1995 was about 34,500 females on these beaches with a lower limit of about 26,200, and an upper limit of about 42,900. This is less than one-third the 1980 estimate of 115,000. Leatherbacks are rare in the Indian Ocean and in very low numbers in the western Pacific Ocean. The largest population is in the western Atlantic. Using an age-based demographic model, Spotila *et al.* (1996) determined that leatherback populations in the Indian Ocean and western Pacific Ocean cannot withstand even moderate levels of adult mortality and that the Atlantic populations are being exploited at a rate that cannot be sustained. They concluded that leatherbacks are on the road to extinction and further population declines can be expected unless action is taken to reduce adult mortality and increase survival of eggs and hatchlings.

In the U.S., nesting populations occur in Florida, Puerto Rico, and the U.S. Virgin Islands. In Florida, the SNBS program documented an increase in leatherback nesting numbers from 98 nests in 1988 to between 800 and 900 nests per season in the early 2000s (FWC 2009a, Stewart and Johnson 2006). Although the SNBS program provides information on distribution and total abundance statewide, it cannot be used to assess trends because of variable survey effort. Therefore, leatherback nesting trends are best assessed using standardized nest counts made at INBS sites surveyed with constant effort over time (1989-2009). An analysis of the INBS data has shown a substantial increase in leatherback nesting in Florida since 1989 (FWC 2009b, TEWG Group 2007).

Recovery Criteria

The U.S. Atlantic population of leatherbacks can be considered for delisting if the following conditions are met:

1. The adult female population increases over the next 25 years, as evidenced by a statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, U.S. Virgin Islands, and along the east coast of Florida;

2. Nesting habitat encompassing at least 75 percent of nesting activity in U.S. Virgin Islands, Puerto Rico, and Florida is in public ownership; and.

3. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for Leatherback Turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico was signed in 1992 (NMFS and Service 1992), and the Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle was signed in 1998 (NMFS and Service 1998d).

Hawksbill Sea Turtle

The hawksbill sea turtle has experienced global population declines of 80 percent or more during the past century and continued declines are projected (Meylan and Donnelly 1999). Most populations are declining, depleted, or remnants of larger aggregations. Hawksbills were previously abundant, as evidenced by high-density nesting at a few remaining sites and by trade statistics.

Recovery Criteria

The U.S. Atlantic population of hawksbills can be considered for delisting if, over a period of 25 years, the following conditions are met:

1. The adult female population is increasing, as evidenced by a statistically significant trend in the annual number of nests on at least five index beaches, including Mona Island and Buck Island Reef National Monument;

2. Habitat for at least 50 percent of the nesting activity that occurs in the U.S. Virgin Islands and Puerto Rico is protected in perpetuity;

3. Numbers of adults, subadults, and juveniles are increasing, as evidenced by a statistically significant trend on at least five key foraging areas within Puerto Rico, U.S. Virgin Islands, and Florida; and

4. All priority one tasks identified in the recovery plan have been successfully implemented.

The Recovery Plan for the Hawksbill Turtle in the U.S. Caribbean, Atlantic, and Gulf of Mexico was signed in 1993 (NMFS and Service 1993), and the Recovery Plan for U.S. Pacific Populations of the Hawksbill Turtle was signed in 1998 (NMFS and Service 1998c).

Kemp's Ridley Sea Turtle

Today, under strict protection, the population appears to be in the early stages of recovery. The recent nesting increase can be attributed to full protection of nesting females and their nests in Mexico resulting from a binational effort between Mexico and the U.S. to prevent the extinction of the Kemp's ridley, and the requirement to use Turtle Excluder Devices (TEDs) in shrimp trawls both in the U.S. and Mexico.

The Mexico government also prohibits harvesting and is working to increase the population through more intensive law enforcement, by fencing nest areas to diminish natural predation, and by relocating most nests into corrals to prevent poaching and predation. While relocation of nests into corrals is currently a necessary management measure, this relocation and concentration of eggs into a "safe" area is of concern since it can reduce egg viability.

Recovery Criteria

The goal of the recovery plan is for the species to be reduced from endangered to threatened status. The Recovery Team members feel that the criteria for a complete removal of this species from the endangered species list need not be considered now, but rather left for future revisions of the plan. Complete removal from the federal list would certainly necessitate that some other instrument of protection, similar to the MMPA, be in place and be international in scope. Kemp's ridley can be considered for reclassification to threatened status when the following four criteria are met:

1. Continuation of complete and active protection of the known nesting habitat and the waters adjacent to the nesting beach (concentrating on the Rancho Nuevo area) and continuation of the bi-national protection project;

2. Elimination of mortality from incidental catch in commercial shrimping in the U.S. and Mexico through the use of TEDs and achievement of full compliance with the regulations requiring TED use;

3. Attainment of a population of at least 10,000 females nesting in a season; and

4. Successful implementation of all priority one recovery tasks in the recovery plan.

The Recovery Plan for the Kemp's Ridley Sea Turtle was signed in 1992 (Service and NMFS 1992). Significant new information on the biology and population status of Kemp's ridley has become available since 1992. Consequently, a full revision of the recovery plan has been completed by the Service and NMFS. The Bi-National Recover Plan for the Kemp's Ridley Sea

turtle (2011) provides updated species biology and population status information, objective and measurable recovery criteria, and updated and prioritized recovery actions.

Common threats to sea turtles in Florida

Anthropogenic factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion; armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants (*Solenopsis* spp.), feral hogs (*Sus scrofa*), dogs (*Canis familiaris),* and an increased presence of native species (e.g., raccoons (*Procyon lotor*), armadillos (*Dasypus novemcinctus*), and opossums (*Didelphis virginiana*)), which raid nests and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the western North Atlantic coast, other areas along these coasts have limited or no protection.

Anthropogenic threats in the marine environment include oil and gas exploration and transportation; marine pollution; underwater explosions; hopper dredging; offshore artificial lighting; power plant entrainment or impingement; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; and poaching and fishery interactions. On April 20, 2010, an explosion and fire on the Mobile Offshore Drilling Unit *Deepwater Horizon* MC252 occurred approximately 50 miles southeast of the Mississippi Delta. A broken well head at the sea floor resulted in a sustained release of oil, estimated at 35,000 and 60,000 barrels per day. On July 15, the valves on the cap were closed, which effectively shut in the well and all sub-sea containment systems. Damage assessment from the sustained release of oil is currently ongoing and the Service does not have a basis at the present time to predict the complete scope of effects to sea turtles range-wide.

Fibropapillomatosis, a disease of sea turtles characterized by the development of multiple tumors on the skin and internal organs, is also a mortality factor, particularly for green turtles. This disease has seriously impacted green turtle populations in Florida, Hawaii, and other parts of the world. The tumors interfere with swimming, eating, breathing, vision, and reproduction, and turtles with heavy tumor burdens may die.

Analysis of the species/critical habitat likely to be affected

The threatened loggerhead sea turtle, the endangered green sea turtle, the endangered leatherback sea turtle, the endangered hawksbill sea turtle, and the endangered Kemp's ridley sea turtle are currently listed because of their reduced population sizes caused by overharvest and habitat loss with continuing anthropogenic threats from commercial fishing, disease, and degradation of remaining habitat. The proposed action has the potential to adversely affect nesting females of these species, their nests, and hatchlings on all nesting beaches where shore protection activities (including the placement of compatible sediment, repair or replacement of groins and jetties, and navigation channel maintenance on the beaches of the Atlantic and Gulf coasts of Florida) occur.

The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) share Federal jurisdiction for sea turtles under the Act. The Service has responsibility for sea turtles on the nesting beach. NMFS has jurisdiction for sea turtles in the marine environment.

In accordance with the Act, the Service completes consultations with all Federal agencies for actions that may adversely affect sea turtles on the nesting beach. The Service's analysis only addresses activities that may impact nesting sea turtles, their nests and eggs, and hatchlings as they emerge from the nest and crawl to the sea. NMFS assesses and consults with Federal agencies concerning potential impacts to sea turtles in the marine environment, including updrift and downdrift nearshore areas affected by sand placement projects on the beach.

The proposed action has the potential to adversely affect nesting females, nests, and hatchlings within the proposed project area. Potential effects include destruction of nests deposited within the boundaries of the proposed project, harassment as a result of construction activities in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches; disorientation of hatchling turtles resulting from project lighting on beaches adjacent to the construction area as they emerge from the nest and crawl to the water; disorientation that occurs after project construction due to landward lights impacting the elevated berm; and behavior modification of nesting females due to escarpment formation within the project area during a nesting season resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs. The quality of the placed sand could affect the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest. The effects of the proposed action on sea turtles will be considered further in the remaining sections of this biological opinion.

Some individuals in a population are more "valuable" than others in terms of the number of offspring they are expected to produce. An individual's potential for contributing offspring to future generations is its reproductive value. Because of delayed sexual maturity, reproductive longevity, and low survivorship in early life stages, nesting females are of high value to a population. The loss of a nesting female in a small recovery unit would represent a significant loss to the recovery unit. The reproductive value for a nesting female has been estimated to be approximately 253 times greater than an egg or a hatchling (NMFS and Service 2008). However, the SPBO includes avoidance and minimization measures that reduce the possibility of mortality of a nesting female on the beach as a result of the project. Therefore, we do not anticipate the loss of any nesting females on the beach as a result of the activities listed in this SPBO.

Sand placement projects are anticipated to result in decreased nesting and loss of nests that do get laid within the project area for two subsequent nesting seasons following the completion of the proposed sand placement. However, it is important to note that it is unknown whether nests that would have been laid in a project area during the two subsequent nesting seasons had the project not occurred are actually lost from the population or if nesting is simply displaced to adjacent beaches. Regardless, eggs and hatchlings have a low reproductive value; each egg or hatchling has been estimated to have only 0.004 percent of the value of a nesting female (NMFS and Service

2008). Thus, even if the majority of the eggs and hatchlings that would have been produced on the project beach are not realized for up to 2 years following project completion, the Service would not expect this loss to have a significant effect on the recovery and survival of the species, for the following reasons: 1) some nesting is likely just displaced to adjacent non-project beaches, 2) not all eggs will produce hatchlings, and 3) destruction and/or failure of nests will not always result from a sand placement project. A variety of natural and unknown factors negatively affect incubating egg clutches, including tidal inundation, storm events, and predation.

During project construction, direct mortality of the developing embryos in nests within the project area may occur for nests that are missed and not relocated. The exact number of these missed nests is not known. However, in two separate monitoring programs on the east coast of Florida where hand digging was performed to confirm the presence of nests and thus reduce the chance of missing nests through misinterpretation, trained observers still missed about 6 to 8 percent of the nests because of natural elements (Martin 1992, Ernest and Martin 1993). This must be considered a conservative number, because nests missed during surveys are not always discovered after hatching. In another study, Schroeder (1994) found that even under the best of conditions, about 7 percent of nests can be misidentified as false crawls by highly experienced sea turtle nest surveyors. Missed nests are usually identified by signs of hatchling emergences in areas where no nest was previously documented. Signs of hatchling emergence are very easily obliterated by the same elements that interfere with detection of nests.

In the U.S., consultations with the Service have included military missions and operations, beach nourishment and other shoreline protection projects, and actions related to protection of coastal development on sandy beaches along the coast. Much of the Service's section 7 consultation involves beach nourishment projects. A list of the Service's consultations completed over the last 5 years is included in Appendix A. The Act does not require entities conducting projects with no Federal nexus to apply for a section 10(a)(1)(B) permit. This is a voluntary process and is applicant driven. Section 10(a)(1)(A) permits are scientific permits that include activities that would enhance the survival and conservation of a listed species. Those permits are not listed as they are expected to benefit the species and are not expected to contribute to the cumulative take assessment.

A list of completed NMFS consultations is included in Appendix B.

ENVIRONMENTAL BASELINE

Status of the species/critical habitat within the action area

INBS nest counts represent approximately 69 percent of known loggerhead nesting in Florida, 74 percent of known green turtle nesting, and 34 percent of known leatherback nesting (FWC 2009a). The INBS program was established with a set of standardized data-collection criteria to measure seasonal nesting, and to allow accurate comparisons between both beaches and years. The reliability of these comparisons results from the uniformity of beach-survey effort in space and time, and from the specialized annual training of beach surveyors. Under the core INBS program,

178 miles of nesting beach have been divided into zones, known as core index zones, averaging 0.5 mile in length. These beaches are monitored daily beginning May 15 and ending August 31. On all index beaches, researchers record nests and nesting attempts by species, the location of each nest, and the date each nest was laid.

Nesting surveys begin at or just before sunrise. Turtle crawls are identified as a true nesting crawl or false crawl (*i.e.*, nonnesting emergence). Nests are marked with stakes and some are surrounded with surveyor flagging tape and, if needed, screened or caged to prevent predation. The marked nests are monitored throughout the incubation period for storm damage, predation, hatching activity and hatching and emerging success. Nest productivity surveys may continue into mid-November depending on nest incubation periods. All monitoring is conducted in accordance with the FWC's Marine Turtle Conservation Guidelines.

Loggerhead Sea Turtle

Five loggerhead sea turtle recovery units have been identified in the Northwest Atlantic (NMFS and Service 2008). Mitochondrial DNA analyses show that there is limited exchange of females among these recovery units (Foote *et al*. 2000, NMFS 2001, Hawkes *et al*. 2005). However, nuclear DNA analyses show that there are no substantial subdivisions across the loggerhead nesting colonies in the southeastern U.S. Male-mediated gene flow appears to be keeping the subpopulations genetically similar on a nuclear DNA level (Francisco-Pearce 2001). The NRU and NGMRU are believed to play an important role in providing males to mate with females from the more female-dominated recovery units.

Two (NGMRU and PFRU) of the five nesting subpopulations occur within the proposed Action Area. Northwest Florida, which accounts for 92 percent of the NGMRU in nest numbers, consists of approximately 234 miles of nesting shoreline. The PFRU makes up 1,166 miles of shoreline and consists of approximately was 69,982 nests per year (2008 to 2012)..

Recovery Units	**Nesting Range**
NGMRU	Escambia through Franklin Counties
PFRU	Pinellas through Nassau Counties

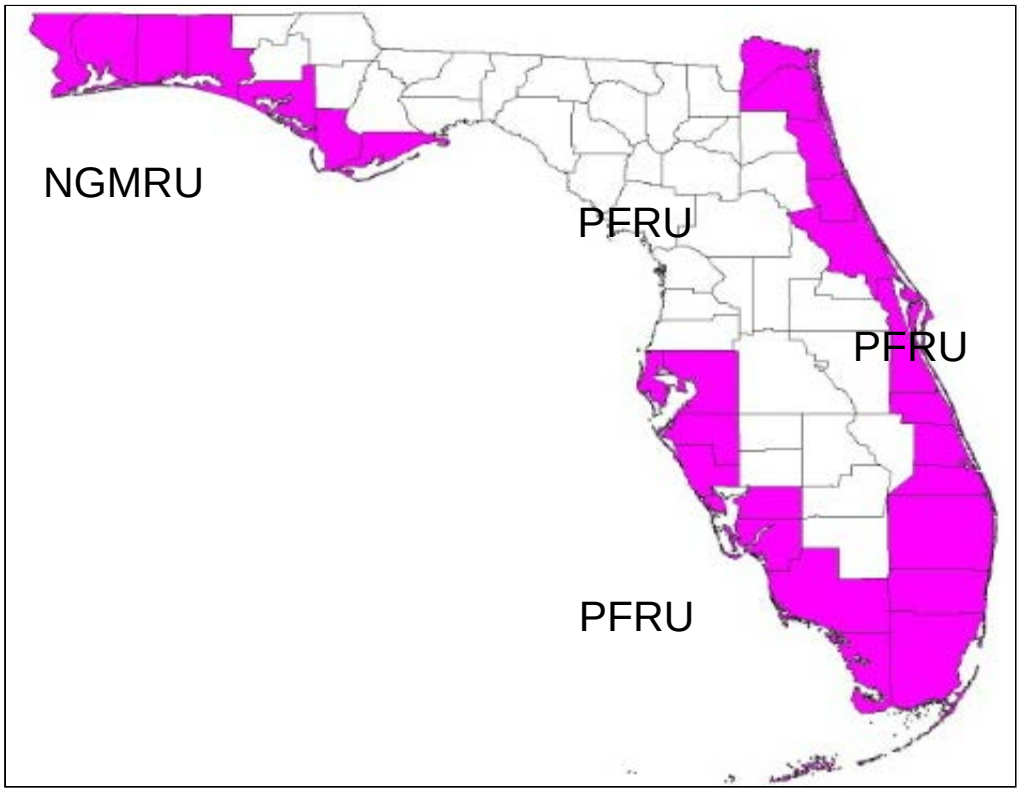

Figure 3. Distribution of loggerhead sea nesting in the PFRU and NGMRU in Florida.

The main loggerhead sea turtle nesting and hatching season throughout Florida is shown in **Table 5.**

Table 6. Loggerhead sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 1 through October 31
Southern Gulf of Mexico	Pinellas through Monroe	April 1 through November 30
Southern Florida Atlantic	Brevard through Miami-Dade	March 1 through November 30
Northern Florida Atlantic	Nassau through Volusia	April 15 through November 30

An updated analysis by FWC/FWRI reveals a shallow decline in loggerhead nest numbers around the State of Florida based on INBS nest counts from 1989 through 2010 (FWC/FWRI 2010). Analysis of nest counts over the last six years (2009 through 2013) have found no trend, although when added to the data from 1989, the overall change is an increase in loggerhead nests since 1989 (FWC/FWRI 2014). The five year average (2008 to2012) for the PFRU was 69,982 nests. The five-year average (2008 to 2012) for the NGMRU was 966 nests.

Sea turtles play a vital role in maintaining healthy and productive ecosystems. Nesting sea turtles introduce large quantities of nutrients from the marine ecosystem to the beach and dune system (Bouchard and Bjorndal 2000). In the U.S., loggerheads play a particularly important role in this regard due to their greater nesting numbers. The nutrients they leave behind on the nesting beaches in the form of eggs and eggshells play an important role for dune vegetation and terrestrial predator populations (Bouchard and Bjorndal 2000). In a study at Melbourne Beach, Florida, Bouchard and Bjorndal (2000) estimated that only 25 percent of the organic matter introduced into nests by loggerheads returned to the ocean as hatchlings. They found that 29-40 percent of all nutrients were made available to detritivores, decomposers, and plants, while 26-31 percent of all nutrients were consumed by nest predators. Thus, all loggerhead recovery units play a vital role in the maintenance of a healthy beach and dune ecosystem within their geographic distribution.

Green Sea Turtle

Green turtle nest numbers are increasing in Florida with a record number of nests being recorded during the 2013 season (FWC 2014). The five year average (2008 to 2012) for green turtles within the action area was 10,384 nests. The number of green turtle nests recorded in Florida during the 2013 nesting season was a record high of 36,195.

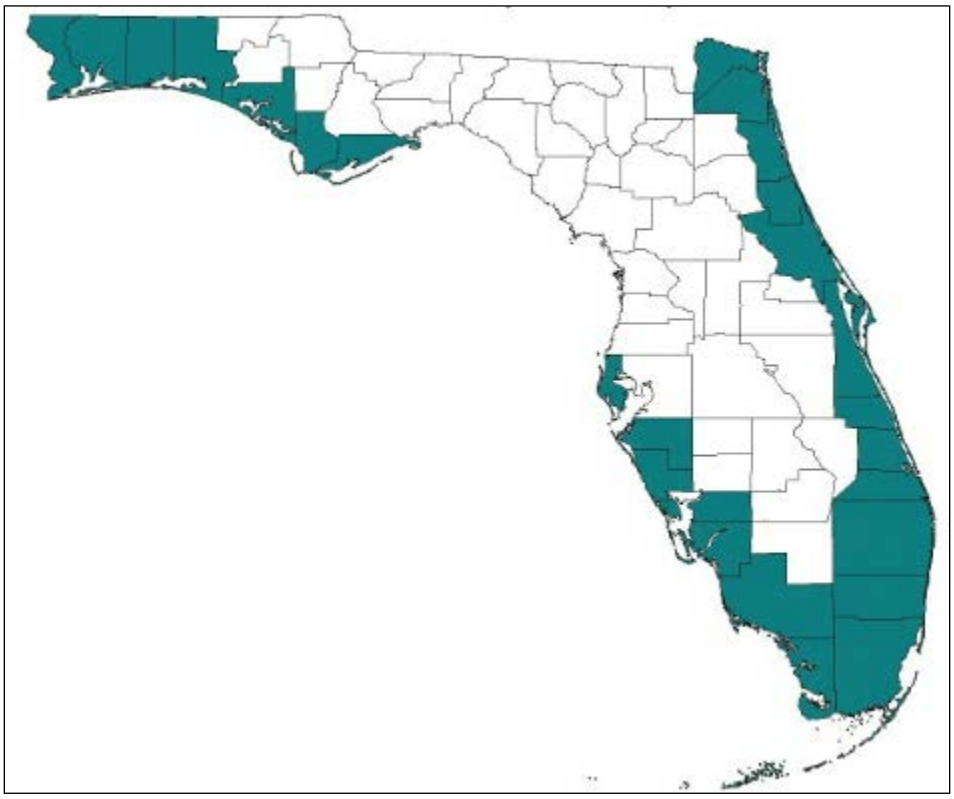

Figure 4. Distribution of green sea turtle nesting in Florida.

The main green sea turtle nesting and hatching season throughout Florida is shown in **Table 6**.

Table 7. Green sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 15 through October 31
Southern Gulf of Mexico	Pinellas through Monroe	May 15 through October 31
Southern Florida Atlantic	Brevard through Miami-Dade	May 1 through November 30
Northern Florida Atlantic	Nassau through Volusia	May 15 through November 15

Leatherback Sea Turtle

Leatherback nest numbers are increasing in Florida with a record number of leatherback nests recorded during the 2009 season (FWC 2009a). The five year average (2008 to 2012) for leatherback sea turtles within the action area was 1,435 nests with a total of 896 nests recorded in 2013.

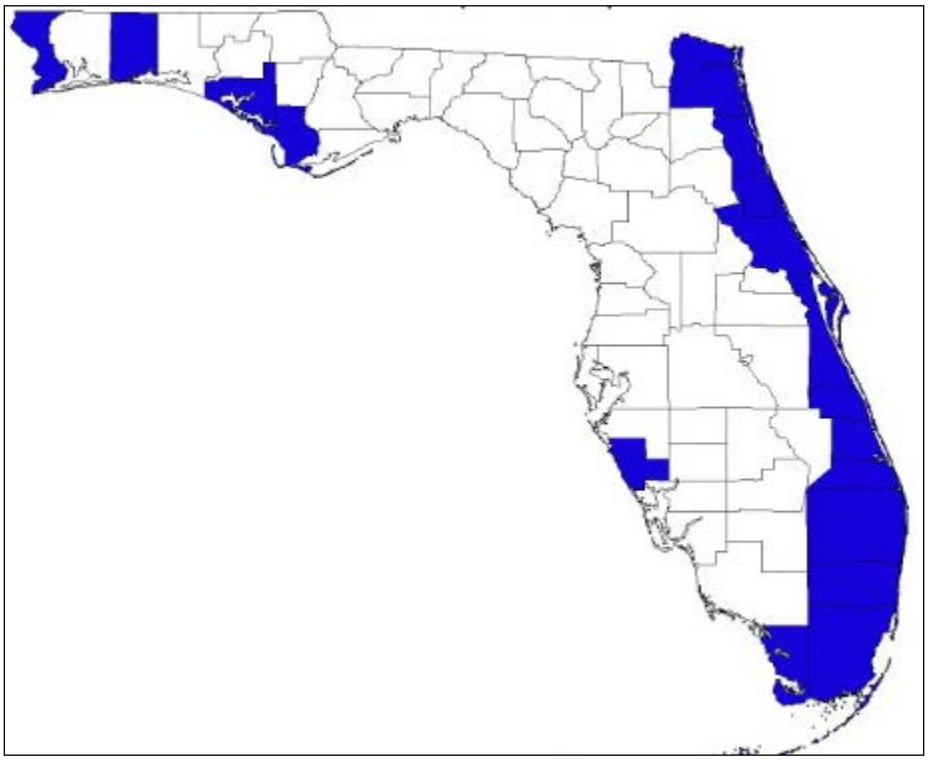

Figure 5. Distribution of leatherback sea turtle nesting in Florida.

The main leatherback sea turtle nesting and hatching season throughout Florida is shown in **Table 7**.

Table 8. Leatherback sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Northern Gulf of Mexico	Escambia through Pasco	May 1 through September 30
Southern Florida Atlantic	Brevard through Miami-Dade	February 15 through November 30
Northern Florida Atlantic	Nassau through Volusia	April 15 through September 30

Hawksbill Sea Turtle

Forty-six hawksbill nests have been documented in Florida from 1979-2013 in Volusia, Martin, Palm Beach, Broward, Miami-Dade, Monroe, and Manatee counties (FWC/FWRI 2014a). The hawksbill sea turtle nesting and hatching season throughout Florida is shown in **Table 8**.

Table 9. Hawksbill sea turtle nesting and hatching season for Florida.

AREA	COUNTIES	SEA TURTLE NESTING SEASON THROUGH HATCHING SEASON
Southern tip of Florida	Monroe	June 1 through December 31
Southern Florida Atlantic	Brevard through Miami-Dade	June 1 through December 31
Northeast Florida	Volusia	June 1 through December 31
Southwest Florida	Manatee	June 1 through December 31

Kemp's Ridley Sea Turtle

Eighty Kemp's ridley nests have been documented in Florida from 1979-2013 in Duval, Flagler, Volusia, Brevard, Martin, Palm Beach, Lee, Charlotte, Sarasota, Pinellas, Franklin, Gulf, Walton, Okaloosa, Santa Rosa, and Escambia counties (FWC/FWRI 2014).

Factors affecting species habitat within the action area

In accordance with the Act, the Service completes consultations with all federal agencies for actions that may adversely affect sea turtles. In Florida, consultations have included military missions and operations, beach nourishment and other shoreline protection, and actions related to protection of coastal development on sandy beaches of Florida's Atlantic Coast (Key West to

Fernandina/Kings Bay) and the Gulf Coast (Ten Thousand Islands to Alabama State Line) (**Appendix A**).

Coastal Development

Loss of nesting habitat related to coastal development has had the greatest impact on nesting sea turtles in Florida. Beachfront development not only causes the loss of suitable nesting habitat, but can result in the disruption of powerful coastal processes accelerating erosion and interrupting the natural shoreline migration (National Research Council 1990b). This may in turn cause the need to protect upland structures and infrastructure by armoring, groin placement, beach emergency berm construction and repair, and beach nourishment which cause changes in, additional loss of, or impact to, the remaining sea turtle habitat.

Hurricanes

Hurricanes were probably responsible for maintaining coastal beach habitat upon which sea turtles depend through repeated cycles of destruction, alteration, and recovery of beach and dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain, which can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes and other storms can result in the direct or indirect loss of sea turtle nests, either by erosion or washing away of the nests by wave action, inundation or "drowning" of the eggs or hatchlings developing within the nest or indirectly by loss of nesting habitat. Depending on their frequency, storms can affect sea turtles on either a short-term basis (nests lost for one season and/or temporary loss of nesting habitat) or long term, if frequent (habitat unable to recover). How hurricanes affect sea turtle nesting also depends on its characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining nesting habitat in a natural state with no development landward of the sandy beach, frequent or successive severe weather events could threaten the ability of certain sea turtle populations to survive and recover. Sea turtles evolved under natural coastal environmental events such as hurricanes. The extensive amount of predevelopment coastal beach and dune habitat allowed sea turtles to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to sea turtle survival and recovery. On developed beaches, typically little space remains for sandy beaches to become reestablished after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their prestorm locations can result in a loss of nesting habitat.

The 2004 hurricane season was the most active storm season in Florida since weather records began in 1851. Hurricanes Charley, Frances, Ivan, and Jeanne, along with Tropical Storm Bonnie, damaged the beach and dune system, upland structures and properties, and infrastructure in the

majority of Florida's coastal counties. The cumulative impact of these storms exacerbated erosion conditions throughout the state.

The 2005 hurricane season was a record-breaking season with 27 named storms. Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma, and Tropical Storms Arlene and Tammy impacted Florida. The cumulative impact of these storms exacerbated erosion conditions in south and northwest Florida.

A common question is whether the 2004 and 2005 hurricane seasons contributed to reduced loggerhead nest numbers observed from 2004-2007. Although Florida has been subject to numerous hurricanes in recent years, these storm events cannot account for the recent decline (1998-2010) observed in the number of loggerhead nests on Florida beaches. The hurricanes have a very limited effect on nesting activity of adult female turtles. Because loggerheads that hatch on Florida beaches require some 20 to 30 years to reach maturity, storm impacts would not manifest themselves for many years. Moreover, hurricane impacts to nests tend to be localized and often occur after the main hatching season for the loggerhead is over (FWC 2008a).

Erosion

The designation of a Critically Eroded Beach is a planning requirement of the State's Beach Management Funding Assistance Program http://www.dep.state.fl.us/beaches/programs/becp/index.htm. A segment of beach shall first be designated as critically eroded in order to be eligible for State funding. A critically eroded area is a segment of shoreline where natural processes or human activity have caused or contributed to erosion and recession of the beach or dune system to such a degree that upland development, recreational interests, wildlife habitat, or important cultural resources are threatened or lost. Critically eroded areas may also include peripheral segments or gaps between identified critically eroded areas which, although they may be stable or slightly erosional now, their inclusion is necessary for continuity of management of the coastal system or for the design integrity of adjacent beach management projects (FDEP 2009). It is important to note, that for an erosion problem area to be critical, there shall exist a threat to or loss of one of four specific interests – upland development, recreation, wildlife habitat, or important cultural resources.

Beachfront Lighting

Artificial beachfront lighting may cause disorientation (loss of bearings) and misorientation (incorrect orientation) of sea turtle hatchlings. Visual signs are the primary sea-finding mechanism for hatchlings (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). Artificial beachfront lighting is a documented cause of hatchling disorientation and misorientation on nesting beaches (Philibosian 1976, Mann 1977, Witherington and Martin 1996). The emergence from the nest and crawl to the sea is one of the most critical periods of a sea turtle's life. Hatchlings that do not make it to the sea quickly become food for ghost crabs, birds, and other predators, or become dehydrated and may never reach the sea. Some types of beachfront lighting attract hatchlings away from the sea while some lights cause adult turtles to avoid stretches of brightly illuminated beach. Research has

documented significant reduction in sea turtle nesting activity on beaches illuminated with artificial lights (Witherington 1992). During the 2007 to 2010 sea turtle nesting seasons in Florida, turtle hatchlings that were documented as being disoriented ranged from 44,828 to more than 64,000 hatchlings per year (**Table 9**) (FWC/FWRI 2014b). Exterior and interior lighting associated with condominiums had the greatest impact causing approximately 42 percent of documented hatchling disorientation/misorientation. Other causes included urban sky glow and street lights (FWC 2007a).

Table 10. Documented disorientations along the Florida coast (FWC 2007a).

Year	Total Number of Hatchling Disorientation Events	Total Number of Hatchlings Involved in Disorientation Events	Total Number of Adult Disorientation Events
2001	743	28,674	19
2002	896	43,226	37
2003	1,446	79,357	18
2004	888	46,487	24
2005	976	41,521	50
2006	1,521	71,798	40
2007	1,410	64,433	25
2008	1,192	49,623	62
2009	1,274	44,828	42
2010	1,513	46,978	82

Predation

Predation of sea turtle eggs and hatchlings by native and introduced species occurs on almost all nesting beaches. Predation by a variety of predators can considerably decrease sea turtle nest hatching success. The most common predators in the southeastern U.S. are ghost crabs (*Ocypode quadrata*), raccoons, feral hogs, foxes (*Urocyon cinereoargenteus* and *Vulpes vulpes*), coyotes (*Canis latrans*), armadillos, and fire ants (Dodd 1988, Stancyk 1995). In the absence of nest protection programs in a number of locations throughout the southeast U.S., raccoons may depredate up to 96 percent of all nests deposited on a beach (Davis and Whiting 1977, Hopkins and Murphy 1980, Stancyk *et al.* 1980, Talbert *et al*. 1980, Schroeder 1981, Labisky *et al.* 1986). In response to increasing predation of sea turtle nests by coyotes, foxes, hogs, and raccoons, multi-agency cooperative efforts have been initiated and are ongoing throughout Florida, particularly on public lands.

Driving on the Beach

The operation of motor vehicles on the beach affects sea turtle nesting by interrupting or striking a female turtle on the beach, headlights disorienting or misorienting emergent hatchlings, vehicles running over nests or hatchlings attempting to reach the ocean, and vehicle tracks traversing the beach which interfere with hatchlings crawling to the ocean. Hatchlings appear to become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier *et al.* 1981). Driving on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success and directly killing preemergent hatchlings (Mann 1977, Nelson and Dickerson 1987, Nelson 1988).

The physical changes and loss of plant cover caused by vehicles on dunes can lead to various degrees of instability, and therefore encourage dune migration. As vehicles move either up or down a slope, sand is displaced downward. Since the vehicles also inhibit plant growth, and open the area to wind erosion, dunes may become unstable, and begin to migrate. Unvegetated sand dunes may continue to migrate across stable areas as long as vehicle traffic continues. Vehicular traffic through dune breaches or low dunes on an eroding beach may cause an accelerated rate of overwash and beach erosion (Godfrey *et al.* 1978). If driving is required, the area where the least amount of impact occurs is the beach between the low and high tide water lines. Vegetation on the dunes can quickly reestablish provided the mechanical impact is removed.

In 1985, the Florida Legislature severely restricted vehicular driving on Florida's beaches, except that which is necessary for cleanup, repair, or public safety. This legislation also allowed an exception for five counties to continue to allow vehicular access on coastal beaches due to the availability of less than 50 percent of its peak user demand for off-beach parking. The counties affected by this exception are Volusia, St. Johns, Gulf, Nassau, and Flagler Counties, as well as limited vehicular access on Walton County beaches for boat launching.

Climate Change

The varying and dynamic elements of climate science are inherently long term, complex, and interrelated. Regardless of the underlying causes of climate change, glacial melting and expansion of warming oceans are causing sea level rise, although its extent or rate cannot as yet be predicted with certainty. At present, the science is not exact enough to precisely predict when and where climate impacts will occur. Although we may know the direction of change, it may not be possible to predict its precise timing or magnitude. These impacts may take place gradually or episodically in major leaps.

Climate change is evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level, according to the Intergovernmental Panel on Climate Change Report (IPCC 2007a). The IPCC Report (2007a) describes changes in natural ecosystems with potential widespread effects on many organisms,

including marine mammals and migratory birds. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species' abundance and distribution are dynamic, relative to a variety of factors, including climate. As climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the U.S. Department of the Interior (DOI) requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities (Service 2007c).

Climatic changes in Florida could amplify current land management challenges involving habitat fragmentation, urbanization, invasive species, disease, parasites, and water management. Global warming will be a particular challenge for endangered, threatened, and other "at risk" species. It is difficult to estimate, with any degree of precision, which species will be affected by climate change or exactly how they will be affected. The Service will use Strategic Habitat Conservation planning, an adaptive science-driven process that begins with explicit trust resource population objectives, as the framework for adjusting our management strategies in response to climate change (Service 2006). As the level of information increases relative to the effects of global climate change on sea turtles and its designated critical habitat, the Service will have a better basis to address the nature and magnitude of this potential threat and will more effectively evaluate these effects to the range-wide status of sea turtles.

Florida is one of the areas most vulnerable to the consequences of climate change. Sea level rise and the possibility of more intense hurricanes are the most serious threats to Florida potentially from climate change. Florida has over 1,350 miles of coastline, low-lying topography, and proximity to the hurricane-prone subtropical mid-Atlantic Ocean and Gulf of Mexico.

One of the most serious threats to Florida's coasts comes from the combination of elevated sea levels and intense hurricanes. Florida experiences more landings of tropical storms and hurricanes than any other state in the U.S. Storm surges due to hurricanes will be on top of elevated sea levels, tides, and wave action. As a result, barrier islands and low-lying areas of Florida will be more susceptible to the effects of storm surge. An important element of adaptation strategy is how to protect beaches, buildings and infrastructure against the effects of rising seas and wind, wave action, and storm surge due to hurricanes while maintaining viable nesting habitat along Florida's coasts.

Temperatures are predicted to rise from 1.6^{o}F to 9°F for North America by the end of this century (IPCC 2007a,b). Alterations of thermal sand characteristics could result in highly female-biased sex ratios because sea turtles exhibit temperature dependent sex determination (e.g., Glen and Mrosovsky 2004, Hawkes *et al*. 2008).

Along developed coastlines, and especially in areas where shoreline protection structures have been constructed to limit shoreline movement, rising sea levels will cause severe effects on nesting females and their eggs. Erosion control structures can result in the permanent loss of dry nesting beach or deter nesting females from reaching suitable nesting sites (National Research Council

1990a). Nesting females may deposit eggs seaward of the erosion control structures potentially subjecting them to repeated tidal inundation or washout by waves and tidal action.

Based on the present level of available information concerning the effects of global climate change on the status of sea turtles and their designated critical habitat, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting sea turtles or their designated critical habitat. Nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

EFFECTS OF THE ACTION

This section is an analysis of the beneficial, direct, and indirect effects of the proposed actions on nesting sea turtles, nests, eggs, and hatchling sea turtles within the Action Area. The analysis includes effects interrelated and interdependent of the project activities. An interrelated activity is an activity that is part of a proposed action and depends on the proposed activity. An interdependent activity is an activity that has no independent utility apart from the action.

Factors to be considered

The proposed projects will occur within habitat that is used by sea turtles for nesting and may be constructed during a portion of the sea turtle nesting season. Long-term and permanent impacts could include a change in the nest incubation environment from the sand placement activities. Short-term and temporary impacts to sea turtle nesting activities could result from project work occurring on the nesting beach during the nesting or hatching period, from changes in the physical characteristics of the beach from the placement of the sand including the profile and from sediment-induced changes in the nest incubation environment.

Proximity of action: Sand placement activities would occur within and adjacent to nesting habitat for sea turtles and dune habitats that ensure the stability and integrity of the nesting beach. Specifically, the project would potentially impact loggerhead, green, leatherback, hawksbill, and Kemp's ridley nesting females, their nests, nesting habitat, and hatchling sea turtles.

Distribution: Sand placement activities that may impact nesting and hatchling sea turtles and sea turtle nests would occur along Gulf of Mexico and Atlantic Ocean coasts.

Timing: The timing of the sand placement activities could directly and indirectly impact nesting females, their nests, and hatchling sea turtles when conducted between March 1 and November 30.

Nature of the effect: The effects of the sand placement activities may change the nesting behavior of adult female sea turtles, diminish nesting success, and reduce hatching and emerging success. Sand placement can also change the incubation conditions within the nest. Any decrease in productivity and/or survival rates would contribute to the vulnerability of the sea turtles nesting in Florida.

Duration: The sand placement activity may be a one-time activity or a multiple-year activity and each sand placement project may take between three and seven months to complete. Thus, the direct effects would be expected to be short-term in duration. Indirect effects from the activity may continue to impact nesting and hatchling sea turtles and sea turtle nests in subsequent nesting seasons.

Disturbance frequency: Sea turtle populations in Florida may experience decreased nesting success, hatching success, and hatchling emergence success that could result from the sand placement activities being conducted at night during one nesting season, or during the earlier or later parts of two nesting seasons. Disturbance due to alterations of the incubation substrate and beach profile could persist for several years, depending on continued presence of placed sand in the nesting beach.

Disturbance intensity and severity: Depending on the amount (including post-disaster work) and the timing of the sand placement activities during sea turtle nesting season, effects to the sea turtle populations of Florida, and potentially the U.S. populations, could be important.

Analyses for effects of the action

Beneficial Effects

The placement of sand on a beach with reduced dry foredune habitat may increase sea turtle nesting habitat if the placed sand is highly compatible (*i.e.*, grain size, shape, color, etc.) with naturally occurring beach sediments in the area, and compaction and escarpment remediation measures are incorporated into the project. In addition, a nourished beach that is designed and constructed to mimic a natural beach system may benefit sea turtles more than an eroding beach it replaces.

Adverse Effects

Through many years of research, it has been documented that beach nourishment can have adverse effects on nesting female sea turtles and hatchlings and sea turtle nests. Results of monitoring sea turtle nesting and beach nourishment activities provide additional information on how sea turtles respond to nourished beaches, minimization measures, and other factors that influence nesting, hatching, and emerging success. Science-based information on sea turtle nesting biology and review of empirical data on beach nourishment monitoring is used to manage beach nourishment activities to eliminate or reduce impacts to nesting and hatchling sea turtles and sea turtle nests so that beach nourishment can be accomplished. Measures can be incorporated pre-, during, and post-construction to reduce impacts to sea turtles. Because of the long history of sea turtle monitoring in Florida, it is not necessary to require studies on each project beach to document those effects each time.

Direct Effects

Direct effects are those direct or immediate effects of a project on the species or its habitat. Placement of sand on a beach in and of itself may not provide suitable nesting habitat for sea turtles. Although sand placement activities may increase the potential nesting area, significant negative impacts to sea turtles may result if protective measures are not incorporated during project construction. Sand placement activities during the nesting season, particularly on or near high density nesting beaches, can cause increased loss of eggs and hatchlings and, along with other mortality sources, may significantly impact the long-term survival of the species. For instance, projects conducted during the nesting and hatching season could result in the loss of sea turtles through disruption of adult nesting activity and by burial or crushing of nests or hatchlings. While a nest monitoring and egg relocation program would reduce these impacts, nests may be inadvertently missed (when crawls are obscured by rainfall, wind, or tides) or misidentified as false crawls during daily patrols. In addition, nests may be destroyed by operations at night prior to beach patrols being performed. Even under the best of conditions, about seven percent of the nests can be misidentified as false crawls by experienced sea turtle nest surveyors (Schroeder 1994).

Nest relocation

Besides the potential for missing nests during surveys and a nest relocation program, there is a potential for eggs to be damaged by nest movement or relocation, particularly if eggs are not relocated within 12 hours of deposition (Limpus *et al.* 1979). Nest relocation can have adverse impacts on incubation temperature (and hence sex ratios), gas exchange parameters, hydric environment of nests, hatching success, and hatchling emergence (Limpus *et al.* 1979, Ackerman 1980, Parmenter 1980, Spotila *et al.* 1983, McGehee 1990). Relocating nests into sands deficient in oxygen or moisture can result in mortality, morbidity, and reduced behavioral competence of hatchlings. Water availability is known to influence the incubation environment of the embryos and hatchlings of turtles with flexible-shelled eggs, which has been shown to affect nitrogen excretion (Packard *et al.* 1984), mobilization of calcium (Packard and Packard 1986), mobilization of yolk nutrients (Packard *et al.* 1985), hatchling size (Packard *et al.* 1981, McGehee 1990), energy reserves in the yolk at hatching (Packard *et al.* 1988), and locomotory ability of hatchlings (Miller *et al.* 1987).

In a 1994 Florida study comparing loggerhead hatching and emerging success of relocated nests with nests left in their original location, Moody (1998) found that hatching success was lower in relocated nests at nine of 12 beaches evaluated. In addition, emerging success was lower in relocated nests at 10 of 12 beaches surveyed in 1993 and 1994. Many of the direct effects of beach nourishment may persist over time. These direct effects include increased susceptibility of relocated nests to catastrophic events, the consequences of potential increased beachfront development, changes in the physical characteristics of the beach, the formation of escarpments, repair/replacement of groins and jetties and future sand migration.

Equipment

The use of heavy machinery on beaches during a construction project may also have adverse effects on sea turtles. Equipment left on the nesting beach overnight can create barriers to nesting females emerging from the surf and crawling up the beach, causing a higher incidence of false crawls and unnecessary energy expenditure.

The operation of motor vehicles or equipment on the beach to complete the project work at night affects sea turtle nesting by: interrupting or colliding with a female turtle on the beach; headlights disorienting or misorienting emergent hatchlings; vehicles running over nesting females or hatchlings attempting to reach the ocean, and vehicle tracks traversing the beach interfering with hatchlings crawling to the ocean. Apparently, hatchlings become diverted not because they cannot physically climb out of the rut (Hughes and Caine 1994), but because the sides of the track cast a shadow and the hatchlings lose their line of sight to the ocean horizon (Mann 1977). The extended period of travel required to negotiate tire tracks and ruts may increase the susceptibility of hatchlings to dehydration and depredation during migration to the ocean (Hosier *et al*. 1981). Driving directly above or over incubating egg clutches or on the beach can cause sand compaction which may result in adverse impacts on nest site selection, digging behavior, clutch viability, and emergence by hatchlings, decreasing nest success and directly killing preemergent hatchlings (Mann 1977, Nelson and Dickerson 1987, Nelson 1988).

Depending on when the dune project is completed, dune vegetation may have become established in the vicinity of dune restoration sites. The physical changes and loss of plant cover caused by vehicles on vegetated areas or dunes can lead to various degrees of instability and cause dune migration. As vehicles move over the sand, sand is displaced downward, lowering the substrate. Since the vehicles also inhibit plant growth, and open the area to wind erosion, the beach and dunes may become unstable. Vehicular traffic on the beach or through dune breaches or low dunes may cause acceleration of overwash and erosion (Godfrey *et al.* 1978). Driving along the beachfront should be limited to between the low and high tide water lines. To minimize the impacts to the beach and recovering dunes, transport and access to the dune restoration sites should be from the road. However, if the work needs to be conducted from the beach, work areas for the truck transport and bulldozer/bobcat equipment should be designated and marked.

Artificial lighting

Visual cues are the primary sea-finding mechanism for hatchling sea turtles (Mrosovsky and Carr 1967, Mrosovsky and Shettleworth 1968, Dickerson and Nelson 1989, Witherington and Bjorndal 1991). When artificial lighting is present on or near the beach, it can misdirect hatchlings once they emerge from their nests and prevent them from reaching the ocean (Philibosian 1976, Mann 1977, FWC 2007a). In addition, a significant reduction in sea turtle nesting activity has been documented on beaches illuminated with artificial lights (Witherington 1992). Therefore, construction lights along a project beach and on the dredging vessel may deter females from coming ashore to nest, misdirect females trying to return to the surf after a nesting event, and misdirect emergent hatchlings from adjacent non-project beaches.

The newly created wider and flatter beach berm exposes sea turtles and their nests to lights that were less visible, or not visible, from nesting areas before the sand placement activity leading to a higher mortality of hatchlings. Review of over 10 years of empirical information from beach nourishment projects indicates that the number of sea turtles impacted by lights increases on the post-construction berm. A review of selected nourished beaches in Florida (South Brevard, North Brevard, Captiva Island, Ocean Ridge, Boca Raton, Town of Palm Beach, Longboat Key, and Bonita Beach) indicated disorientation reporting increased by approximately 300 percent the first nesting season after project construction and up to 542 percent the second year compared to prenourishment reports (Trindell *et al.* 2005).

Specific examples of increased lighting disorientations after a sand placement project include Brevard and Palm Beach Counties, Florida. A sand placement project in Brevard County, completed in 2002, showed an increase of 130 percent in disorientations in the nourished area. Disorientations on beaches in the County that were not nourished remained constant (Trindell 2007). This same result was also documented in 2003 when another beach in Brevard County was nourished and the disorientations increased by 480 percent (Trindell 2007). Installing appropriate beachfront lighting is the most effective method to decrease the number of disorientations on any developed beach including nourished beaches. A shoreline protection project was constructed at Ocean Ridge in Palm Beach County, Florida, between August 1997 and April 1998. Lighting disorientation events increased after nourishment. In spite of continued aggressive efforts to identify and correct lighting violations in 1998 and 1999, 86 percent of the disorientation reports were in the nourished area in 1998 and 66 percent of the reports were in the nourished area in 1999 (Howard and Davis 1999).

While the effects of artificial lighting have not been specifically studied on each beach that is nourished in Florida, based on the experience of increased artificial lighting disorientations on other Florida beaches, impacts are expected to potentially occur on all nourished beaches statewide.

Changing to sea turtle compatible lighting can be easily accomplished at the local level through voluntary compliance or by adopting appropriate regulations. Of the 27 coastal counties in Florida where sea turtles are known to nest, 21 have passed beachfront lighting ordinances in addition to 58 municipalities (http://myfwc.com/media/418420/seaturtle_lightordmap.pdf). Local governments have realized that adopting a lighting ordinance is the most effective method to address artificial lighting along the beachfront.

Indirect Effects

Indirect effects are those effects that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Effects from the proposed project may continue to affect sea turtle nesting on the project beach and adjacent beaches in future years.

Increased susceptibility to catastrophic events

Nest relocation within a nesting season may concentrate eggs in an area making them more susceptible to catastrophic events. Hatchlings released from concentrated areas also may be subject to greater predation rates from both land and marine predators, because the predators learn where to concentrate their efforts (Glenn 1998, Wyneken *et al.* 1998).

Increased beachfront development

Pilkey and Dixon (1996) stated that beach replenishment frequently leads to more development in greater density within shorefront communities that are then left with a future of further replenishment or more drastic stabilization measures. Dean (1999) also noted that the very existence of a beach nourishment project can encourage more development in coastal areas. Following completion of a beach nourishment project in Miami during 1982, investment in new and updated facilities substantially increased tourism there (National Research Council 1995). Increased building density immediately adjacent to the beach often resulted as much larger buildings that accommodated more beach users replaced older buildings. Overall, shoreline management creates an upward spiral of initial protective measures resulting in more expensive development which leads to the need for more and larger protective measures. Increased shoreline development may adversely affect sea turtle nesting success. Greater development may support larger populations of mammalian predators, such as foxes and raccoons, than undeveloped areas (National Research Council 1990a), and can also result in greater adverse effects due to artificial lighting, as discussed above.

Changes in the physical environment

Beach nourishment may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand (Nelson and Dickerson 1988a). These changes could result in adverse impacts on nest site selection, digging behavior, clutch viability, and hatchling emergence (Nelson and Dickerson 1987, Nelson 1988).

Beach nourishment projects create an elevated, wider, and unnatural flat slope berm. Sea turtles nest closer to the water the first few years after nourishment because of the altered profile (and perhaps unnatural sediment grain size distribution) (Ernest and Martin 1999, Trindell 2005) (**Figure 6**).

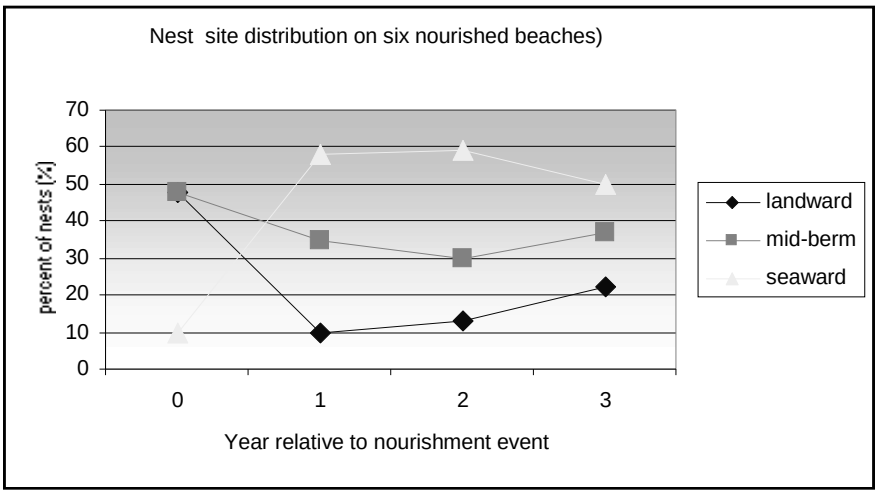

Figure 6. Review of sea turtle nesting site selection following nourishment (Trindell 2005).

Beach compaction and unnatural beach profiles resulting from beach nourishment activities could negatively impact sea turtles regardless of the timing of projects. Very fine sand or the use of heavy machinery can cause sand compaction on nourished beaches (Nelson *et al.* 1987, Nelson and Dickerson 1988a). Significant reductions in nesting success (*i.e.*, false crawls occurred more frequently) have been documented on severely compacted nourished beaches (Fletemeyer 1980, Raymond 1984, Nelson and Dickerson 1987, Nelson *et al.* 1987), and increased false crawls may result in increased physiological stress to nesting females. Sand compaction may increase the length of time required for female sea turtles to excavate nests and cause increased physiological stress to the animals (Nelson and Dickerson 1988b). Nelson and Dickerson (1988c) concluded that, in general, beaches nourished from offshore borrow sites are harder than natural beaches, and while some may soften over time through erosion and accretion of sand, others may remain hard for 10 years or more.

These impacts can be minimized by using suitable sand and by tilling (minimum depth of 36 inches) compacted sand after project completion. The level of compaction of a beach can be assessed by measuring sand compaction using a cone penetrometer (Nelson 1987). Tilling of a nourished beach with a root rake may reduce the sand compaction to levels comparable to unnourished beaches. However, a pilot study by Nelson and Dickerson (1988c) showed that a tilled nourished beach will remain uncompacted for up to one year. Multi-year beach compaction monitoring and, if necessary, tilling would ensure that project impacts on sea turtles are minimized.

A change in sediment color on a beach could change the natural incubation temperatures of nests in an area, which, in turn, could alter natural sex ratios. To provide the most suitable sediment for nesting sea turtles, the color of the nourished sediments should resemble the natural beach sand in the area. Natural reworking of sediments and bleaching from exposure to the sun would help to

lighten dark nourishment sediments; however, the timeframe for sediment mixing and bleaching to occur could be critical to a successful sea turtle nesting season.

Escarpment formation

On nourished beaches, steep escarpments may develop along the water line interface as the beach adjusts from an unnatural construction profile to a more natural beach profile (Coastal Engineering Research Center 1984, Nelson *et al.* 1987). These escarpments can hamper or prevent access to nesting sites (Nelson and Blihovde 1998). Researchers have shown that female sea turtles coming ashore to nest can be discouraged by the formation of an escarpment, leading to situations where they choose marginal or unsuitable nesting areas to deposit eggs (e.g., in front of the escarpments, which often results in failure of nests due to prolonged tidal inundation). This impact can be minimized by leveling any escarpments prior to the nesting season.

Construction of groins and jetties

Groins and jetties are shore-perpendicular structures that are designed to trap sand that would otherwise be transported by longshore currents. Jetties are defined as structures placed to keep sand from flowing into channels (Kaufman and Pilkey 1979, Komar 1983). In preventing normal sand transport, these structures accrete updrift beaches while causing accelerated beach erosion downdrift of the structures (Komar 1983, Pilkey *et al.* 1984, National Research Council 1987), a process that results in degradation of sea turtle nesting habitat. As sand fills the area updrift from the groin or jetty, some littoral drift and sand deposition on adjacent downdrift beaches may occur due to spillover. However, these groins and jetties often force the stream of sand into deeper offshore water where it is lost from the system (Kaufman and Pilkey 1979). The greatest changes in beach profile near groins and jetties are observed close to the structures, but effects eventually may extend many miles along the coast (Komar 1983).

Jetties are placed at ocean inlets to keep transported sand from closing the inlet channel. Together, jetties and inlets are known to have profound effects on adjacent beaches (Kaufman and Pilkey 1979). Witherington *et al.* (2005) found a significant negative relationship between loggerhead nesting density and distance from the nearest of 17 ocean inlets on the Atlantic coast of Florida. The effect of inlets in lowering nesting density was observed both updrift and downdrift of the inlets, leading researchers to propose that beach instability from both erosion and accretion may discourage loggerhead nesting.

Construction or repair of groins and jetties during the nesting season may result in the destruction of nests, disturbance of females attempting to nest, and disorientation of emerging hatchlings from project lighting. Following construction, the presence of groins and jetties 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.

Escarpments may develop on beaches between groins as the beaches equilibrate to their final profiles. These escarpments are known to prevent females from nesting on the upper beach and can cause them to choose unsuitable nesting areas, such as seaward of an escarpment. These nest sites commonly receive prolonged tidal inundation and erosion, which results in nest failure (Nelson and Blihovde 1998). As groin structures fail and break apart, they spread debris on the beach, which may further impede nesting females from accessing suitable nesting sites and trap both hatchlings and nesting turtles.

Species' response to a proposed action

The following summary illustrates sea turtle responses to and recovery from a nourishment project comprehensively studied by Ernest and Martin (1999). A significantly larger proportion of turtles emerging on nourished beaches abandoned their nesting attempts than turtles emerging on natural or prenourished beaches. This reduction in nesting success is most pronounced during the first year following project construction and is most likely the result of changes in physical beach characteristics associated with the nourishment project (e.g., beach profile, sediment grain size, beach compaction, frequency and extent of escarpments). During the first post-construction year, the time required for turtles to excavate an egg chamber on untilled, hard-packed sands increases significantly relative to natural conditions. However, tilling (minimum depth of 36 inches) is effective in reducing sediment compaction to levels that did not significantly prolong digging times. As natural processes reduced compaction levels on nourished beaches during the second post-construction year, digging times returned to natural levels (Ernest and Martin 1999).

During the first post-construction year, nests on nourished beaches are deposited significantly seaward of the toe of the dune and significantly landward of the tide line than nests on natural beaches. More nests are washed out on the wide, flat beaches of the nourished treatments than on the narrower steeply sloped natural beaches. This phenomenon may persist through the second post-construction year monitoring and result from the placement of nests near the seaward edge of the beach berm where dramatic profile changes, caused by erosion and scarping, occur as the beach equilibrates to a more natural contour.

The principal effect of beach nourishment on sea turtle reproduction is a reduction in nesting success during the first year following project construction. Although most studies have attributed this phenomenon to an increase in beach compaction and escarpment formation, Ernest and Martin (1999) indicated that changes in beach profile may be more important. Regardless, as a nourished beach is reworked by natural processes in subsequent years and adjusts from an unnatural construction profile to a natural beach profile, beach compaction and the frequency of escarpment formation decline, and nesting and nesting success return to levels found on natural beaches.

BEACH MICE

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/critical habitat description

The formal taxonomic classification of beach mouse subspecies follows the geographic variation in pelage and skeletal measurements documented by Bowen (1968). This peer-reviewed, published classification was also accepted by Hall (1981). Since the listing of the beach mice, further research concerning the taxonomic validity of the subspecific classification of beach mice has been initiated and/or conducted. Preliminary results from these studies support the separation of beach mice from inland forms, and support the currently accepted taxonomy (Bowen 1968) (*i.e.*, each beach mouse group represents a unique and isolated subspecies). Recent research using mitochondrial DNA data illustrates that Gulf Coast beach mouse subspecies form a well-supported and independent evolutionary cluster within the global population of the mainland or inland old field mice (Van Zant and Wooten 2006).

The old-field mouse (*Peromyscus polionotus)* is different in form and structure as well as being genetically diverse throughout its range in the southeastern U.S. (Bowen 1968, Selander *et al.* 1971). Currently there are 16 recognized subspecies of old-field mice (Hall 1981). Eight subspecies occupy coastal rather than inland habitat and are referred to as beach mice (Bowen 1968). Two existing subspecies of beach mouse and one extinct subspecies are known from the Atlantic coast of Florida and five subspecies live along the Gulf coast of Alabama and northwestern Florida.

Rivers and various inlets bisect the Gulf and Atlantic beaches and naturally isolate habitats in which the beach mice live. The outer coastline and barrier islands are typically separated from the mainland by lagoons, swamps, tidal marshes, and flatwood areas with hardpan soil conditions. However, these dispersal barriers are not absolute; sections of sand peninsulas may from time to time be cut off by storms and shift over time due to wind and current action. Human development has also fragmented the ranges of the subspecies. As a consequence of coastal development and the dynamic nature of the coastal environment; beach mouse populations are generally comprised of various disjunct populations.

<u>Atlantic Coast beach mice</u>

The southeastern beach mouse (SEBM) was listed as a threatened species under the Act in 1989 (54 *FR* 20598). Critical habitat was not designated for this subspecies. SEBM is also listed as threatened by the State of Florida. The original distribution of the SEBM was from Ponce Inlet, Volusia County, southward to Hollywood, Broward County, and possibly as far south as Miami in Miami-Dade County. It is currently restricted to Volusia, Brevard, and Indian River Counties. Formerly, this subspecies occurred along about 175 miles of Florida's southeast coast; it now occupies about 50 miles, a significant reduction in range (**Figure 7**).

This subspecies uses both beach dunes and inland areas of scrub vegetation. The most seaward vegetation typically consists of sea oats (*Uniola paniculata*), bitter panicgrass (*Panicum amarum*), railroad vine (*Ipomoea pes-caprae*), beach morning-glory (*Ipomoea stolonifera*), and camphorweed (*Heterotheca subaxillaris*). Further landward, vegetation is more diverse, including beach tea (*Croton punctatus*), pricklypear (*Opuntia humifusa*), saw palmetto (*Serenoa repens)*, wax myrtle (*Myrica cerifera)*, and sea grape (*Coccoloba uvifera*).

Anastasia Island beach mice

The Anastasia Island beach mouse (AIBM), was listed as endangered under the Act in 1989 (54 *FR* 20598). Critical habitat was not designated for the subspecies. AIBM is also listed as an endangered species by the State of Florida. The distribution of the AIBM has declined significantly, particularly in the northern part of its range. AIBM was historically known from the vicinity of the Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida (Frank and Humphrey 1996). Included in their range, AIBM populations are found along 14.5 miles of Anastasia Island, mainly on 3.5 miles at Anastasia State Park (ASP) and one mile at Fort Matanzas National Monument (FMNM). AIBM have been found at low densities in dunes on the remainder of the island. Beach mice have also been located along sections of the 4.2 miles of dune habitat at Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR)-Guana River. Anastasia Island is separated from the mainland of Florida to the west by extensive salt marshes and the Mantazas River, to the north by the St. Augustine Inlet, and to the south by the Matanzas Inlet which are both maintained and open. This has restricted the range of AIBM to 14.5 mile length of Anastasia Island and sections of GTMNERR-Guana River (**Figure 8**).

In 1992 to 1993, the Service funded the reintroduction of AIBM to GTMNERR in St. Johns County where historical habitat for the subspecies existed (Service 1993). GMTNERR-Guana River portion of the Reserve (4.0 miles of undeveloped beach) is nine miles north of the existing population of beach mice at ASP. Fifty-five mice (27 females and 28 males) were trapped at FMNM and ASP from September 24, to November 12, 1992, and placed in soft-release enclosures at the state park on September 27, and November 12, 1992. During follow-up trapping conducted in February 1993, beach mice occupied the entire 4.2-mile length of the park; 34 were captured and it was estimated that the population totaled 220. Quarterly trapping has been conducted since the reintroduction and mice have not been captured since September 2006. This may be a result of habitat loss alteration from storms or habitat conditions. Sneckenberger 2001 indicates that the scrub habitat found in the tertiary dunes provides a more stable level of food resources, which becomes crucial when food is scarce or nonexistent in the primary and secondary dunes. This suggests that access to primary, secondary, and scrub dune habitat is essential to beach mice at the individual level, which may be an issue for this population as A1A Highway separates/bisects the primary dune from the secondary dunes and scrub dune habitats.

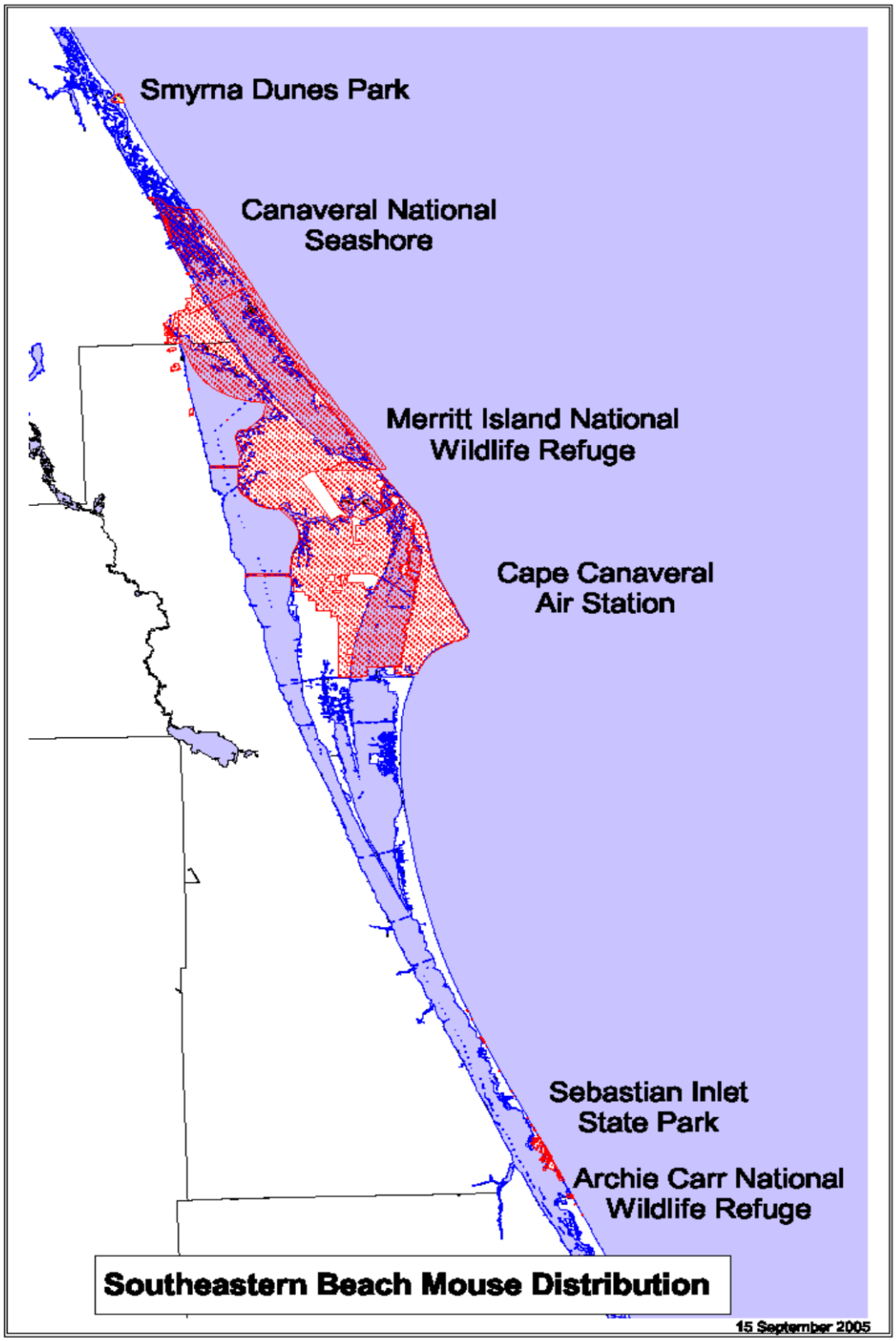

Figure 7. The distribution of the southeastern beach mouse.

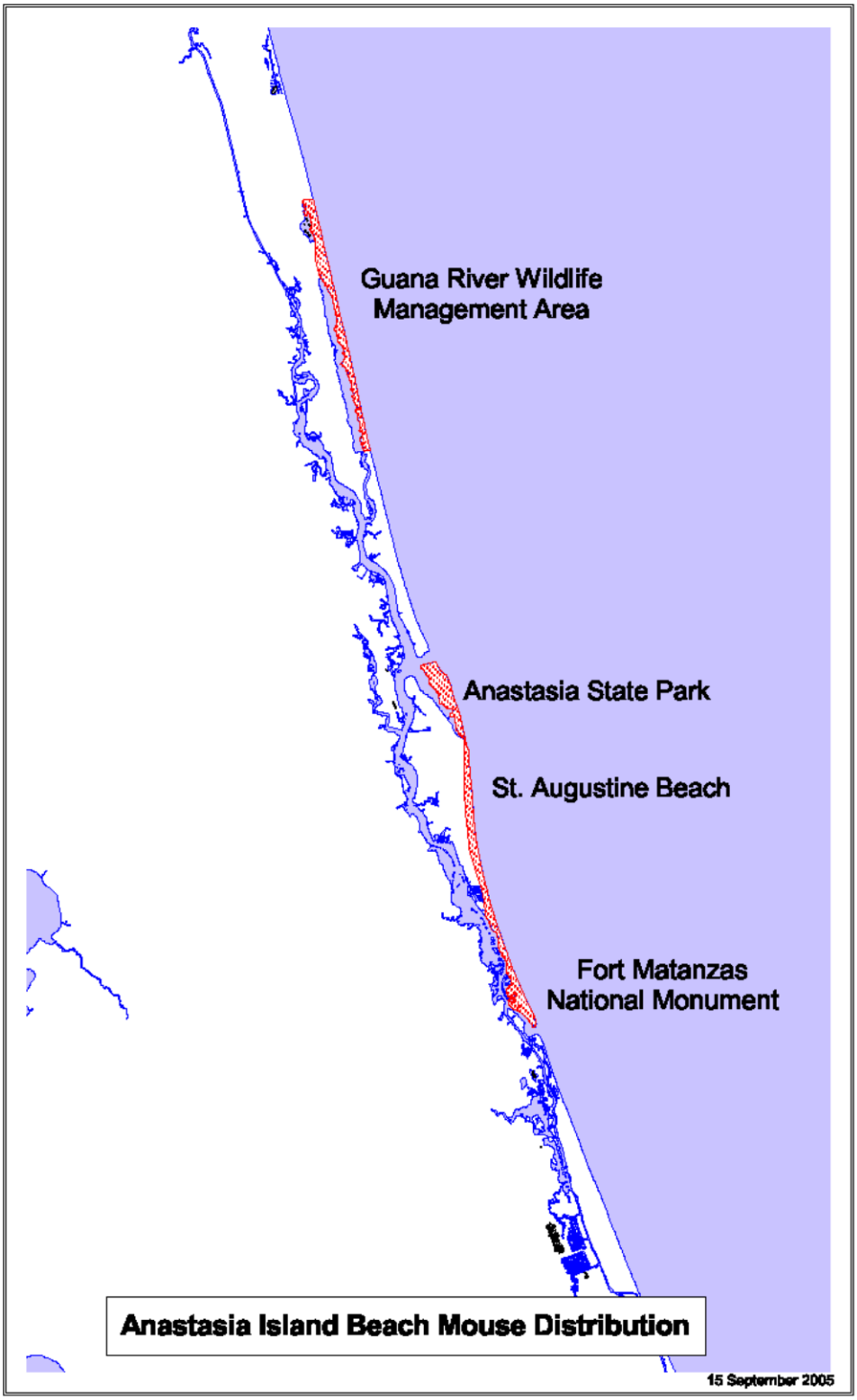

Figure 8. The distribution of the Anastasia Island beach mouse.

Gulf Coast Beach Mice

The CBM and the PKBM were listed with the Alabama beach mouse (ABM) (*Peromyscus polionotus ammobates*), as endangered species under the Act in 1985 (50 *FR* 23872). The SABM was listed under the Act in 1998 (63 *FR* 70053). CBM, SABM, and PKBM are also listed as endangered species by the State of Florida (FWC 2010). Critical habitat was designated for the CBM, and PKBM at the time of listing; however, critical habitat was revised in 2006 (71 *FR* 60238). Critical habitat was also designated for the SABM in 2006 (71 *FR* 60238).

The historical range of the CBM extended 53 miles between Destin Pass, Choctawhatchee Bay in Okaloosa County and East Pass in St. Andrew Bay, Bay County, Florida. PKBM historically ranged along the entire length of Perdido Key for 16.9 miles between Perdido Bay, Alabama (Perdido Pass) and Pensacola Bay, Florida (Bowen 1968). The historical range of the SABM extended 38 miles between Money Bayou in Gulf County, and Crooked Island at the East Pass of St. Andrews Bay, Bay County, Florida including the St. Joseph peninsula and the coastal mainland adjacent to St. Joseph Bay, Florida (**Figure 9**).

Critical habitat

Since the listing of the PKBM and CBM in 1985, research has refined previous knowledge of Gulf Coast beach mouse habitat requirements and factors that influence their use of habitat. Based on the current knowledge of the life history, biology, and ecology of the subspecies and the requirements of the habitat to sustain the essential life history functions of the subspecies, the primary constituent elements (PCE) of critical habitat for Gulf Coast beach mice consist of:

1. A contiguous mosaic of primary, secondary scrub vegetation, and dune structure, with a balanced level of competition and predation and few or no competitive or predaceous nonnative species present, that collectively provide foraging opportunities, cover, and burrow sites;

2. Primary and secondary dunes, generally dominated by sea oats that despite occasional temporary impacts and reconfiguration from tropical storms and hurricanes provide abundant food resources, burrow sites, and protection from predators;

3. Scrub dunes, generally dominated by scrub oaks, that provide food resources and burrow sites, and provide elevated refugia during and after intense flooding due to rainfall and/or hurricane induced storm surge;.

4. Functional, unobstructed habitat connections that facilitate genetic exchange, dispersal, natural exploratory movements, and recolonization of locally extirpated areas; and

5. A natural light regime within the coastal dune ecosystem, compatible with the nocturnal activity of beach mice, necessary for normal behavior, growth and viability of all life stages.

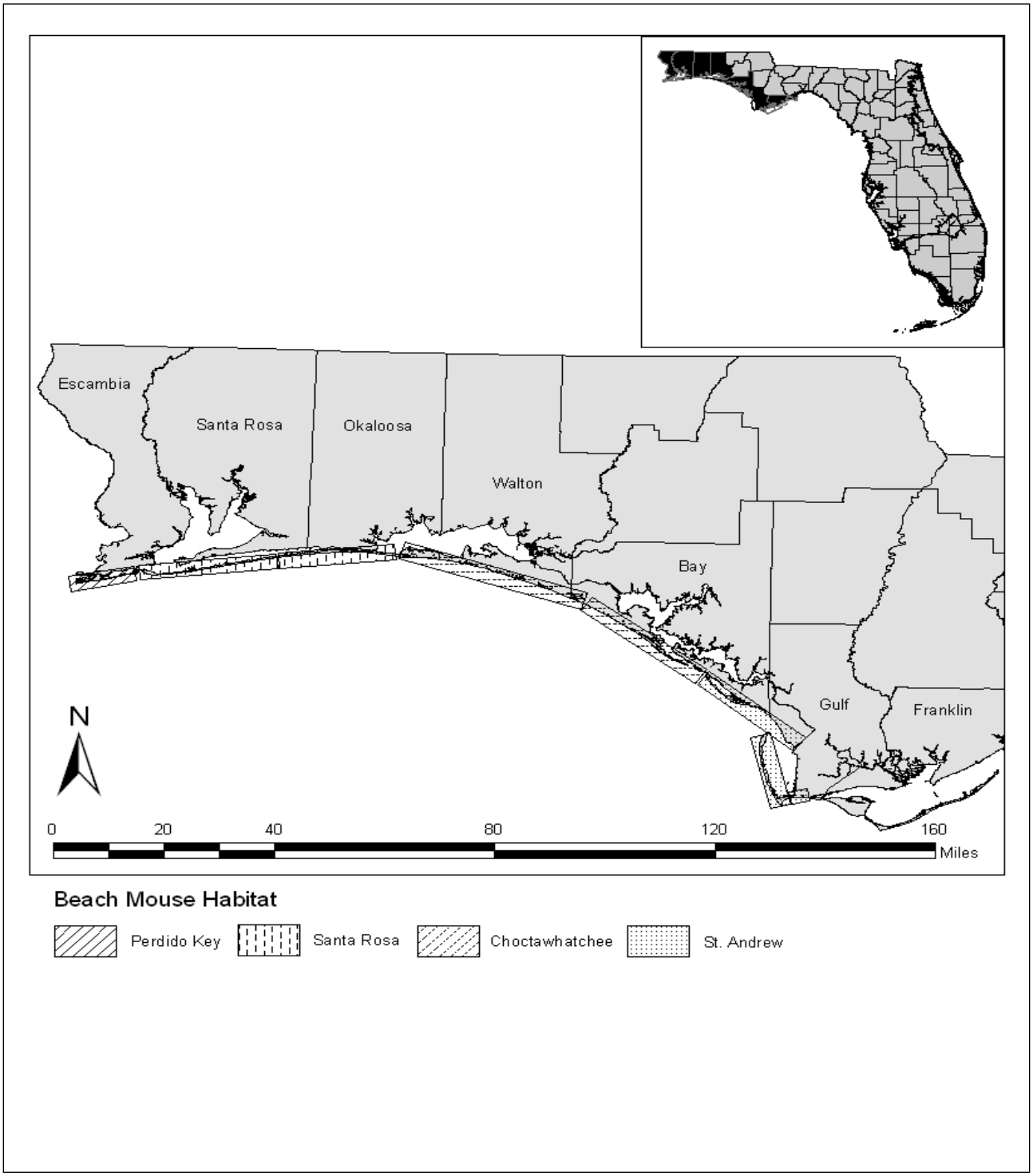

Figure 9. Historical range of Gulf Coast beach mouse subspecies.

Thirteen coastal dune areas (critical habitat units) in southern Alabama and the panhandle of Florida have been determined to be essential to the conservation of PKBM, CBM, and SABM and are designated as critical habitat (**Figures 10 through 12**). These 13 units include five units for PKBM, five units for CBM, and three units for the SABM. These units total 6,194 acres of coastal dunes, and include 1,300 acres for the PKBM in Escambia County, Florida and Baldwin County, Alabama (**Table 10**); 2,404 acres for the CBM, in Okaloosa, Walton, and Bay Counties, Florida (**Table 11**); and 2,490 acres for the SABM in Bay and Gulf Counties, Florida (**Table 12**).

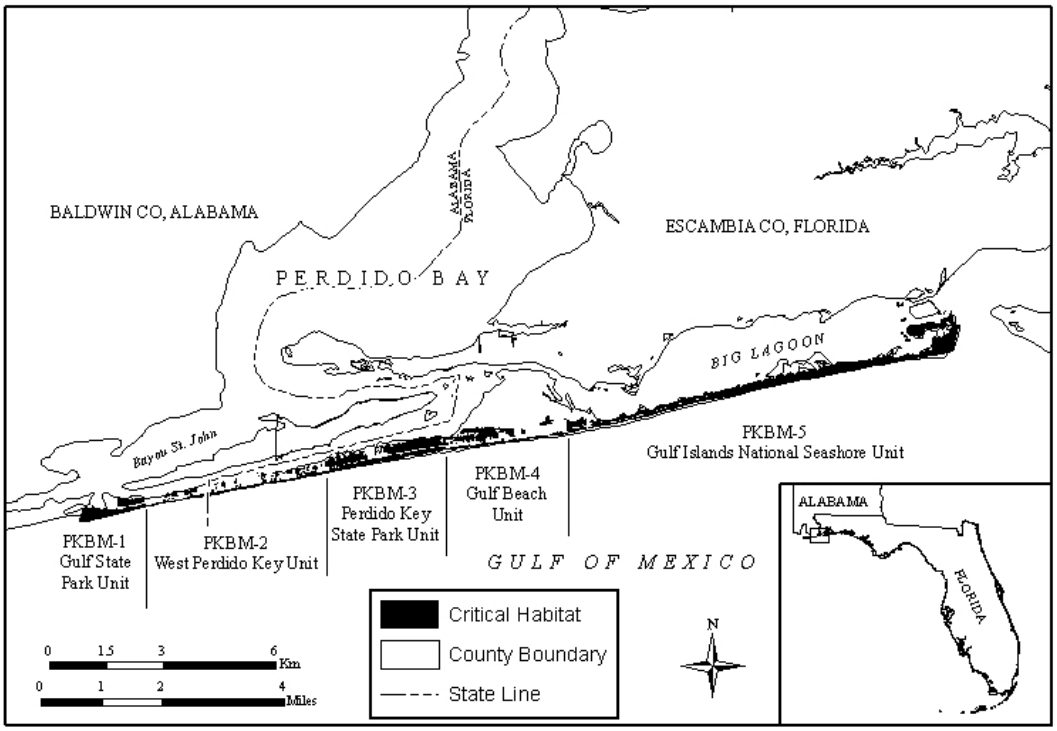

Figure 10. Critical habitat units designated for the Perdido Key beach mouse.

Table 11. Critical habitat units designated for the Perdido Key beach mouse.

Perdido Key Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. Gulf State Park Unit	0	115	0	115
2. West Perdido Key Unit	0	0	147	147
3. Perdido Key State Park Unit	0	238	0	238
4. Gulf Beach Unit	0	0	162	162
5. Gulf Islands National Seashore Unit	638	0	0	638
Total	638	353	309	1300

Gulf State Park

The Gulf State Park Unit (PKBM-1) consists of 115 acres of PKBM habitat in southern Baldwin County, Alabama, on the westernmost region of Perdido Key. PKBM were known to inhabit this unit during surveys in 1979 and 1982, and by 1986 this was the only known existing population of the subspecies (Humphrey and Barbour 1981; Holler *et al*. 1989). This population of less than 30 individuals was the donor for the reestablishment of PKBM into Gulf Islands National Seashore in 1986. This project ultimately saved Perdido Key beach mice from extinction as the population at Gulf State Park was considered extirpated in 1998 due to tropical storms and predators (Moyers *et al*. 1999). In 2010, captive bred mice are released at Gulf State Park. This reintroduction was deemed a success and the population has continued to increase. The track tube monitoring was established at GSP in 2010, which began with only a 9 percent occurrence rate and the end of the year yielded an 83 percent occurrence rate, 2011 started with an 85 percent occurrence rate and continued to increase slightly until September 2011 which yielded a 73 percent occurrence rate in the tracking tubes (FWC 2012a and FWC 2014b). A 3-day trapping effort the week of May 7, 2012, continued to find PKBM distributed throughout habitat south of Highway 182. Two reproductively-active male PKBM were found north of Highway 182 (J. Gore pers. comm. 2012). The release appears to have been a success and PKBM are occupying all three public lands for the first time since being listed as endangered. Recent track tube data for 2013 shows an average of 93 percent occurrence of PKBM in the tracking tubes at GSP (FWC 2013a and FWC 2013b).

Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. Because scrub habitat is separated from the frontal dunes by a highway in some areas, the population inhabiting this unit can be especially vulnerable to hurricane impacts, and therefore further linkage to scrub habitat and/or habitat management would improve connectivity. This unit is managed by the Alabama Department of Conservation and Natural Resources and provides primary constituent elements (PCEs) 2, 3, 4, and 5. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit, which contains interior scrub habitat as well as primary and secondary dunes, serves as a re-designation and expansion of the original critical habitat designation (50 *FR* 23872). The original designation did not include scrub habitat which we now know is necessary for the long-term persistence of beach mouse populations.

The West Perdido Key Unit (PKBM-2) consists of 114 acres in southern Escambia County, Florida, and 33 acres in southern Baldwin County, Alabama. This unit encompasses essential features of beach mouse habitat from approximately 1.0 mile west of where the Alabama-Florida State line bisects Perdido Key east to 2.0 miles east of the State line and areas from the MHWL north to the seaward extent of human development or maritime forest. This unit consists of private lands and ultimately includes essential features of beach mouse habitat between Perdido Key State Park (Unit 3) and GSP (Unit 1). Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat and provides PCEs 2, 3, and 4.

Habitat fragmentation and other threats specific to this unit are mainly due to development. Consequently, threats to this unit that may require special management considerations include habitat fragmentation and habitat loss, artificial lighting, presence of feral cats as well as other predators at unnatural levels, excessive foot traffic and soil compaction, and damage to dune vegetation and structure. This area was not known to be occupied at the time of listing. While no trapping has been conducted on these private lands to determine presence, sign of beach mouse presence was confirmed by the Service in 2013 and 2014 through observations of beach mouse burrows and tracks, and this unit is contiguous with two occupied units. Therefore, we have determined this unit to be currently occupied. This unit provides essential connectivity between two core population areas (PKBM-3 and PKBM-1), provides habitat for expansion, natural movements, and re-colonization, and is therefore essential to the conservation of the species. Specifically, this unit may have historically provided for the re-colonization of GSP (PKBM-1) and/or may facilitate similar re-colonization in the future as the habitat recovers from recent hurricane events.

The Perdido Key State Park Unit (PKBM-3) consists of 238 acres in southern Escambia County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of PKSP from approximately 2.0 miles east of the Alabama–Florida State line to 4.0 mile east of the State line and the area from the MHWL north to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. This unit provides PCEs 2, 3, 4, and 5 and is essential to the conservation of the species. Improving and/or restoring habitat connections would increase habitat quality and provide more functional connectivity for dispersal, exploratory movements, and population expansion. This unit is managed by the Florida Park Service. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit serves as a redesignation and expansion of a zone included in the initial critical habitat designation (50 *FR* 23872); however, the zone did not include scrub habitat, which we now know is necessary for the long-term persistence of beach mouse populations.

Trapping efforts in this area were limited in the past. In 2000, a successful relocation program reestablished mice at PKSP. In 2004 and 2005, hurricane/tropical storm damage to the habitat at PKSP dropped PKBM detection to only 10 percent of the available habitat, indicating low densities (Loggins 2007). In 2005, the FWC started monitoring the presence of PKBM on public lands by tracking tubes. The Service and other land managers have relied on this data as a means of tracking the presence of PKBM in GSP, PKSP, and GINS. Tracking data from June 2006 indicated that about 25 percent of the available habitat was occupied at PKSP (FWC 2007). Trapping at PKSP and GINS in March 2007 was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (FWC 2007). Trapping conducted in April of 2008 found no mice on PKSP (J. Himes pers. comm. 2008). According to 2009 tracking data, there were no mice occurrences at PKSP until May 2009, then only sporadic occurrences until November 2009 as the occurrence data started to show a slow but steady increase (FWC 2014b). Tracking data from 2010 showed a dramatic increase in PKBM

occurrences within PKSP with 20 percent occurrence at the beginning of the year, and 84 percent occurrence at the end of 2010 (FWC 2010c). Trapping in 2010 on PKSP captured 11 individual beach mice (11 total captures) in February and 36 individuals (106 total captures) in May. At that time, information was insufficient to accurately estimate population size. These captures represent the minimum number of mice in the park for those months. Trapping at GINS and PKSP in spring 2010 generally confirmed the population was increasing with PKBM widely distributed at both public lands.

The number of track tubes visited by mice has increased over the past several years and recent years indicate almost all track tubes contain PKBM tracks. This is likely due to the fact that the storm-impacted coastal habitats have basically recovered and development and predator pressures have decreased. Data from 2011 showed that 96 percent (81 total traps) of track tubes registered beach mouse tracks, indicating that mice were becoming widespread throughout PKSP (J. Gore pers. comm. 2011, FWC 2012a, and FWC 2014b). The 2012 track tube surveys yielded 99 percent of track tubes with beach mouse tracks at PKSP (D. Greene pers. comm. 2012 and FWC 2012a, FWC 2012b, and FWC 2012c). During 2013, the track tube data indicates 97 percent of track tubes contained PKBM tracks (FWC 2013a and FWC 2013b).

There were effects to the Unit resulting from the overwash and inundation by storm surge that occurred several times during the 2004 and 2005 storm seasons. Blow outs occurred on the west and east portions of the PKSP. Two sections of the Hwy 292 were washed out. Park facilities were destroyed. Dune vegetation was significantly impacted, but has been restored passively and actively. Park facilities have been reconstructed in accordance with protected species guidelines.

The Gulf Beach Unit (PKBM-4) consists of 162 acres in southern Escambia County, Florida. This unit includes essential features of beach mouse habitat between GINS and Perdido Key State Park from approximately 4.0 miles east of the Alabama–Florida State line to 6.0 miles east of the State line and areas from the MHWL north to the seaward extent of human development or maritime forest. This unit consists of private lands. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat. Habitat fragmentation and other threats specific to this unit are mainly due to development. Consequently, threats to this unit that may require special management considerations include habitat fragmentation and habitat loss, artificial lighting, presence of feral cats as well as other predators at unnatural levels, excessive foot traffic and soil compaction, and damage to dune vegetation and structure. While not known to be occupied at the time of listing, a single beach mouse was trapped within the unit as a result of trapping efforts in 2004 (Service 2004). There have been no data collected within this unit to confirm either absence or presence since this single trapping event in 2004. However, Service personnel have observed burrows and tracks indicating PKBM are occupying the area. This unit provides PCEs 2, 3, and 4 and is essential to the conservation of the species. This unit includes high-elevation scrub habitat and serves as a refuge during storm events and as an important repopulation source if storms extirpate or greatly reduce local populations. This unit currently provides essential connectivity between two core populations GINS (PKBM-5) and PKSP (PKBM-3) and provides essential habitat for expansion, natural movements, and recolonization (PCE 4).

The Gulf Islands National Seashore Unit (Unit 5) consists of 638 acres in southern Escambia County, Florida, on the easternmost region of Perdido Key. This unit encompasses essential features of beach mouse habitat within the boundary of Gulf Islands National Seashore–Perdido Key Area (also referred to as Johnson Beach) from approximately 6.0 miles east of the Alabama–Florida State line to the eastern tip of Perdido Key at Pensacola Bay and the area from the MHWL north to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists mainly of primary and secondary dune habitat, but provides the longest contiguous expanse of frontal dune habitat within the historic range of the PKBM. PBKM were known to inhabit this unit in 1979. No beach mice were captured during surveys in 1982 and 1986 (Humphrey and Barbour 1981; Holler *et al*. 1989). However the population was impacted by Hurricane Frederic (1979), and considered unoccupied at the time of listing. However, no beach mice were captured during surveys in 1982 and 1986 (Humphrey and Barbour 1981; Holler *et al*. 1989). In 1986, PKBM were re-established to GINS as part of the State of Florida and Service recovery efforts. In 2000 and 2001, PKBM captured from this site served as donors to re-establish beach mice at PKSP. Due to damage from storm surge during the 2004 and 2005 storm seasons, PKBM are detected on approximately 30 percent of the beach mouse habitat available (Loggins 2007). Tracking data from June 2006 indicated that about 32 percent of the available habitat was occupied at GINS (FWC 2007). Trapping at PKSP and GINS in March 2007 was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (FWC 2007). Trapping conducted in April of 2008 was more encouraging with the capture of 35 mice at GINS (S. Sneckenberger pers. comm. 2008). Through 2008-2010 the population continues to expand from GINS to PKSP and beyond. This is the first natural recolonization of a park without the need for a translocation. From 2010 to 2013, the track tube occurrences have averaged 84 percent, 94 percent, 95 percent, and 94 percent respectively (FWC 2014b, FWC 2012a, FWC 2012b, FWC 2012c, FWC 2013a, and FWC 2013b).

PKBM-5, in its entirety, possesses all five PCEs and is essential to the conservation of the species. However, most of this unit consists of frontal dunes, making the population inhabiting this unit particularly threatened by storm events. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, and/or a decrease in habitat quality. This unit is managed by the National Park Service–Gulf Islands National Seashore. This unit was included in the initial critical habitat designation (50 *FR* 23872) as well as the 2006 revision (71 *FR* 60238). The majority of this unit was overwashed and inundated by storm surge several times during the 2004 and 2005 storm seasons. Park facilities were destroyed and most of the Park road was destroyed. Dune vegetation was washed away or covered with sand. Habitat has since recovered and was comprised of natural and human facilitated dune restoration by GINS staff. Park structures were reconstructed landward of their former locations and in accordance with protected species guidelines.

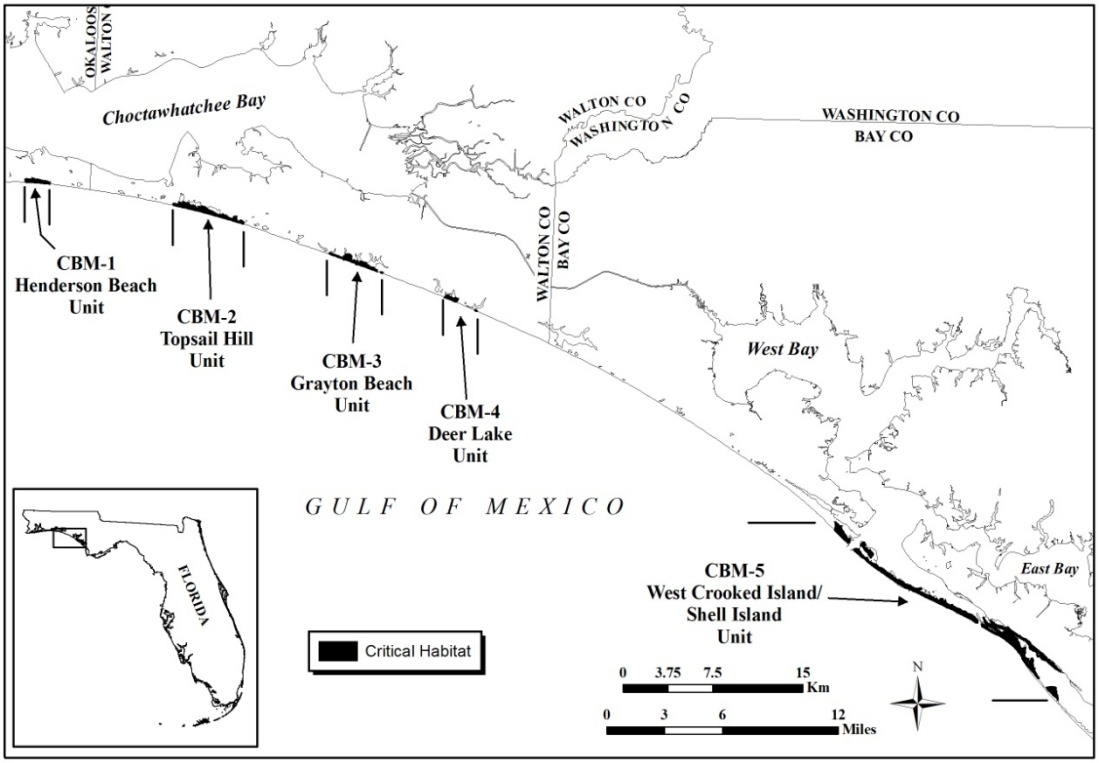

Figure 11. Critical habitat units designated for the Choctawhatchee beach mouse.

Table 12. Critical habitat units designated for the Choctawhatchee beach mouse.

Choctawhatchee Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. Henderson Beach Unit	0	96	0	96
2. Topsail Hill Unit	0	277	31	308
3. Grayton Beach Unit	0	162	17	179
4. Deer Lake Unit	0	40	9	49
5. W. Crooked Island/Shell Island Unit	1333	408	30	1771
Total	1333	982	87	2404

The Henderson Beach unit (CBM–1) consists of 96 acres in Okaloosa County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Henderson Beach State Park from 0.5 miles east of the intersection of Highway 98 and Scenic Highway 98 to 0.25 miles west of Matthew Boulevard and the area from the MHWL north to the seaward extent of the

maritime forest. This westernmost unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3). This unit is within the historical range of the subspecies; however, it was not known to be occupied at the time of listing and current occupancy is unknown because no recent efforts have been made to document beach mouse presence or absence. Because this unit includes protected, high-elevation scrub habitat, it may serve as a refuge during storm events and as an important source population if storms extirpate or greatly reduce local populations or populations to the east.

This unit is managed by the Florida Park Service and is essential to the conservation of the species. Threats specific to this unit that may require special management considerations include habitat fragmentation, Park development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The Topsail Hill Unit (CBM–2) consists of 308 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Topsail Hill Preserve State Park, as well as adjacent private lands from 0.1 miles east of the Gulf Pines subdivision to 0.6 miles west of the Oyster Lake outlet and the area from the MHWL north to the seaward extent of human development or maritime forest. This unit provides primary, secondary, and scrub dune habitat and possesses all five PCEs. Its large, contiguous, high-quality habitat allows for natural movements and population expansion. Choctawhatchee beach mice were confirmed present in the unit in 1979 (Humphrey *et al*. 1987), were present at the time of listing, and are still present.

Beach mice have been captured on Stallworth County Park and Stallworth Preserve subdivision, a private development within the unit, and east of the Park (Service 2003a and Yanchis pers comm 2014). The population of Choctawhatchee beach mice inhabiting this unit appears to harbor unique genetic variation and displays a relatively high degree of genetic divergence considering the close proximity of this population to other populations (Wooten and Holler 1999).

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include Park and residential development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the CBM within the area covered under the Habitat Conservation Plan (HCP) for the Stallworth County Preserve (4 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act.

The Grayton Beach Unit (CBM–3) consists of 179 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Grayton Beach State Park, as well as adjacent private lands and inholdings, from 0.3 mi west of the Alligator Lake outlet east to 0.8 miles west of Seagrove Beach and the area from the MHWL north to the seaward

extent of human development or maritime forest. This unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3), habitat connectivity (PCE 4) and is essential to the conservation of the species. This unit also provides a relatively natural light regime (PCE 5). Beach mice were not detected in the unit in 1979 (Holler 1992a); however, they were found to be present in 1995 after Hurricane Opal (Moyers *et al.* 1999). While it seems likely that beach mice were present at the time of listing (and may have been present, but not detected, in 1979), the Service does not have data to confirm this assumption. Therefore, the Service considered this unit to be unoccupied at the time of listing. A program to strengthen and reestablish the population began in 1989 and yielded a persistent population at Grayton Beach State Park. A recent translocation of 43 CBM from Topsail State Park to Grayton Beach State Park in 2011 has proven successful as the 2013 follow-up trapping data indicated 93 new CBM at Grayton Beach State Park. According to 2013 track tube data, there is a 69 percent occurrence of beach mouse presence (average) at Grayton Beach State Park (FWC 2013a and FWC 2013b). Beach mice are also known to currently occupy the private lands immediately east of the park.

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include hurricane impacts that may require dune restoration and revegetation, excessive open, unvegetated habitat due to recreational use or storm impacts that may require revegetation, Park development, artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the Choctawhatchee beach mouse within the area covered under the HCP for the Watercolor development (4 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act.

The Deer Lake Unit (CBM–4) consists of 49 acres in Walton County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of Deer Lake State Park as well as adjacent private lands from approximately one mile east of the Camp Creek Lake inlet west to approximately 0.5 miles west of the inlet of Deer Lake and the area from the MHWL north to the seaward extent of maritime forest or human development. This unit provides primary, secondary, and scrub dune habitat (PCEs 2 and 3), habitat connectivity to adjacent lands (PCE 4), and is essential to the conservation of the species. This unit also provides a relatively natural light regime (PCE 5). Because live-trapping efforts in this area have been limited to incidental trapping, and beach mice were not detected in 1998 (Moyers *et al*. 1999), the Service considered this unit to be unoccupied at the time of listing. CBM were translocated from Topsail Hill Preserve State Park to private lands adjacent to this unit in 2003 and 2005 (Service 2003b, 2005a, 2005b, 2005c, 2005d). Tracking within the adjacent State park lands have indicated expansion of the population into the park. Recent track tube data from 2013 indicates Deer Lake State Park had a 73 percent (average) occurrence rate for monthly CBM presence (FWC 2013a and FWC 2013b).

This unit has portions with different ownership, purposes, and mandates. Threats specific to this unit that may require special management considerations include artificial lighting, presence of

feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Lands containing the features essential to the conservation of the CBM within the area covered under the HCP/Incidental Take Permit (ITP) for Watersound (71 acres) are excluded from critical habitat designation under section 4(b)(2) of the Act (see Application of Section 4(a)(3) and Exclusions Under Section 4(b)(2) of the Act section below). This excluded area is 0.5 miles west of the Camp Creek Lake inlet to 0.5 miles east of the Camp Creek Lake inlet.

The West Crooked Island/ Shell Island Unit (CBM–5) consists of 1,771 acres in Bay County, Florida. This unit encompasses essential features of beach mouse habitat within the boundaries of St. Andrew State Park mainland from 0.1 miles east of Venture Boulevard east to the entrance channel of St. Andrew Sound, Shell Island east of the entrance of St. Andrew Sound east to East Pass, and West Crooked Island southwest of East Bay and east of the entrance channel of St. Andrew Sound, and areas from the MHWL north to the seaward extent of the maritime forest. Shell Island consists of State lands, Tyndall Air Force Base (AFB) lands, and small private inholdings. Choctawhatchee beach mice were known to inhabit the majority of Shell Island in 1987 (Holler 1992b) and were again confirmed present in 1998 (Moyers *et al*. 1999), 2002, and 2003 (Lynn 2003a). Because beach mice inhabited nearly the entire suitable habitat on the island less than two years prior to listing and were reconfirmed after listing, the Service considered this area to be occupied at the time of listing. The West Crooked Island population is the result of a natural expansion of the Shell Island population after the two islands became connected in 1998 and 1999, a result of Hurricanes Opal and Georges (Service 2003b). Shell Island was connected to the mainland prior to the 1930s when a navigation inlet severed the connection on the western end. Beach mice were documented at St. Andrew State Park mainland as late as the 1960s (Bowen 1968), though no records of survey efforts exist again until Humphrey and Barbour (1981) and Meyers (1983) at which time beach mice were not detected. Therefore, it seems likely that this area was not occupied at the time of listing. Current beach mouse population levels at this site are unknown, and live-trapping to document the absence of mice has not been conducted. Similar to the original designation, this Park was designated as critical habitat because it has features essential to the CBM. It is also within the historical range of the mouse. This unit supports the easternmost population of CBM, with the next known population 22 miles to the west.

This unit provides primary, secondary, and scrub dune habitat and possesses all five PCEs. Portions of this unit are managed by the Florida Park Service, while the remaining areas are federally (Tyndall AFB) and privately owned.

Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high residential or recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

Figure 12. Critical habitat units designated for the St. Andrew beach mouse.

Table 13. Critical habitat units designated for the St. Andrew beach mouse.

St. Andrew Beach Mouse Critical Habitat Units	Federal Acres	State Acres	Local and Private Acres	Total Acres
1. East Crooked Island Unit	649	0	177	826
2. Palm Point Unit	0	0	162	162
3. St. Joseph Peninsula Unit	0	1280	222	1502
Total	649	1280	561	2490

The East Crooked Island Unit (SABM–1) consists of 826 acres in Bay County, Florida. This unit encompasses essential features of beach mouse habitat on East Crooked Island from the entrance of St. Andrew Sound to one mile west of Mexico Beach, and the area from the MHWL to the seaward extent of the maritime forest (not including Raffield Peninsula). Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat and possesses all five PCEs. SABM were known to inhabit the unit in 1986 and 1989 (James 1992), though the population was

presumably extirpated after 1989 due to impacts from hurricanes. The East Crooked Island population was reestablished with donors from St. Joseph State Park in 1997. This unit was occupied at the time of listing. Live-trapping in 2002 confirmed occupation of mice (Moyers and Shea 2002, Lynn 2002a, Slaby 2005). Recent track tube data indicates mice are still present in this unit (FWC 2013a and FWC 2013b). This unit maintains connectivity along the island and this unit is essential to provide a donor population following storm events.

The majority of this unit is federally owned (Tyndall AFB), while the remaining habitat is privately owned. Threats specific to this unit that may require special management considerations include artificial lighting, presence of feral cats as well as other predators at unnatural levels, and high recreational and military use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The Palm Point Unit (SABM–2) consists of 162 acres of private lands in Gulf County, Florida. This unit encompasses habitat from Palm Point 1.25 miles northwest of the inlet of the Gulf County Canal to the southeastern boundary of St. Joseph Beach and the area from the MHWL to the seaward extent of the maritime forest. SABM were documented in the area by Bowen (1968) and were considered to have been present in this unit at the time of listing. Since SABM beach mouse habitat is limited to only two other areas, protecting this mainland site located within the species' historical range is needed for the subspecies' long-term persistence. As other viable opportunities are limited or nonexistent, this unit is essential to reduce the threats of stochastic events to this subspecies. Furthermore, as this unit is on the mainland, it is somewhat buffered from the effects of storm events. This area provides frontal and scrub dune habitat (PCEs 2 and 3), but may provide limited connectivity between habitats. Threats specific to this unit that may require special management considerations include habitat fragmentation, habitat loss, artificial lighting, presence of free-roaming cats as well as other predators at unnatural levels, and high residential use that may result in soil compaction, damage to dunes, or other decrease in habitat quality.

The St. Joseph Peninsula Unit (SABM–3) consists of 1,502 acres in Gulf County, Florida. This unit encompasses essential features of beach mouse habitat within the boundary of St. Joseph Peninsula State Park (Park) as well as south of the Park to the peninsula's constriction north of Cape San Blas (also known as the "stumphole" region) and area from the MHWL to the seaward extent of the maritime forest. Beach mouse habitat in this unit consists of primary, secondary, and scrub dune habitat, and provides a relatively contiguous expanse of habitat within the historical range of the SABM. This unit possesses all five PCEs and was occupied at the time of listing. SABM were known to inhabit this unit in 1986 and 1987 (James 1987, 1992, 1995, Gore 1994, Moyers *et al.* 1999, Slaby 2005). In addition, recent trapping and tracking efforts suggest that mice continue to occupy private lands south of the Park (K. Yanchis pers comm., FWS 2012). The Park alone does not provide sufficient habitat to allow for population expansion along the peninsula, which may be necessary for a population anchored by the tip of a historically dynamic peninsula. A continuous presence of beach mice along the peninsula is the species' best defense against local and complete extinctions due to storm events. The population of SABM inhabiting

this unit appears to possess unique genetic variation, and displays greater than expected genetic divergence from other populations (Wooten and Holler 1999).

The Florida Park Service manages portions of this unit, while the remaining area is privately owned. Threats specific to this unit that may require special management considerations include artificial lighting, habitat fragmentation and habitat loss, presence of feral cats as well as other predators at unnatural levels, and high recreational use that may result in soil compaction, damage to dunes, or other decrease in habitat quality. The population inhabiting this unit may also be particularly susceptible to hurricanes due to its location within St. Joseph Bay (the peninsula is a thin barrier peninsula with a north–south orientation).

Life history (All subspecies of beach mice)

Beach mice are differentiated from the inland subspecies by the variety of fur (pelage) patterns on the head, shoulders, and rump. The overall dorsal coloration in coastal subspecies is lighter in color and less extensive than on those of the inland subspecies (Sumner 1926, Bowen 1968). Similarly, beach mouse subspecies can be differentiated from each other by pelage pattern and coloration.

The SEBM averages 5.47 inches in total length (average of 10 individuals = 5.07 inches, with a 2.04-inch tail length (Osgood 1909, Stout 1992). Females are slightly larger than males. These beach mice are slightly darker in appearance than some other subspecies of beach mice, but paler than inland populations of *P. polionotus* (Osgood 1909). SEBM have pale, buffy coloration from the back of their head to their tail, and their underparts are white. The white hairs extend up on their flanks, high on their jaw, and within 0.07 to 0.12 inches of their eyes (Stout 1992). There are no white spots above the eyes as with AIBM (Osgood 1909). Their tail is also buffy above and white below. Juvenile SEBM are more grayish in coloration than adults; otherwise they are similar in appearance (Osgood 1909).

The AIBM averages 5.45 inches in total length (average of 10 individuals); with 2.05 inches mean tail length (James 1992). This subspecies has a very pale, buff-colored head and back with extensive white coloration underneath the sides (Howell 1939). Bowen (1968) noted two distinct rump color pigmentations, one tapered and the other a squared pattern, which extended to the thighs.

The SABM has head and body lengths averaging 2.95 inches, and tail mean lengths averaging 2.05 inches (James 1992). This subspecies has a very pale, buff-colored head and back with extensive white coloration underneath and along the sides (Howell 1939). Bowen (1968) noted two distinct rump color pigmentations, one tapered and the other a squared pattern, which extended to the thighs.

The PKBM is slightly smaller than the other Gulf coast beach mouse subspecies (Bowen 1968). Head and body length ranges from 2.7 to 3.3 inches (Holler 1992b). The pigmentation of PKBM

is gray to gray-brown with the underparts white and coloration on the head is less pronounced. The line between pigmented and unpigmented pelage runs dorsally posterior above the eyes and behind the ears. Pigmentation patterns on the rump are either squared or squared superimposed on a tapered pattern (Bowen 1968). There is no tail stripe.

CBM have head and body lengths ranging from 2.7 to 3.5 inches (Holler 1992a). This beach mouse is distinctly more orange-brown to yellow-brown than the other Gulf coast beach mouse subspecies (Bowen 1968). Pigmentation on the head either extends along the dorsal surface of the nose to the tip, or ends posterior to the eyes leaving the cheeks white. A dorsal tail stripe is either present or absent.

Behavior

Peromyscus polionotus is the only member of the genus that digs an extensive burrow. Beach mice are semifossorial, using their complex burrows as a place to rest during the day and between nightly foraging bouts, escape from predators, have and care for young, and hold limited food caches. Burrows of *P. polionotus* generally consist of an entrance tunnel, nest chamber, and escape tunnel. Burrow entrances are usually placed on the sloping side of a dune at the base of a shrub or clump of grass. The nest chamber is formed at the end of the level portion of the entrance tunnel at a depth of 23.6 to 35.4 inches, and the escape tunnel rises from the nest chamber to within 9.8 inches of the surface (Blair 1951). Nests of beach mice are constructed in the nest chamber of their burrows, a spherical cavity about 1.5 to 2.5 inches in diameter. The nest comprises about one-fourth of the size of the cavity and is composed of sea oat roots, stems, leaves and the chaffy parts of the panicles (Ivey 1949). Beach mice have been found to select burrow sites based on a suite of biotic and abiotic features including dune slope, soil compaction, vegetative cover, and height above sea level (Lynn 2000a, Sneckenberger 2001). A shortage of potential burrow sites is considered to be a possible limiting resource.

Reproduction and Demography

Studies on *Peromyscus* species in peninsular Florida suggest that these species may achieve greater densities and undergo more significant population fluctuations than their temperate relatives, partially because of their extended reproductive season (Bigler and Jenkins 1975). Subtropical beach mice can reproduce throughout the year; however, their peak reproductive activity is generally during late summer, fall, and early winter. Extine (1980) reported peak reproductive activity for SEBM on Merritt Island during August and September, based on external characteristics of the adults. This peak in the timing and intensity of reproductive activity was also correlated to the subsequent peak in the proportion of juveniles in the population in early winter (Extine 1980). Peak breeding season for Gulf Coast beach mice is autumn and winter, declining in spring, and falling to low levels in summer (Rave and Holler 1992, Blair 1951). However, pregnant and lactating beach mice have been observed in all seasons (Moyers *et al.* 1999).

Sex ratios in beach mouse populations are generally 1:1 (Extine 1980, Rave and Holler 1992).

Beach mice are believed to be generally monogamous (Smith 1966, Foltz 1981, Lynn 2000a). While a majority of individuals appear to pair for life, paired males may sire extra litters with unpaired females. Beach mice are considered sexually mature at 55 days of age; however some are capable of breeding earlier (Weston 2007). Gestation averages 28 to 30 days (Weston 2007) and the average litter size is four pups (Fleming and Holler 1990). Littering intervals may be as short as 26 days (Bowen 1968).

Apparent survival rate estimates (products of true survival and site fidelity) of beach mice along the Gulf Coasts of Florida and Alabama have demonstrated that their average life span is about nine months (Swilling 2000). Other research indicated that 63 percent of Alabama beach mice lived (or remained in the trapping area) for four months or less, 37 percent lived 5 months or greater and two percent lived 12 to 20 months (Rave and Holler 1992). Less than half (44 percent) of beach mice captured for the first time were recaptured the next season (Holler *et al*. 1997). Greater than 10 percent of mice were recaptured three seasons after first capture; and four to eight percent were recaptured more than one year after initial capture. Beach mice held in captivity have lived three years or more (Blair 1951, Holler 1995).

Habitat and Movement

Beach mice inhabit coastal dune ecosystems on the Atlantic and Gulf Coasts of Florida and the Gulf Coast of Alabama. The dune habitat is generally categorized as: primary dunes (characterized by sea and other grasses), secondary dunes (similar to primary dunes, but also frequently include such plants as woody goldenrod (*Chrysoma pauciflosculosa*), false rosemary (*Conradina canescens*), and interior or scrub dunes (often dominated by scrub oaks and yaupon (*Ilex vomitoria*). Contrary to the early belief that beach mice were restricted to (Howell 1909, 1921, Ivey 1949), or preferred the frontal dunes (Blair 1951, Pournelle and Barrington 1953, Bowen 1968), recent research has shown that scrub habitat serves an invaluable role in the persistence of beach mouse populations (Swilling *et al.* 1998, Sneckenberger 2001). Beach mice occupy scrub dunes on a permanent basis and studies have found no detectable differences between scrub and frontal dunes in beach mouse body mass, home range size, dispersal, reproduction, survival, food quality, and burrow site availability (Swilling *et al.* 1998, Swilling 2000, Sneckenberger 2001). While seasonally abundant, the availability of food resources in the primary and secondary dunes fluctuates (Sneckenberger 2001). In contrast, the scrub habitat provides a more stable level of food resources, which becomes crucial when food is scarce or nonexistent in the primary and secondary dunes. This suggests that access to primary, secondary, and scrub dune habitat is essential to beach mice at the individual level.

The sea oat zone of primary dunes is considered essential habitat of beach mice on the Atlantic Coast (Humphrey and Barbour 1981, Humphrey *et al.* 1987, Stout 1992). The SEBM has also been reported from sandy areas of adjoining coastal strand/scrub vegetation (Extine 1980, Extine and Stout 1987), which refers to a transition zone between the fore dune and the inland plant community (Johnson and Barbour 1990). Beach mouse habitat is heterogeneous, and distributed in patches that occur both parallel and perpendicular to the shoreline (Extine and Stout 1987). Because this habitat occurs in a narrow band along Florida's coast, structure and composition of

the vegetative communities that form the habitat can change dramatically over distances of several feet.

Primary dune vegetation described from SEBM habitat includes sea oats, bitter panicgrass, railroad vine, beach morning-glory, saltmeadow cordgrass (*Spartina patens*), lamb'squarters (*Chenopodium album*), saltgrass (*Distichlis spicata*), and camphorweed (Extine 1980). Coastal strand and inland vegetation is more diverse, and can include pricklypear, saw palmetto, wax myrtle, Florida rosemary (*Ceratiola ericoides*), sea grape, and sand pine (*Pinus clausa*) (Extine and Stout 1987). Extine (1980) observed this subspecies as far as 0.62 miles inland on Merritt Island; he concluded that the dune scrub communities he found them in represent only marginal habitat for the SEBM. SEBM have been documented in coastal scrub more than a mile from the beach habitat at Kennedy Space Center/Merritt Island National Wildlife Refuge (NWR) and Cape Canaveral Air Force Station (CCAFS) (Stout *et al*. 2006). Extine (1980) and Extine and Stout (1987) reported that the SEBM showed a preference for areas with clumps of palmetto, sea grape, and expanses of open sand.

Essential habitat of the AIBM is characterized by patches of bare, loose, sandy soil (Humphrey and Frank 1992a). Although they are mainly found in the sea oat zone of the primary zone, they will occur in sandy areas with broomsedge (*Andropogon* sp.) (Service 1993). Ivy (1949) reported AIBM to occur in woody vegetation as far as 500 feet inland. Pournelle and Barrington (1953) found this subspecies in scrub as far as 1,800 feet from the dunes. Because this habitat occurs in a narrow band along Florida's coast, structure and composition of the vegetative communities that form the habitat can change dramatically over distances of only a few feet. Much of the habitat within the range of the AIBM has been converted to condominiums and housing developments. The majority of the high quality habitat, densely occupied by beach mice, remains along the length of both ASP and FMNM, at either end of Anastasia Island.

Two main types of movement have been identified for small mammals: within home-range activity and long-range dispersal. Such movements are influenced by a suite of factors, such as availability of mates, predation risk, and habitat quality. Movement and home range studies have been conducted for most beach mouse subspecies, but are limited to natural habitat (*i.e*., research has been conducted on public lands within contiguous beach mouse habitat, not within a development or in a fragmented landscape). Novak's (1997) study of the home range of CBM on Shell Island indicated males had a mean home range of 1.0 $\pm$ 4.1 acres and females had a mean home range of 0.81 $\pm$ 2.18 acres. Lynn (2000a) found male and female radio-tagged ABM had a mean home range of 1.68 $\pm$ 0.27 acres and 1.73 $\pm$ 0.40 acres, respectively. Swilling *et al.* (1998) observed one radio-collared ABM to travel over 328 feet during nightly forays after Hurricane Opal to obtain acorns from the scrub dunes. Using radio telemetry, Lynn (2000a) documented an ABM that traveled one mile within a 30-minute period. Moyers and Shea (2002) trapped a male and female CBM that moved about 637 feet and 2,720 feet in one night, respectively. Gore and Schaefer (1993) documented a marked Santa Rosa beach mouse crossing State Road (SR) 399, a two-lane highway. Lynn and Kovatch (2004) through mark and recapture trapping documented PKBM that crossed SR 292, a two-lane highway and right-of-way (100-feet wide).

Sneckenberger (2001) found significant seasonal differences in the movement of ABM, and suggested that this was a result of seasonal fluctuations in food availability, food quality, and nutritional needs. Smith (2003) found that Santa Rosa beach mice demonstrated an increase in movement as habitat isolation increased suggesting that longer travel distances were needed to obtain necessary resources. Smith also found that Santa Rosa beach mice had a preference for vegetation cover and connectivity, which is likely a behavioral response to increased predation risk in open areas. Thus, while beach mice are able and do travel great distances the travel pathways should have vegetated cover and no large gaps or open areas. Previous connectivity research suggests critical thresholds exist for species persistence in fragmented landscapes (With and Crist 1995). As fragmentation increases and connectivity is lost, species' ability to move through and between habitats is reduced in a nonlinear fashion.

Foraging

Beach mice are nocturnal and forage for food throughout the dune system. Beach mice feed primarily upon seeds and fruits, and appear to forage based on availability and have shown no preferences for particular seeds or fruits (Moyers 1996). Beach mice also eat small invertebrates, especially during late spring and early summer when seeds are scarce (Ehrhart 1978, Moyers 1996). Research suggests that the availability of food resources fluctuates seasonally in Gulf Coast coastal dune habitat, specifically that the frontal dunes appear to have more species of high quality foods, but these sources are primarily grasses and annuals that produce large quantities of small seeds in a short period of time. Foods available in the scrub consist of larger seeds and fruits that are produced throughout a greater length of time and linger in the landscape (Sneckenberger 2001). Nutritional analysis of foods available in each habitat revealed that seeds of plant species in both habitats provide a similar range of nutritional quality.

Population dynamics

Population size

Estimating animal abundance or population size is an important and challenging scientific issue in wildlife biology (Otis *et al.* 1978, Pollock *et al.* 1990). A number of different census methods are available to estimate wildlife populations, each with particular benefits and biases. Beach mouse surveys involve live trapping mark-recapture studies, which is a common method with small mammals. A five-night minimum trapping period has been standard practice since 1987 for Gulf Coast beach mice. As the referenced trapping events were not designed similarly or using a standardized sampling techniques, data should not be compared between subspecies or trapping events, nor should densities (mice per 100 trap nights) be inferred beyond the trapping area during that trapping session.

Population densities of beach mice typically reach peak numbers in the late autumn into spring (Rave and Holler 1992, Holler *et al*. 1997). Peak breeding period occurs in autumn and winter, apparently coinciding with the increased availability of seeds and fruits from the previous growing season. Seasonal and annual variation in size of individual populations may be great (Rave and Holler 1992, Holler *et al.* 1997). Food supplementation studies showed that old field mouse

populations increased when foods were abundant; thus, populations of old field mice appear to be food-limited (Smith 1971, Galindo-Leal and Krebs 1998). Similar studies have not been conducted with beach mouse populations.

Gulf Coast Beach Mice

In 1979, Humphrey and Barbour (1981) estimated about 515 CBM existed on Topsail Hill and Shell Island. That estimate was used during the Federal listing of the CBM in 1985. Population estimates on Shell Island from February 1993 to March 1994, ranged from 105 to 338 CBM on a 23-acre study area (Novak 1997). Just prior to Hurricane Opal in 1995, it was estimated that Shell Island supported 800 to 1,200 CBM (Gore 1999). Three years following Hurricane Opal in June 1998, one trapping effort at six different sites on Shell Island resulted in a cumulative population estimate of 195 CBM (164 CBM captured) (Moyers *et al*. 1999). The east portion of the island has been trapped from 2000 to 2003. Population estimates have ranged between 24 and 67 CBM (Lynn 2004b). At Topsail Hill Preserve State Park, trapping conducted in March 2003 and March 2005 yielded a population estimate of 190 to 250 CBM (Service 2003a, Sneckenberger 2005). From late 2006 through 2007 results of tracking tubes surveys at Topsail Hill Preserve State Park suggested that the CBM population was not densely distributed (FWC 2008b). Trapping of four 100-trap transects yielded population estimates of 190, 250, less than 10 (too few to estimate), and 87 in 2003, 2005, 2006, and 2007, respectively (Service 2007a). The track and trapping data together indicate that Topsail Hill Reserve State Park currently does not support a high population of beach mice. In 2003 and again in 2005, a total of 26 mice were translocated from Topsail Hill Preserve State Park to the WaterSound private development adjacent to Deer Lake State Park. Trapping has been sporadic on WaterSound but has yielded population estimates of 5 to 46 individuals in 2003 to 2007 (Moyers 2007). Deer Lake State Park has not been trapped; however, tracks have been observed as recently as 2006 (FWC 2008b). Population estimates from trapping at Grayton Beach State Park (main unit) from 1995 to 2000, ranged from 25 to 116 CBM (Moyers *et al.* 1999, Van Zant 2000). The central unit was trapped for three nights in August 2002; however, no mice were captured (Lynn 2002b). Limited tracking surveys were accomplished in 2003, 2004 and 2005 and beach mouse tracks were observed (Kovatch 2003, Toothacker 2004, FWC 2008b). The western area, although it provides CBM habitat, has not been documented as occupied by CBM (Moyers *et al.* 1999, Van Zant 2000). The population estimates for the WaterColor development for the two years prior to and one year following development ranged from 3 to 7 CBM (St. Joe Company 1999). CBM were last captured in February of 2001 at WaterSound; quarterly trapping has continued on the site through mid-2008 without CBM being captured (St. Joe/Arvida 2003). Auburn University trapped West Crooked Island in October 2000, and the Service trapped the area in 2001 to 2003. The population estimate ranged from a low of 174 to a high of 244 CBM (Lynn 2000b, 2002d, 2002e, 2002f, 2002g, 2003b). The Service estimated the total population of CBM in 2003, to be about 600 to 1,000 beach mice. A recent translocation of 43 CBM from Topsail State Park to Grayton Beach State Park in 2011 has proven successful as the 2013 follow-up trapping data indicated 93 new CBM at Grayton Beach State Park. According to 2013 track tube data, there is a 69 percent occurrence of beach mouse presence (average) at Grayton Beach State Park (FWC 2013a and FWC 2013b). Recent track tube data

from 2013 indicates Deer Lake State Park had a 73 percent (average) occurrence rate for monthly CBM presence (FWC 2013a and FWC 2013b).

Since its listing in 1985, PKBM population estimates never reached more than 400 to 500 individuals until 2003. Before Hurricane Ivan (2004) a population estimate of 500 to 800 was divided between two populations - the Johnson Beach Unit of GINS and PKSP (Service 2004). The status of PKBM at Gulf State Park (GSP) is uncertain, likely extirpated in 1999. In October 2005, following the active hurricane seasons of 2004 and 2005, a trapping effort of less than one-third of the habitat available on public lands yielded captures of less than 30 individuals. Tracking data from June 2006 indicated that about 25 and 32 percent of the available habitat was occupied at PKSP and GINS, respectively (Loggins 2007). Trapping at PKSP and GINS in March 2007, was cancelled after one night after the capture of only one mouse (a fatality) and very limited sightings of beach mouse sign (tracks, burrows) (Loggins 2007). With no tracks observed in the tube surveys the PKBM may now be absent from PKSP (FWC 2008b). According to 2009 tracking data, there were no mice occurrences at PKSP until May 2009, then only sporadic occurrences until November 2009 as the occurrence data started to show a slow but steady increase (FWC 2014b). Tracking data from 2010 showed a dramatic increase in PKBM occurrences within PKSP with 20 percent occurrence at the beginning of the year, and 84 percent occurrence at the end of 2010 (FWC 2010c). Trapping in 2010 on PKSP captured 11 individual beach mice (11 total captures) in February and 36 individuals (106 total captures) in May. At that time, information was insufficient to accurately estimate population size. These captures represent the minimum number of mice in the park for those months. Trapping at GINS and PKSP in spring 2010 generally confirmed the population was increasing with PKBM widely distributed at both public lands. Recent data from 2011 showed that 96 percent (81 total traps) of track tubes registered beach mouse tracks, indicating that mice were becoming widespread throughout PKSP (J. Gore pers. comm. 2011, FWC 2012a, and FWC 2014b). The 2012 track tube surveys yielded 99 percent of track tubes with beach mouse tracks at PKSP (D. Greene pers. comm. 2012 and FWC 2012a, FWC 2012b, and FWC 2012c). During 2013, the track tube data indicates 97 percent of track tubes contained PKBM tracks (FWC 2013a and FWC 2013b). At GINS, the number of PKBM has not increased since the initial high levels in winter of 2005-2006 (FWC 2008b). However, population estimates indicate there may be a few hundred PKBM at GINS (Gore 2008). Trapping conducted in April of 2008 was more encouraging with the capture of 35 mice at GINS (S. Sneckenberger pers. comm. 2008). Through 2008-2010 the population continues to expand from GINS to PKSP and beyond. This is the first natural recolonization of a park without the need for a translocation. From 2010 to 2013, the track tube occurrences at GINS have averaged 84 percent, 94 percent, 95 percent, and 94 percent respectively (FWC 2014b, FWC 2012a, FWC 2012b, FWC 2012c, FWC 2013a, and FWC 2013b).

The SABM even at its lowest population probably numbered several hundred individuals (Gore as cited in 63 *FR* 70055). James (1992) estimated that the East Crooked Island subpopulation to be about 150. However, by 1996, SABM were no longer found on East Crooked Island. Following Hurricane Opal in 1995, Mitchell *et al.* (1997) estimated the St. Joe Peninsula State Park population to be between 300 and 500 mice. In November 1997 and January 1998, 19 pairs of St. Andrew beach mice were relocated from St. Joseph Peninsula State Park to East Crooked Island,

Tyndall Air Force Base (Moyers *et al.* 1999). Trapping surveys conducted on East Crooked Island in 2000 and 2002 through 2007 indicated that beach mice occupied the entire island (Lynn 2002c, FWC 2008b). Population estimates ranged from 71 to 133 mice (Lynn 2002c). The FWC (2008b) estimates 22 miles of habitat as occupied by SABM throughout the mouse's historical range with population estimates of about 3,000 mice at East Crooked Island and about 1,775 mice in the front dunes at St. Joseph State Park. Data from 2008-2012 on East Crooked Island showed a decrease in SABM, with average track tube occurrences of 97 percent, 97 percent, 96 percent, 87 percent, and 83 percent, respectively (FWC 2014b and FWC 2012a). However, recent data from 2013 indicates 95 percent of track tubes contained SABM tracks (FWC 2013a and FWC 2013b). Surveys conducted from 2008-2012 at Rish Park yielded average track tube occurrence that fluctuated between 79 percent, 91 percent, 76 percent, 79 percent, and 83 percent, respectively (FWC 2014b and FWC 2012a). More recent data in 2013 showed an average of 73 percent of track tubes contained SABM tracks (FWC 2013a and FWC 2013b).

Atlantic Coast Beach Mice

Populations of the SEBM have been estimated to be around 5,000 to 6,000 mice. Recent surveys have confirmed that SEBM are found on the beaches of Canaveral National Seashore, Merritt Island NWR, and CCAFS in Brevard County, all on federally protected lands. In April 2002, a population of SEBM was documented at the Smyrna Dunes Park, at the north end of New Smyrna Beach (Sauzo 2004). Prior to 2006, populations of the SEBM were thought extirpated from both sides of the Sebastian Inlet (Bard 2004). However, during surveys in June 2006, a single mouse was located at the very southern end of the Sebastian Inlet State Park. Mice were also found at Jungle Trail on the Pelican Island National Wildlife Refuge, another area where they where thought extirpated. Additional surveys of other areas south of Brevard County have not located any mice and indicate the distribution of this subspecies in the counties south of Brevard, severely fragmented. SEBM are no longer believed to occur at Jupiter Island, Palm Beach, Lake Worth, Hillsboro Inlet or Hollywood Beach (Service 1999).

Although the distribution of the AIBM has declined significantly, particularly in the northern part of its range, the populations at ASP and FMNM have continued to fluctuate seasonally between two and 90 mice per acre. It is thought that populations should be characterized by a range rather than a static value (Frank and Humphrey 1996). Quarterly surveys of these two sites have shown that the populations have remained stable. Due to the limited dune habitat at the ASP, this population has not been able to maintain a stable population and it is unknown how many mice remain.

Population variability

Beach mouse populations fluctuate on a seasonal and annual basis. Attempts to explain population dynamics have revealed an incomplete understanding of the species and its population cycles. It is clear that beach mice, like all rodents, are known for high reproductive rates and experience extreme highs and lows in population numbers. Depressed beach mouse populations may be associated with tropical storms and drought, perhaps resulting from reduced habitat and food

resources. These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951, Bowen 1968, Smith 1971, Hill 1989, Rave and Holler 1992, Swilling *et al.* 1998, Swilling 2000).

Population stability

Population viability analysis (PVA) is essentially a demographic modeling exercise to predict the likelihood a population will continue to exist over time (Groom and Pascual 1997). The true value in using this analytical approach is not to determine the probability of a species' extinction, but to clarify factors that have the most influence on a species' persistence. From 1996 to 1999, the Service funded Auburn University to develop a PVA for beach mice (Holler *et al*. 1999, Oli *et al.* 2001). Four subpopulations of Gulf Coast beach mice subspecies were modeled. They consisted of two subpopulations of PKBM, one at GINS-Perdido Key Area and one at Florida Point, and two subpopulations of ABM, one at Bon Secour NWR and one at Fort Morgan State Park. They used a stochastic (random) differential equation (Wiener-drift) model, applied to long term demographic data. The model is stochastic because it incorporates the variable effects of the environment upon population change. However, it did not model the effects of hurricanes on the habitat or population of beach mice.

The Oli *et al.* (2001) analyses indicated that all four subpopulations were at risk of extinction, with habitat fragmentation as the most influential factor. The GINS-Perdido Key Area had the highest risk for extinction; the PKBM had a 100 percent chance of reaching one individual (becoming functionally extinct) within 21 (mode) or 45 (median) years. At Florida Point, the PKBM had a low risk of becoming functionally extinct (1.3 percent) within 13 to 20 years. However, following Hurricane Opal in 1995, and subsequent predation pressure, the PKBM population at Florida Point was believed extirpated in 1999. This localized extirpation clearly demonstrates that while PVA's are useful in determining significant factors in species survival, they have limited use in predicting the time to extinction for a given species.

More recently, the Conservation Breeding Specialist Group (Traylor-Holzer 2004, 2005, 2006) was contracted by the Service to conduct a population and habitat viability analysis (PHVA) on ABM using the Vortex population simulation model (Lacy 1993). The goal was to develop an ABM population model and use the model to assess the status of the ABM habitat, and populations and projections for continued existence. The PHVA results projects the ABM to have a 26.8 percent $\pm$ 1.0 percent likelihood of extinction over the next 100 years. Much of this risk is due to hurricane impacts on ABM populations and habitat, which can result in population declines. The model suggests that hurricanes are a driving force for ABM populations, both directly and also indirectly as their impacts interact with other factors, including development of higher elevation (scrub) habitat and predation by cats. Due to the similarities in the subspecies and proximal location, it can be inferred that these factors also have a strong influence on the persistence of PKBM populations. When reviewing PHVA results, it is crucial that the actual values for the risk of extinction are not the focus of the interpretation. The true value of a PHVA is the ability to compare management strategies and development scenarios, run sensitivity analyses, and determine the main influence(s) on population persistence.

Similar to the land use arrangement on Perdido Key, the Fort Morgan peninsula (occupied by ABM) consists of three areas of public lands separated by two areas of private lands, which allow for limited (varied) dispersal between the public lands. The current level of dispersal between public lands through private lands is unknown, but is affected by development and habitat degradation. Without dispersal between public lands through private lands, the PHVA results project the ABM to have a 41.2 percent ± 1.1 percent likelihood of extinction. If all privately-owned habitat between the public lands is lost, the likelihood of extinction increases to 46.8 percent ± 1.1 percent. Again, it can be inferred that a similar increase in risk of extinction would occur with the PKBM if dispersal could not occur through private lands.

Despite the similarities in the subspecies, it is important to note that carrying capacity (K), which was found to be a strong influence on the model, would be different in PKBM. For ABM, K was estimated using maximum ABM density estimates (4.5 to 11.6 ABM per acre) and acres of habitat (2,989 acres). As density estimates for PKBM would likely be lower, and remaining PKBM habitat is less than 1,300 acres, the Vortex model for PKBM would likely project a greater likelihood of extinction.

The Service contracted with the Georgia Cooperative Fish and Wildlife Research Unit to critique the PVAs for the ABM accomplished by Oli *et al.* (2001) and Conservation Breeding Specialist Group (Traylor-Holzer 2006). Conroy and Runge (2006) indicated that neither PVA provided reliable estimates of extinction probability for ABM. They recommended that future PVA work should incorporate sampling, temporal, and possibly spatial variance for input variables and should clearly and explicitly express uncertainty in extinction output. Until this can be done, reliable estimates of extinction probability for the ABM (and other beach mouse subspecies) cannot be estimated.

Species that are protected across their ranges have lower probabilities of extinction (Soulé and Wilcox 1980). Beach mouse populations persist naturally through local extirpations due to storm events or the harsh, stochastic nature of coastal ecosystems. Historically, these areas would be recolonized as population densities increase and dispersal occurred from adjacent populated areas. In addition, from a genetic perspective, beach mice recover well from population size reductions (Wooten 1994), given sufficient habitat is available for population expansion after the bottleneck occurs. As human development has fragmented the coastal dune landscape, beach mice can no longer recolonize along these areas as they did in the past (Holliman 1983). As a continuous presence of beach mice or suitable habitat along the coastline is no longer possible and any hurricane can impact the entire range of each subspecies, the probability of beach mice persisting would be enhanced by the presence of contiguous tracts of suitable habitat occupied by multiple independent populations (Shaffer and Stein 2000). The history of the PKBM alone illustrates the need for multiple populations (a now potentially extirpated population was the source of the two remaining populations of the subspecies) (Holler *et al.* 1989, 71 *FR* 60238). While maintaining multiple populations of beach mouse subspecies provides protection from total loss (extinction), especially when migration and relocations are possible (Oli *et al.* 2001), conservation of each subspecies necessitates protection of genetic variability throughout their ranges (Ehrlich 1988).

Preservation of natural populations is therefore crucial, as the loss of a population of beach mice can result in a permanent loss of alleles (Wooten and Holler 1999). This loss of genetic variability cannot be regained through translocations or other efforts.

Status and Distribution

The distribution of all the beach mouse subspecies is significantly reduced from their historical ranges due to modification and destruction of the coastal dune ecosystem inhabit. Habitat loss and alteration was likely a primary cause of the extinction of one subspecies, the Pallid beach mouse, which was endemic to barrier beach between Matanzas and Ponce de Leon inlets in Volusia and Flagler Counties (Humphrey and Barbour 1981).

Atlantic Coast Beach Mice

The distribution of the SEBM has declined significantly, particularly in the southern part of its range. Historically, it was reported to occur along about 174 miles of Florida's central and southeast Atlantic coast from Ponce (Mosquito) Inlet, Volusia County, to Hollywood Beach, Broward County (Hall 1981). Bangs (1898) reported it as extremely abundant on all the beaches of the east peninsula from Palm Beach at least to Mosquito (Ponce) Inlet. During the 1990s, the SEBM was reported only from Volusia County (Canaveral National Seashore); in Brevard County (Canaveral National Seashore, Kennedy Space Center/Merritt Island NWR, and CCAFS); a few localities in Indian River County (Sebastian Inlet State Park, Treasure Shores Park, and several private properties), and St. Lucie County (Pepper Beach County Park and Fort Pierce Inlet State Park) (Humphrey *et al*. 1987, Robson 1989, Land Planning Group, Inc. 1991, Humphrey and Frank 1992b, Service 1993). The SEBM is geographically isolated from all other subspecies of beach mice.

Populations of the SEBM are still found on the beaches of Canaveral National Seashore, Merritt Island NWR, and CCAFS in Brevard County, all on federally protected lands. In April 2002, a population of SEBM was documented at the Smyrna Dunes Park, at the north end of New Smyrna Beach (Sauzo 2004). Populations from the north side of Sebastian Inlet appear to be extirpated (Bard 2004). SEBM were documented on the south side of Sebastian Inlet in 2006, although none have been found since then.

The status of the species south of Brevard County is currently unknown. The surveys conducted during the mid-1990s indicated the distribution of this subspecies in the counties south of Brevard County was severely limited and fragmented. There are not enough data available to determine population trends for these populations. These surveys revealed that it occurred only in very small numbers where it was found. In Indian River County, the Treasure Shores Park population experienced a significant decline in the 1990s, and it is uncertain whether populations still exist at Turtle Trail or adjacent to the various private properties (Jennings 2004). Trapping efforts documented a decline from an estimated 300 individuals down to numbers in the single digits. In 2006, a population off Jungle Trail at Pelican Island NWR was discovered (Van Zant 2006). No beach mice were found during surveys in St. Lucie County and it is possible that this species is

extirpated there. The SEBM no longer occurs at Jupiter Island, Palm Beach, Lake Worth, Hillsboro Inlet or Hollywood Beach (Service 1999).

The primary reason for the significant reduction in the range of the SEBM is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated SEBM habitat in the southern part of its range. This increased urbanization has also increased the recreational use of dunes, and harmed the vegetation essential for dune maintenance. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect other beach mouse habitat. In addition to this increased urbanization, coastal erosion is responsible for the loss of the dune environment along the Atlantic coast, particularly during tropical storms and hurricanes. The extremely active 2004 hurricane season had a pronounced affect on Florida's Atlantic coast beaches and beach mouse habitat.

The encroachment of residential housing onto the Atlantic coast also increases the likelihood of predation and harassment by free-roaming cats and dogs. A healthy population of SEBM on the north side of Sebastian Inlet State Park in Brevard County was completely extirpated by 1972, presumably by free-roaming cats (Bard 2004). Urbanization of coastal habitat could also lead to potential competition of beach mice with house mice (*Mus musculus*) and introduced rats.

The distribution of the beach mouse is limited due to modification and destruction of its coastal habitats due mostly to developmental pressures. One additional Atlantic coast subspecies, the pallid beach mouse (*P. p. decoloratus*), was formerly reported from two sites in Volusia County, but extensive surveys provide substantial evidence that this subspecies is extinct (Humphrey and Barbour 1981).

The distribution of the AIBM has declined significantly, particularly in the northern part of its range. Historically, it was reported to occur from the vicinity of the Duval-St. Johns County line southward to Matanzas Inlet, St. Johns County, Florida (Humphrey and Frank 1992a). It currently occurs only on Anastasia Island, primarily at the north (ASP) and south (FMNM) ends of the island, although beach mice still occur at low densities in remnant dunes along the entire length of the island (Service 1993). The original distribution consisted of about 50 miles of beach; current populations occupy about 14 miles of beach with possibly only 3 miles supporting viable populations (Service 1993).

In 1992 to 1993, 55 mice (27 females and 28 males) were reintroduced to GMTNERR-Guana River portion of the Reserve (4.0 miles of undeveloped beach) in St. Johns County. In 1993, the population was estimated at 220 mice. Quarterly trapping has been conducted since the reintroduction and mice have not been captured since September 2006. This may be a result of habitat loss or alteration from storms and or habitat conditions.

The primary reason for the significant reduction in the range of the AIBM is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated AIBM habitat in the northern two-thirds of its range. This increased urbanization has also increased the recreational use of dunes, and harmed the vegetation essential for dune

maintenance. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect other beach mouse habitat. In addition to this increased urbanization, coastal erosion is responsible for the loss of the dune environment along the Atlantic coast, particularly during tropical storms and hurricanes. The extremely active 2004 hurricane season had a severe effect on Florida's Atlantic coast beaches and beach mouse habitat.

The encroachment of residential housing onto the Atlantic coast also increases the likelihood of predation by free-roaming cats and dogs. ASP has successfully reduced feral cat populations at the recreation area and has seen a benefit to the beach mice. Urbanization of coastal habitat could also lead to potential competition of beach mice with house mice and introduced rats.

Gulf Coast Beach Mice

PKBM populations have existed since the late 1970s as isolated populations along its historical range (16.9 miles). The effects of Hurricane Frederic (1979) coupled with increased habitat fragmentation due to human development led to the extirpation of all but one population of PKBM. The less than 30 individuals at Gulf State Park (at the westernmost end of Perdido Key) were once the only known existing population of PKBM (Holler *et al*. 1989). Beach mice from this site were used to reestablish PKBM at Gulf Islands National Seashore (GINS) between 1986 and 1988 (Holler *et al.* 1989). Then in 1999 the population at Gulf State Park was considered extirpated (Moyers *et al.* 1999). In 2000, 10 PKBM (five pairs) was relocated from GINS to PKSP. In February of 2001, this relocation was supplemented with an additional 32 PKBM (16 pairs). The PKBM were released on both north and south sides of SR 292 in suitable habitat. Two years of quarterly survey trapping indicated that the relocations of PKBM to PKSP were successful and this was considered an established population (Lynn and Kovatch 2004). PKBM were also trapped on private land between GINS and PKSP in 2004, increasing documentation of current occurrences of the mouse (Lynn 2004a). Based on the similarity of habitat between these areas and the rest of Perdido Key, as well as the continuity of the habitat, the mouse is believed to inhabit other private properties where suitable habitat exists north and south of SR 292. The PKBM is considered to occur on 42 percent of Perdido Key (1,227 acres of 2,949 acres) (**Table 14**).

Table 14. Perdido Key beach mouse habitat on Perdido Key in Florida and Alabama.

Area	Total in AL & FL		Total in Florida		Total in Alabama	
	Acres	**Percent**	**Acres**	**Percent**	**Acres**	**Percent**
Perdido Key	2,949	100	2,615	89	334	11
PKBM habitat	**1,292**	100	**1,146**	**88**	148	12
Private lands	1,440	49	1,278	43	162	5
PKBM habitat	**302**	**23**	**270**	**24**	33	3
Public lands	1,509	51	1,337	45	172	6
			GINS		GSP	
			1,052		172	
			PKSP			
			285			
PKBM habitat	990	76	876	67	114	9
			GINS		GSP	
			638		114	
			PKSP			
			238			

[1]Data calculated by Service's Panama City, Florida using 2004 Digital Orthophoto Quarter-Quadrangle (DOQQ) aerial photography, 2005 parcel data from Baldwin County, Florida and 2005 parcel data from Escambia County, Florida and revised June 2006.

The listing of PKBM was based on data collected in 1983-84, and at that time the mouse was recovering from the effects of Hurricane Frederick in 1979. Following Hurricane Frederic estimated population numbers based on trapping were 13 PKBM found at one location (Gulf State Park). Just prior to listing, only one PKBM was captured in trapping surveys, this again being at Gulf State Park. Since that time, numbers have fluctuated dramatically based on hurricanes and/or translocation efforts, but were at their highest estimate ever documented just prior to Hurricane Ivan in 2004 at between 500-800 individuals. This was a result of significant partnership efforts and included translocation and habitat restoration on public lands. Even with the destructive hurricanes in 2004 and 2005, current numbers of PKBM, while low (no population estimates are available), are greater than one mouse and mice have been confirmed from two areas (PKSP and GINS). Survey efforts (tracking and trapping) have also been sporadic and inconsistent; therefore, it is difficult to establish long term trend information at this time.

CBM subpopulations currently persist along approximately 15 miles of Gulf of Mexico shoreline consisting of four isolated areas along 11 miles of beachfront within its former range. Another 5 miles outside of the CBM's known historical range has been recently colonized (Lynn, 2000a, 2003a). In the 1950s, the CBM was widespread and abundant at that time according to Bowen (1968). By 1979, Humphrey and Barbour (1981) reported only 40 percent of the original habitat remained undeveloped in noncontiguous areas. They also documented that the CBM had been extirpated from seven of its nine historical localities being restricted to the Topsail Hill area in

Walton County and Shell Island in Bay County. In 1985 when the CBM became federally protected, CBM were still only known from the Topsail Hill area and Shell Island, an area consisting of about 10 miles of coastline (50 *FR* 23872). In 1989, a cooperative interagency effort reintroduced CBM onto the central and west units of Grayton Beach State Park increasing the occupied coastline by another mile (Holler *et al*. 1989). In 1999, with the closing of East Pass and Shell Island connecting to West Crooked Island, CBM increased their range by approximately four miles (Lynn 2000b). CBM are now known to occupy approximately 15 miles of Gulf of Mexico beachfront; 12 of the 15 miles are publicly owned lands.

There are four subpopulations of CBM that exist: 1) Topsail Hill Preserve State Park (and adjacent eastern and western private lands), 2) Shell Island (includes St. Andrew State Park mainland and Shell Island with private inholdings and Tyndall AFB), 3) Grayton Beach (and adjacent eastern private lands), and 4) West Crooked Island. Approximately 96 percent of the lands known to be occupied by CBM are public lands. Translocations to establish a fifth subpopulation of CBM occurred in March of 2003 and 2005. CBM from Topsail Hill Preserve State Park were moved to private lands at Camp Creek/Water Sound in Walton County, Florida (Lynn 2003a, Service 2005a, 2005b, 2005c, 2005d).

Topsail Hill Preserve State Park consists of 1,637 acres of which 262 acres provide CBM habitat; the majority being occupied by CBM. The Florida Park Service prepared a Unit Management Plan for the Preserve that explicitly plans for conservation and protection of CBM habitats (FDEP 2007). Private lands on the east side consist of approximately 9.63 acres. Of that, 7 acres consist of the development known as the Stallworth Preserve. The Service issued an ITP for CBM associated with the Stallworth Preserve HCP in 1995; an amendment to the permit was issued in 1999. The remaining 2.63 acres has been purchased by Walton County with a grant from the Service. Private lands on the west side of the Preserve consist of 24 acres and include Four-Mile Village, a low density single family development, and the Coffeen Nature Preserve managed by the Sierra Club.

Shell Island consists of lands within the St. Andrew State Park, Tyndall AFB, and private lands. The Unit Management Plan for the State Park was completed in 1999. The plan identifies the need for protection and management of the CBM. Tyndall AFB manages their portion of Shell Island under the installation's Integrated Natural Resources Management Plan. The Service has joined with the State Park and Tyndall AFB since 1995 by providing funding to protect and restore CBM habitats on Shell Island.

The St. Andrew State Park mainland consists of 1,260 acres of which 123 acres are beach mouse habitat. Several tracking efforts looking for signs of CBM on the mainland were made between 1995 and 1998; no evidence was found that indicated the presence of the beach mouse (Moyers 1996, Moyers *et al.* 1999). However, live-trapping to document the absence of the mouse has not been conducted. Reintroduction of this area is considered an action to support recovery of CBM.

The Grayton Beach subpopulation consists of two units in Grayton Beach State Park. The Park is divided into a central and western unit and is currently connected by a narrow band of primary

dunes. Total acreage of the Park is 2,236 acres with 153 acres providing suitable CBM habitat. The Unit Management Plan for the Park identified the protection of the CBM as an important component. The Park has requested and received funds from the Service to implement CBM habitat restoration and protection. Portions of private lands (WaterColor and Seaside developments) on the east side of the central unit are occupied by CBM or provide suitable habitat.

West Crooked Island consists of 1,558 acres of which 730 acres provide CBM habitat and remains occupied by CBM (Lynn 2004b). The West Crooked Island subpopulation resulted from its connection to Shell Island in 1998-1999. The construction of the St. Andrew Pass navigation inlet in the early 1930s severed Shell Island from the mainland on its western end. Since then, the original pass, East Pass (or Old Pass) began to close. After passage of Hurricane Opal in 1995, East Pass temporarily closed and reopened; however, after passage of hurricanes Earl and Georges in 1998, the pass closed (Coastal Tech 1999, Middlemas 1999). CBM dispersed onto West Crooked Island from Shell Island colonizing most of the island within two years (Lynn 2004b). East Pass was reopened as a joint venture between Tyndall AFB and Bay County in December of 2001 but has since closed again.

SABM is now known to consist of two subpopulations, East Crooked Island and St. Joseph Peninsula State Park. The majority of the East Crooked Island subpopulation is located on Tyndall AFB and the other on the St. Joseph Peninsula State Park. Other important public lands for the conservation of the mouse would include Eglin Air Force Base lands at Cape San Blas and Billy Joe Rish Park. Private lands adjacent to Tyndall AFB and the State Park are either known to be occupied by SABM or contain habitat. Trapping by St Joe/Arvida on about 111 acres of SABM habitat at East Crooked Island was conducted in 2000, 2001, and 2003. The trapping confirmed existence of SABM on the property (Moyers and Shea 2002). However, trapping their property in St. Joseph Beach did not result in capture of any beach mice (Moyers and Shea 2002). Although SABM is thought to continue to occupy habitat south of St. Joseph Peninsula State Park, only tracking has been conducted to confirm its presence on private lands since the late 1990s. Private lands adjacent to public lands are available for population dispersal and food source during periods of high population and after severe weather events. However, subpopulations on large tracts of private land within the historical range of the subspecies are needed for conservation of the SABM.

Land development has been primarily responsible for the permanent loss of SABM habitat along its approximately 40-mile long historical range. In addition, construction of U.S. highway 98 accelerated the habitat loss from associated development. By the mid 1990's about 12 linear miles were known to be occupied (Gore 1994, 1995), indicating a 68 percent reduction in it historical distribution (63 *FR* 70053). An effort to re-establish the SABM back into its historical range was initiated around the time of listing (Moyers *et al.* 1999); however, the range reduction described above did not take this into account since the success of the reintroduction was not known at the time (63 *FR* 70053). Similar analyses have not been conducted since.

Our best documentation of the species' decline can be seen from trapping or tracking surveys conducted at various times throughout its range. By the mid to late 1980's concerns were raised

when trapping efforts failed to result in captures at West Crooked Island (Gore 1987). By 1990 the SABM appeared to only inhabit a small portion (approximately 11 linear miles) of its original range: west end of East Crooked Island and within St. Joseph Peninsula State Park (Gore 1990). SABM's apparent decline continued into the mid-1990's when in 1994, the population on East Crooked Island was "presumed to be extinct" (Wooten and Holler 1999), leaving only one known population on St. Joseph Peninsula (Moyers *et al.* 1999). Subsequent reintroduction efforts in 1997-1998 appeared to have re-established the population on East Crooked Island (Moyers *et al.* 1999).

Recovery Criteria

The Recovery Plan for the SEBM identifies the primary recovery objectives for the subspecies (Service 1993). The SEBM can be considered for delisting if 10 viable, self-sustaining populations can be established throughout a significant portion of its historical range. More specifically, delisting can be considered if the following conditions are met:

1. Viable populations are maintained on the five public land areas where the subspecies currently occurs. Each population should not fluctuate below an effective breeding size of 500 individuals;

2. Five additional viable populations are established throughout the historical range of the subspecies; and

3. These populations should be monitored for at least five years.

The Recovery Plan for the AIBM identifies the primary recovery objectives for the subspecies (Service 1993). The AIBM can be considered for reclassification from endangered to threatened status if five viable, self-sustaining populations can be established. Because the majority of this subspecies' historical range has been permanently destroyed, it is not likely that it can be fully recovered or delisted. For the AIBM to be considered for downlisting to threatened, it is required that those populations at the northern and southern end of Anastasia Island continue to be viable. Each population should support a breeding population of 500 individuals. Two additional viable populations shall be established within the mainland portion of the historical range. All of these populations should be monitored for five years.

The Recovery Plan for the PKBM, CBM, and ABM identifies the primary recovery objectives to be the stabilization of present populations by preventing further habitat deterioration, and the reestablishment of populations in areas where they were extirpated (Service 1987). For each of the subspecies to be considered for downlisting to threatened, it is required that there be a minimum of at least three distinct self-sustaining populations in designated critical habitat with at least 50 percent of the critical habitat being protected and occupied by beach mice (Service 1987).

While this is the currently approved Recovery Plan for the three beach mouse subspecies, studies and research since the Recovery Plan publication provided additional information concerning

recovery needs for the subspecies. Protection and enhancement of existing populations and their habitat, plus reestablishment of populations in suitable areas within their historical ranges, are necessary for the subspecies survival and recovery. Core beach mouse populations remain isolated and are vulnerable to natural and anthropogenic factors that may further reduce or degrade habitat and/or directly reduce beach mouse population sizes. Maximizing the number of independent populations is critical to species survival. Protection of a single, isolated, minimally viable population risks the extirpation or extinction of a species as a result of harsh environmental conditions, catastrophic events, or genetic deterioration over several generations (Kautz and Cox 2001). To reduce the risk of extinction through these processes, it is important to establish multiple protected populations across the landscape (Soulé and Simberloff 1986, Wiens 1996). Through the critical habitat designation process we are addressing this by designating five independent units for the subspecies spaced throughout its historical range, depending on the relative fragmentation, size, and health of habitat, as well as availability of areas with beach mouse PCEs.

The Service completed a five-year status review of the CBM and PKBM in August 2007 (Service 2007a, 2007b). For both subspecies the following was recommended: designate a beach mouse recovery coordinator; revise the recovery plan; accomplish viable populations, monitor habitat improvement, corridor persistence and hurricane response; conduct genetic studies and translocations as necessary; participate in education and outreach and complete an emergency response plan.

A Recovery Plan for the SABM was finalized in 2010 and the recovery objectives are to reestablish additional populations, threat minimization or removal, habitat protection and/or restoration, and outreach/education to the public. This recovery plan is up to date and includes current threats to SABM.

In accordance with the Act, Federal agencies (including the Service) consult with the Service for actions that may adversely affect beach mice and their designated habitat. In Florida, consultations have included military missions and operations, beach nourishment and other shoreline protection, and actions related to protection of coastal development (**Table 14**).

Table 15. Previous biological opinions within Florida that have been issued for projects that had adverse impact to the nesting beach mice.

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
GINS Dune Protection (PKBM)	2000	0.01 acre (CH)
Translocation to PKSP (PKBM)	2000	≤ 3 beach mice (source mice from CH; relocation to CH and non-CH in PKSP)
Supplemental translocation to PKSP (PKBM)	2003	≤ 3 beach mice (source mice from CH; relocation to CH and non-CH in PKSP)

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
FEMA Berm Orange Beach, AL (PKBM)	2003	0.14 acre non-CH
Service scientific collecting permit program (PKBM)	2004-2005	1 beach mouse per 400 trap-nights per area (partial CH)
Florencia Development (within Action Area) (PKBM)	2005	3.5 acres (non-CH)
PKSP Re-build (PKBM)	2005	1.99 acres (CH)
FEMA Berm Emergency consultation (within Action Area) (PKBM)	2005	Consultation not complete (non-CH)
GINS road rebuild (PKBM)	2005	1.7 acres (CH)
Magnolia West Development (within Action Area) (PKBM)	2006	5.2 acres (not CH at time of construction, presently CH)
Palazzo Development (PKBM)	2006	0.58 acre (not CH at time of construction, presently CH)
Searinity Development (PKBM)	2006	0.32 acre (not CH at time of construction, presently CH)
Retreat Development (PKBM)	2006	0.21 acre (not CH at time of construction, presently CH)
Bond Residence (PKBM)	2006	0.17 acre (CH)
Three-batch condo (Island Club, Marquesas, Lorelei) (PKBM)	2007	0.95 acres (CH)
Naval Air Station Pensacola Pensacola Pass navigation channel dredging (PKBM)	2007	6.3 miles (CH)
Paradise Island development (PKBM)	2007	0.91 acres (CH)
Calabria condo development (PKBM)	2008	0.33 acres (non-CH)
Escambia County beach nourishment (PKBM)	2008	0.16 acres (partial CH)
Seabreeze Condominiums (PKBM)	2009	0.39 acres
Spanish Key Parking Lot (PKBM)	2009	0.28 acres

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
Perdido Key Fire Station (PKBM)	2010	0.43 acres (CH)
Evans Residence	2012	0.21 acre
Stern Residence	2012	0.07 acre
Whalen Residence	2012	0.18 acre
Carbone Residence	2012	0.74 acre
Lost Key	2012	26.1 acre
Stallworth Preserve Development (CBM)	1995	7 acres (CH)
Navy Panama City Beach site 4 construction (CBM)	2000	0.01 acre (CH)
East Pass Re-opening (CBM)	2001	Temporary, indirect take (CH)
WaterColor and WaterSound Developments (CBM)	2000	7.6 acres (non-CH)
Service scientific collecting permit (CBM)	2004-2005	1 beach mouse per 400 trap-nights per area (partial CH)
FEMA beach berms post hurricane Ivan emergency consultation (CBM)	2005	Consultation not complete (partial CH)
Western Lake Reopening consultation (CBM)	2006	2.7 acres annually for 5 years (CH)
FEMA Statewide post-disaster berm programmatic BO (PKBM, CBM, SABM, AIBM, and SEBM)	2007	75 miles for eroded shoreline(partial CH)
Angelos Development (CBM)	2009	0.42 acres
Bonfire Beach (SABM)	2008	38 acres
Ovation (SABM)	2010	5.41 acres (CH)
Sea Colony Development (AIBM)	1998	0.7 acres (non-CH)
Anastasia State Park beach nourishment (AIBM)	2005	50 linear feet (non-CH)

PROJECT	YEAR	IMPACT (Habitat/critical habitat/individuals)
Service scientific collecting permit program (AIBM)	2004-2005	1 beach mouse per 400 trap-nights per area (non-CH)
Rodent Control Program on CCAFS (SEBM)	2002	50 beach mice
Cape Canaveral Air Force borrow source (SEBM)	2007	300 linear feet (non-CH)
Service scientific collecting permit program (SEBM)	2004-2005	1 beach mouse per 400 trap-nights per area (non-CH)
CCAFS Routine Maintenance Programmatic (SEBM)	2008	Temporary loss of habitat during trenching/digging for pipeline installation and repair, roadside mowing, soil remediation, pole placement, wells, soil boring, lines of sight, scrub restoration

Common Threats to Beach Mice in Florida

Habitat Loss or Degradation

Coastal dune ecosystems are continually responding to inlets, tides, waves, erosion and deposition, longshore sediment transport and depletion, and fluctuations in sea level. The location and shape of barrier island beaches perpetually adjusts to these physical forces. Winds move sediment across the dry beach forming dunes and the island interior landscape. The natural communities contain plants and animals that are subject to shoreline erosion and deposition, salt spray, wind, drought conditions, and sandy soils. Vegetative communities include foredunes, primary and secondary dunes, interdunal swales, sand pine scrub, and maritime forests. During storm events, overwash is common and may breach the island at dune gaps or other weak spots, depositing sediments on the interior and backsides of islands, increasing island elevation and accreting the sound shoreline. Breaches may result in new inlets through the island.

The quality of the dune habitat (primary, secondary, and scrub) is an important factor in maintaining and facilitating beach mouse recovery. Habitat manipulation is an old and widely used tool in wildlife management. It is especially useful in improving habitat suitability to increase local populations of a species. For beach mice, improving habitat can enhance the abundance and diversity of food resources, increase the chances of meeting a mate, and reduce competition for food and burrow sites.

Long term trapping data has shown that beach mouse densities are cyclic and fluctuate by order of magnitude on a seasonal and annual basis. These fluctuations can be a result of reproduction rates, food availability, habitat quality and quantity, catastrophic events, disease, and predation (Blair 1951, Bowen 1968, Smith 1971, Hill 1989, Rave and Holler 1992, Swilling *et al.* 1998, Swilling

2000, Sneckenberger 2001). Without suitable habitat sufficient in size to support the natural cyclic nature of beach mouse populations, subspecies are at risk from local extirpation and extinction, and may not attain the densities necessary to persist through storm events and seasonal fluctuations of resources.

Habitat loss and fragmentation associated with residential and commercial real estate development is the primary threat contributing to the endangered status of beach mice (Holler 1992a, 1992b, Humphrey and Frank 1992a). Coastal commercial and residential development has fragmented all the subspecies into disjunct populations. Isolation of habitats by imposing barriers to species movement is an effect of fragmentation that equates to reduction in total habitat (Noss and Csuti 1997). Furthermore, isolation of small populations of beach mice reduces or precludes gene flow between populations and can result in the loss of genetic diversity. Demographic factors such as predation (especially by cats), diseases, and competition with house mice, are intensified in small, isolated populations, which may be rapidly extirpated by these pressures. Especially when coupled with events such as storms, reduced food availability, and/or reduced reproductive success, isolated populations may experience severe declines or extirpation (Caughley and Gunn 1996). The influence these factors have on populations or individuals is largely dependent on the degree of isolation.

The conservation of multiple large, contiguous tracts of habitat is essential to the persistence of beach mice. At present, large parcels of land exist mainly on public lands. Protection, management, and recovery of beach mice on public areas have been complicated by increased recreational use as public lands are rapidly becoming the only natural areas left on the coast. Public lands and their staff are now under pressure to manage for both the recovery of endangered species and recreational use. Where protection of large contiguous tracts of beach mouse habitat along the coast is not possible, establishing multiple independent populations is the best defense against local and complete extinctions due to storms and other stochastic events (Danielson 2005). Protecting multiple populations increases the chance that at least one population within the range of a subspecies will survive episodic storm events and persist while vegetation and dune structure recover.

Habitat connectivity also becomes essential where mice occupy fragmented areas lacking one or more habitat types. If scrub habitat is lacking from a particular tract, adjacent or connected tracts with scrub habitat are necessary for food and burrow sites when resources are scarce in the frontal dunes, and are essential to beach mouse populations during and immediately after hurricanes. Trapping data suggests that beach mice occupying the scrub following hurricanes recolonize the foredune once vegetation and some dune structure have recovered (Swilling *et al*. 1998, Sneckenberger 2001). Similarly, when frontal dune habitat is lacking from a tract and a functional pathway to frontal dune habitat does not exist, beach mice may not be able to attain the resources necessary to expand the population and reach the densities necessary to persist through the harsh summer season or the next storm. Functional pathways may allow for natural behavior such as dispersal and exploratory movements, as well as gene flow to maintain genetic variability of the population within fragmented or isolated areas. To that end, contiguous tracts or functionally connected patches of suitable habitat are essential to the long-term conservation of beach mice.

A lack of suitable burrow sites may be a consequence of habitat degradation. Beach mice use burrows to avoid predators, protect young, store food, and serve as refugia between foraging bouts and during periods of rest. Beach mice have been shown to select burrow sites based on a suite of abiotic and biotic factors. A limitation in one or more factors may result in a shortage of suitable sites and the availability of potential burrow sites in each habitat may vary seasonally. Beach mice tend to construct burrows in areas with greater plant cover, less soil compaction, steep slopes, and higher elevations above sea level (Lynn 2000a, Sneckenberger 2001). These factors are likely important in minimizing energy costs of burrow construction and maintenance while maximizing the benefits of burrow use by making a safe and physiologically efficient refuge. Similar to food resources, this fluctuation in availability of burrow sites suggests that a combination of primary, secondary, and scrub dune habitat is essential to beach mice at the individual level.

Predation

Beach mice have a number of natural predators including coachwhip (*Masticophis flagellum*) corn snakes (*Elaphe guttata guttata*), pygmy rattlesnake (*Sistrurus miliarius*), eastern diamondback rattlesnake (*Crotalus adamanteus*), short-eared owl (*Asio flammeus*), great-horned owl (*Bubo virginianus*), great blue heron (*Ardea herodias*), northern harrier (*Circus cyaneus*), red fox, gray fox, skunk (*Mephitis mephitis*), weasel (*Shallela frenata*), and raccoon (Blair 1951, Bowen 1968, Holler 1992a, Novak 1997, Moyers *et al.* 1999, Van Zant and Wooten 2003). Predation of beach mouse populations that have sufficient recruitment and habitat availability is natural and not a concern. However, predation pressure from natural and non-native predators may result in the extirpation of small, local populations of beach mice.

Free-roaming cats are believed to have a devastating effect on beach mouse persistence (Bowen 1968, Linzey 1978) and are considered to be the main cause of the loss of at least one population of beach mice (Holliman 1983). Cat tracks have been observed in areas of low trapping success for beach mice (Moyers *et al.* 1999). The PHVA for the ABM indicated that if each population had as few as one cat, which ate one mouse a day, rapid extinction would occur in over 99 percent of all iterations (Traylor-Holzer 2005).

In response to increasing depredation of sea turtle nests by coyote, fox, hogs, and raccoon, multi-agency cooperative effort have been initiated and are ongoing throughout Florida, in particular on public lands. These programs also benefit beach mice.

Hurricanes

Hurricanes can severely affect beach mice and their habitat, as tidal surge and wave action overwash habitat, leaving a flat sand surface denuded of vegetation; sand is deposited inland, completely or partially covering vegetation; blowouts between the ocean and bays and lagoons leave patchy landscapes of bare sand; primary dunes are sheared or eroded; and habitat is completely breached, creating channels from the ocean to bays and lagoons. Other effects include direct mortality of individuals, relocation/dispersal, and subsequent effects of habitat alterations

(that impact such factors as forage abundance/production and substrate elevation). Habitat impacts can be widespread, encompassing the range of the subspecies.

Until frontal dune topography and vegetation redevelop, scrub habitat maintains beach mice populations and provides the majority of food resources and potential burrow sites (Lynn 2000a, Sneckenberger 2001). While storms temporarily reduce population densities (often severely), this disturbance regime maintains open habitat and retards plant succession, yielding a habitat more suitable for beach mice than one lacking disturbance. The low-nutrient soil of the coastal dune ecosystem often receives a pulse of nutrients from the deposition of vegetative debris along the coastline (Lomascolo and Aide 2001). Therefore, as the primary and secondary dunes recover, beach mice recolonize this habitat readily as food plants develop to take advantage of the newly available nutrients. Recovery times vary depending upon factors such as hurricane characteristics (*i.e.*, severity, amount of associated rain, directional movement of the storm eye, storm speed), successional stage of habitat prior to hurricane, elevation, and restorative actions post hurricane. Depending on these factors, recovery of habitat may take from one to over 40 years.

The impact of hurricanes on plant communities temporarily affects food availability, and hence can limit population densities in impacted habitats soon after storms. Observations indicate that Hurricane Opal (a Category 3 storm in November 1995) caused a decrease in one population of ABM by 30 percent (Swilling *et al.* 1998). However, population densities in scrub habitat typically increased following hurricanes (Swilling *et al.* 1998). Sneckenberger (2001) also found atypical numbers of ABM in scrub following a hurricane. Five months post-storm, "densities (individuals/km) were up to 7.5 times greater in scrub areas than in frontal dune grids." Impacts of the storm may have been apparent as long as 17 months after the storm when scrub densities remained triple those of frontal dunes (Sneckenberger 2001). Moyers *et al.* (1999) found similar results for CBM at Grayton Beach State Park. When frontal and primary dunes sustained extensive damage during Hurricane Opal in 1995, beach mice were captured behind what remained of primary dune habitat. By 1998, however, primary dunes and the immediate habitat inland appeared to support higher numbers of beach mice.

In addition to the overall change in post Hurricane Opal distribution of ABM, Swilling *et al*. (1998) found the mean percent of newly marked individuals increased from 14 percent for the three trapping periods before the storm to an average of 26.7 percent for the same interval post hurricane. The average for the three trapping periods immediately following was even higher, at 42.7 percent of the individuals captured. Swilling *et al.* (1998) concluded that this increased presence of new individuals reflected increased reproduction. A statistical analysis of the data indicated that the number of females exhibiting signs of reproduction was significantly higher than normal (18.9 percent higher). Moyers *et al.* (1999) also found similar results at Topsail Hill Preserve State Park. Four to five months following Hurricane Opal, all female CBM captured were pregnant or lactating. Trapping six months after the hurricane, Moyers *et al.* (1999) noted that 51.5 percent of captured CBM were new unmarked beach mice.

Although hurricanes can significantly alter beach mouse habitat and population densities in certain habitats, some physical effects may benefit the subspecies. Hurricanes are probably responsible

for maintaining coastal dune habitat upon which beach mice depend through repeated cycles of destruction, alteration, and recovery of dune habitat. Holler *et al.* (1999) suggested that hurricanes could function to break up population subgroups and force population mixing. The resultant breeding between members of formerly isolated subgroups increases genetic heterogeneity and could decrease the probability of genetic drift and bottlenecks.

Beachfront Lighting

Artificial lighting increases the risk of predation and influences beach mouse foraging patterns and natural movements as it increases their perceived risk of predation. Foraging activities and other natural behaviors are influenced by many factors. Artificial lighting alters behavior patterns causing beach mice to avoid otherwise suitable habitat and decreases the amount of time they are active (Bird *et al.* 2004).

The presence of vegetative cover reduces predation risk and perceived predation risk of foraging beach mice, and allows for normal movements, activity, and foraging patterns. Foraging in sites with vegetative cover is greater and more efficient than in sites without cover (Bird 2002). Beach mice have also been found to select habitat for increased percent cover of vegetation, and decreased distance between vegetated patches (Smith 2003).

Genetic variability

Selander *et al.* (1971) conducted an electrophoretic study on 30 populations of *P. polionotus*, including populations of beach mouse subspecies. Based on 30 allozyme loci, they estimated that the level of allozyme variation found in beach mouse populations was at least 40 percent lower than the level of variation in nearby inland populations. This work indicates that beach mouse populations already have lower genetic variability before inbreeding, bottleneck events, or founder effects that may occur in a reintroduced population. Lower levels of heterozygosity has been linked to less efficient feeding, fewer demonstrations of social dominance and exploratory behavior, and smaller body size (Smith *et al.* 1975, Garten 1976, Teska *et al.* 1990). Research focused on inbreeding depression in old-field mice (including one beach mouse subspecies), determined that the effects of inbreeding negatively influenced factors such as litter size, number of litters, and juvenile survivorship (Lacy *et al.* 1995).

In 1995, the Service contracted with Auburn to conduct genetic analysis of: 1) post-reestablishment gene structure in PKBM and CBM; 2) microgeographic patterning and its relevance to alternate management approaches for ABM on the Bon Secour NWR; and 3) if feasible, the historical relationship of SABM from Crooked Island relative to CBM from Shell Island and SABM from St. Joseph Peninsula.

Results of the work for CBM found: 1) founder effects were observed in the Grayton Beach State Park population (fixation of alleles common to the donor population and allele frequency shifts); 2) incongruity in number and size of several alleles was observed between Grayton Beach State Park and Shell Island; 3) overall genetic divergence between the donor and reestablished

population was moderate; 4) genetic differences between Topsail Hill Preserve State Park and other CBM sites were higher than expected given the spatial proximity; 5) Topsail Hill Preserve State Park appears to be a reservoir for unique variation within the remaining populations of CBM; and 6) the overall relatedness estimated for Grayton Beach State Park suggested that any mating would involve close relatives (Wooten and Holler 1999).

Wooten and Holler (1999) recommended strategies for management of CBM based on genetics. Management of the Grayton Beach State Park population for genetic characteristics appears to be needed; however, additional genetic analyses will be needed. Relocation of CBM to Grayton Beach State Park from Shell Island should be continued.

Results of the work for PKBM found that: 1) founder effect (from Florida Point to GINS) did impact the GINS-Perdido Key Area subpopulation. Loss of rare alleles and allele frequency shifts were noted; 2) a low to moderate level of overall genetic divergence was observed; 3) data suggests that some effects of genetic drift were mediated by continued transfer of individuals; 4) levels of heterozygosity were unexpected given recent history; 5) average levels of relatedness among individuals is high which may portend future inbreeding related problems (however, no evidence of existing inbreeding was observed in the data); and 6) the overall level of microsatellite variation retained in the GINS-Perdido Key Area subpopulation was higher than anticipated. Wooten and Holler (1999) recommended management of PKBM based on genetics by: 1) preserving the natural population to the maximum extent possible since the loss of the Florida Point subpopulation resulted in the permanent loss of alleles; 2) using the GINS-Perdido Key Area subpopulation as a donor for reestablishment of other populations because of the retention of a substantial amount of genetic variation; and 3) reestablishment plans should include transfers between donor and reestablished subpopulations. In addition, translocations should be accomplished in pairs.

Analysis of genetic work focused on SABM indicated that there are two possible genetic histories for Crooked Island beach mice: 1) the last known beach mice from Crooked Island were derived from CBM or 2) the last known beach mouse from Crooked Island were unique from both CBM found on Shell Island or SABM found on St. Joseph peninsula (Van Zant 2003).

Climate Change (refer to page 49)

Analysis of the Species/Critical Habitat Likely to be Affected

Beach mice are currently federally protected because of their low numbers caused by habitat loss with continuing threats to their habitat (including critical habitat for CBM, PKBM, and SABM) and resulting affects from storm and post-storm events. The primary reason for the significant reduction in their range is the loss and alteration of coastal dunes. Large-scale commercial and residential development on the coast of Florida has eliminated beach mouse habitat. Coastal urbanization has also increased the recreational use of beachfront areas. Dune habitat maintenance is an important component of beach mouse conservation. Providing a healthy and continuous dune system assures mouse population stability. Integral to this is keeping visitors to the beach off the

dunes and replanting as necessary when impacts occur or are observed. The extremely active 2004 and 2005 hurricane seasons also had a severe effect on Florida's beaches and beach mouse habitat.

Critical habitat for three (PKBM, CBM, and SABM) of the five subspecies of beach mice has been designated and will be discussed. No critical habitat has been designated for the other two subspecies (SEBM and AIBM). Therefore, the proposed action would have no effect on designated critical habitat for these two subspecies because none is designated.

Generally, sand placement activities or dredged navigation channel material is not placed on existing beach mouse habitat consisting of vegetated dunes. Typical effects from these activities to beach mice and their habitats consist of the staging and storage of equipment, work vehicles, or materials and beach access for sand placement activities or dredged material placement. These effects may result in the permanent and temporary loss, degradation, or fragmentation of beach mouse habitat and changes in essential life history behaviors (dispersal and movement, foraging, seeking mates, breeding, and care of young). Beach mice spend their entire lives within the dune ecosystem and are nocturnal. Sand placement projects may occur at anytime of the year depending on their location and are usually conducted on a 24/7 schedule. The quality of the placed sand could affect the suitability of the beach and dunes to support beach mouse burrow construction and food sources. The effect of the activities covered under the consultation with incorporation of the proposed conservation measures on beach mice overall survival and recovery are considered in this SPBO.

ENVIRONMENTAL BASELINE

Status of the species/Critical Habitat within the Action Area (all subspecies of beach mice)

The action area encompasses the entire range of five subspecies of beach mice, and designated critical habitats of three beach mouse subspecies. Therefore, the previous discussion in "Status of the Species" applies here. The known distribution of the five subspecies of beach mice is a result of cursory surveys and intermittent trapping involving different projects. There has not been a systematic trapping study done in order to determine the status of each subspecies throughout their ranges.

Factors affecting the species environment within the action area

<u>Coastal development</u>

Beach mice were listed as endangered and threatened species primarily because of the fragmentation, adverse alteration, and loss of habitat due to coastal development. The threat of development-related habitat loss continues to increase. Other contributing factors include low population numbers, habitat loss from a variety of reasons (including hurricanes), predation or competition by animals related to human development (cats and house mice), and the existing strength or lack of regulations regarding coastal development.

Hurricanes

Hurricanes were probably responsible for maintaining coastal beach habitat upon which beach mice depend through repeated cycles of destruction, alteration, and recovery of dune habitat. Hurricanes generally produce damaging winds, storm tides and surges, and rain and can result in severe erosion of the beach and dune systems. Overwash and blowouts are common on barrier islands. Hurricanes can impact beach mice either directly (e.g., drowning) or indirectly (e.g., loss of habitat). Depending on their frequency, storms can affect beach mice on either a short-term basis (e.g., temporary loss of habitat) or long term (e.g., loss of food, which in turn may lead to increased juvenile mortality, resulting in a depressed breeding season). How hurricanes affect beach mice also depends on the characteristics (winds, storm surge, rainfall), the time of year (within or outside of the nesting season), and where the northeast edge of the hurricane crosses land.

Because of the limited remaining habitat, frequent or successive severe weather events could compromise the ability of certain populations of beach mice to survive and recover. Beach mice evolved under natural coastal environmental events such as hurricanes. The extensive amount of predevelopment coastal beach and dune habitat allowed beach mice to survive even the most severe hurricane events. It is only within the last 20 to 30 years that the combination of habitat loss to beachfront development and destruction of remaining habitat by hurricanes has increased the threat to beach mice survival and recovery. On developed beaches, typically little space remains for sandy beaches to become re-established after periodic storms. While the beach itself moves landward during such storms, reconstruction or persistence of structures at their prestorm locations can result in a major loss of habitat for beach mice.

The 2004 hurricane season was the most active storm season in Florida since weather records began in 1851. Hurricanes Charley, Frances, Ivan, and Jeanne, along with Tropical Storm Bonnie, damaged the beach and dune system, upland structures and properties, and infrastructure in the majority of Florida's coastal counties. The cumulative impact of these storms exacerbated erosion conditions throughout the state.

The 2005 hurricane season was a record-breaking season with 27 named storms. Hurricanes Dennis, Katrina, Ophelia, Rita, and Wilma, and Tropical Storms Arlene and Tammy impacted Florida. The cumulative impact of these storms exacerbated erosion conditions in south and northwest Florida.

Beachfront Lighting

Artificial lighting along developed areas of both coastlines continues to cause increase susceptibility to predators, altered foraging and breeding habits which impact beach mouse recovery. While a majority of coastal local governments and counties have adopted beachfront lighting ordinances compliance and enforcement is lacking in some areas. Further, the lighting in areas outside the beachfront ordinance coverage areas continues to be unregulated resulting in

urban glow. Even the darker areas of conservation managed lands are subject to surrounding sky glow.

Predation

A major continuing threat to beach mice is predation by free-roaming cats and other nonnative species. The domestic cat is not native to North America and is considered a separate species from its wild ancestral species, *Felis silvestris*. Cats are hunters, retaining this behavior from their ancestors. However, wildlife in the western Hemisphere did not evolve in the presence of a small, abundant predator like the domestic cat, and thus did not develop defenses against them. Cats were introduced to North America a few hundred years ago.

Free-roaming pets prey on small mammals, birds, and other native wildlife. In the U.S., on a nationwide basis, cats kill over a billion small mammals and hundreds of millions of birds each year. Worldwide, cats are second only to habitat destruction in contributing to the extinction of birds. Cats have been documented to take beach mice, sea turtle hatchlings, shorebirds, and migratory birds. A significant issue in the recovery of beach mice is predation by free-ranging pet and feral cats. Beach mice have a number of natural predators including snakes, owls, herons, and raccoons. Predation is part of the natural world. However, predation pressure from both natural and nonnative predators may result in the extirpation of small, local populations of beach mice in a very short time (Bowen 1968, Linzey 1978).

Climate Change

Based on the present level of available information concerning the effects of global climate change on the status of beach mice and its designated critical habitat, the Service acknowledges the potential for changes to occur in the action area, but presently has no basis to evaluate if or how these changes are affecting beach mice or its designated critical habitat nor does our present knowledge allow the Service to project what the future effects from global climate change may be or the magnitude of these potential effects.

EFFECTS OF THE ACTION

Factors to be considered

Aspects of the sand placement and dredged material placement activities will occur within habitat that is used by beach mice year round. The activities include the storage of equipment, work vehicles, or materials and creation, expansion, or use of beach access points for sand placement activities or dredged material placement. The work, depending on the location, may be conducted any time of the year. Most effects would be expected to be temporary. These short-term and temporary impacts could include loss of foraging habitat, altered beach mouse movement and dispersal activities. Long-term and permanent impacts from the sand placement activities such as excavation of dune habitat and degradation could impact beach mice by fragmentation of their habitat including critical habitat for the PKBM, CBM, and SABM.

There are typically different "levels" of access sites needed for a project. The primary access is a "lay-down" yard, where pipe is delivered and stored, and storage trailers, and other equipment and materials are stored. These are typically big paved parking lots, so that the Corps's trucks can access the area to drop off and pick up equipment. There's typically a beach access at that point to get the pipe and equipment onto the beach and that access is usually at least 50-ft wide (pipe sections are typically 40 to 50 feet long). In NW Florida and Alabama, these yards have been approximately eight miles apart.

“Intermediate areas" are used at about the quarter points of the project length. These are used for the fuel tank, welding equipment, and other items or systems that get used a couple of times a day. These locations can vary from two to three miles apart. In addition, there are access points to allow project vehicles and trucks on and off the beach. Based on previous projects it would be expected to have single-vehicle entry points at one-half to one-mile intervals.

Protective, avoidance, and minimization measures have been incorporated into the project plan to avoid or minimize the potential impacts from the sand placement and dredged material placement activities. However, even with these measures, impacts to beach mice are expected to occur from some aspects of the project activities. The activities are expected to directly or indirectly adversely affect beach mice and/or their habitat including designated critical habitat for the PKBM, CBM, and SABM. The work may occur on public and/or private lands.

Proximity of Action: Some aspects of the sand placement and dredged material placement activities would occur directly in beach mouse habitat. The storage or staging of pipe and other equipment, and vehicles, use or creation of beach access points, and placement of pipe, nourishment or dredged material could occur in habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM. Beach mice spend their entire life cycle within the coastal dune system.

Distribution: The storage or staging of pipe and other equipment and vehicles and use of beach access points that could occur in habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM may vary depending on the individual project length and existing beach accesses and non-beach mouse habitat that can be used for storage and staging.

Timing: The timing of the activities would directly and indirectly impact beach mice and their habitat depending on the season. Beach mice reproduce year-round with more mice being produced in the late winter and early spring. Impacts could include but would not be limited to disrupting mice seeking mates, constructing nest burrows, foraging for food, caring for their young, and young mice leaving the nest burrow dispersing into new habitat.

Nature of the Effect: The effects of the activities may include the temporary loss of habitat including the loss of a few beach mice from excavation of habitat for beach access and reduction of beach mouse activity including feeding, reproduction, and movement from loss or alteration of habitat. Activities that decrease the amount or quality of dune habitat or movement could affect beach mice by reducing the amount of available habitat and fragmenting the habitat.

Duration: Time to complete the project construction may vary depending on the project length, weather, and other factors (equipment mobilization and break downs, availability of fuel, lawsuits, etc.). Project work could take as little as a month and as long as a one or two years. Beach mouse habitats would remain disturbed until the project is completed and the habitats are restored. Dune restoration could be complete from 6 to 12 months after the project has been completed. The short generation time of beach mice combined with the time frames provided in this document (projects from 1 month to 2 years, dune restoration 6 to 12 months following project completion) will impact multiple generations of beach mice. The time to complete a project and restore the habitat can be a complete loss of habitat availability and use for multiple generations of beach mice.

Disturbance frequency: Depending on the sand placement activity and dredging project frequency, this could result in impacts to beach mice and their habitats at any time during the year on a minimum cycle of every 2 years. Following initial sand placement, activities could occur every year depending on the project location and erosion events. The actual number of times the sand placement would occur is unknown. Following initial sand placement or dredge material placement, maintenance activities could occur every two to 10 years depending on the project location and situation (erosion, long shore sand transportation, upstream activities, and weather events). Thus, impacts related to the subject activities would be expected to occur no more often than every two to three years. However, while not anticipated, work could occur annually in response to emergency events. The actual number of times the nourishment and dredging material disposal activities is unknown but can be based on previous work.

Disturbance intensity and severity: Depending on the frequency needed to conduct the nourishment and dredged material work and the existence of staging areas and beach access points, effects to the recovery of beach mouse may vary. However, the action area encompasses entire range of each subspecies and the overall intensity of the disturbance is expected to be minimal. The severity is also likely to be slight as few if any mice would be lost and dune habitats can be restored quickly if protected from other impacts (pedestrians and vehicles).

The staging and storage of equipment and materials and beach access points could occur within habitat occupied or used by SEBM, AIBM, PKBM, CBM, and SABM and could be adjacent to designated critical habitat for the PKBM, CBM, and SABM. Beach mice are permanent inhabitants of the coastal ecosystem conducting all their life cycles in this environment. While the current status of individual beach mouse subspecies is unknown, their general distribution is known.

Analysis for effects of the action

The action area consists of the Atlantic or Gulf beachfront including the wet and dry unvegetated beach, developing foredunes and interdunal swales, and areas that were formerly primary or secondary dunes. Sand placement or dredged material placement work would not occur on existing vegetated primary or secondary dunes. However, construction of or expansion of an existing beach access could be located through scrub, secondary, or primary dunes. Beach mice

would generally be found inhabiting stable primary, secondary, and scrub dunes on a permanent basis with other habitats being used periodically on a daily or seasonal basis for feeding and movement. Some of these areas also include critical habitat.

Direct and Indirect Impacts

Direct impacts are effects of the action on the species occurring during project implementation and construction (sand placement or dredged material placement). Direct loss of individual beach mice may occur during the creation or expansion of beach access points when heavy equipment clears the habitat and packs the sand. In general the length of time between project maintenance work is expected to be sufficient for beach mouse habitat to be restored. Thus, it is not anticipated that the nourishment and dredged material placement activities would result in permanent beach mouse habitat destruction (including critical habitat). However, habitat for all the beach mouse subspecies and critical habitat for the PKBM, CBM, and SABM that provides food or cover may be temporarily destroyed or altered from the activities.

Indirect effects are a result of a proposed action that occur later in time and are reasonably certain to occur. The indirect effect of the sand placement and dredged material placement activities would be newly created or expanded existing beach access points that act as barriers to beach mouse movement for foraging, or population expansion or dispersal. Maintaining the connectivity among habitats is vital to persistence of beach mice recovery. Recovery actions needed to assure the connectivity include restoration and maintenance of the dune system following project completion.

For the Service to determine if the project impacts on designated critical habitat would be an adverse modification, the Service shall determine if the impact on the habitat appreciably diminishes the capability of the critical habitat to satisfy essential requirements of beach mice. The long-term maintenance of the beach mouse populations in the project areas could be compromised if the sand placement and dredged material placement activities occur too frequently resulting in a long-term barrier to mice movement. However, our evaluation indicates the impacts to critical habitat should be temporary in nature based on past history of nourishment projects. In addition, the area to be directly affected within the individual subspecies would be a small percentage of the overall critical habitat and would not be expected to reduce the carrying capacity of the recovery unit or appreciably diminish the ability of the PCE's to provide for the essential functions of the critical habitat units.

Species' response to a proposed action

This SPBO is based on effects that are anticipated to beach mice (all life stages) as a result of the temporary physical disturbance of beach mice habitat from beach nourishment or dredged material placement and associated activities. Some individual beach mice (all life stages) may be lost during the initial construction or expansion of beach accesses where heavy equipment destroys dune habitat and compacts the sand within the access corridor. Any mice that survive the initial construction may move outside of the disturbed area and construct burrows elsewhere in the vicinity. This will result in increased exposure to predation due to the removal of their burrows.

Following access construction, a bare gap of sand could form a barrier to limit beach mouse movement within the area altering regular movement patterns. The bare areas could not be used for foraging, breeding or sheltering. These impacts are expected to be limited to the construction phase of the project (one month to two years). As the life span of a beach mouse is estimated to be approximately nine months, the loss of individual mice or the temporary loss of habitat could affect several generations of beach mice, but because beach mice can reproduce rapidly with adequate resources, colonization or recolonization of the restored habitat would be expected.

Beach mice have evolved to adapt to catastrophic weather events. Additional factors such as surrounding development pressure and nonnative predators may affect the species' ability to recover from the loss of individuals. However, the temporary loss of the habitat itself is not expected to permanently impact the populations as all beach mouse habitat within the project areas not permanently destroyed would be restored or maintained as part of the conservation measures committed to by the Corps or the Applicant. The temporary nature of the impacts to dune habitats is not expected to alter the function and conservation role of the remaining beach mouse habitat including designated critical habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this SPBO. Future Federal actions that are unrelated to the proposed project are not considered in this opinion and require separate consultation pursuant to section 7 of the Act.

It is reasonably certain to expect that coastal development, human occupancy and recreational use along the Atlantic and Gulf coasts of Florida will increase in the future. Redevelopment along with new developments following the hurricane seasons of 2004 and 2005 are occurring as allowed by local zoning standards. It is unknown how much influence a nourished beach would contribute to the development and recreational use of the shoreline. Any projects that are within endangered or threatened species habitat will require section 7 consultation or section 10(a) (1)(B) permitting from the Service.

In recognizing the importance of coastal barrier islands along the Atlantic and Gulf coasts, Congress passed the Coastal Barrier Resources Act (CBRA) of 1982 and Coastal Barrier Improvement Act in 1991. The purpose of CBRA is "…to minimize the loss of human life, wasteful expenditure of Federal revenues, and the damage to fish, wildlife, and other natural resources associated with the coastal barriers along the Atlantic and Gulf coasts by restricting future Federal expenditures and financial assistance which have the effect of encouraging development of coastal barriers." Congress established the Coastal Barrier Resources System units that apply to the CBRA.

Escambia County is currently in the final permitting stages of a beach nourishment project for Perdido Key. The project would cover approximately 4 miles of beachfront along county and private lands, not including state and Federal lands. The Service completed an endangered species

consultation for the project in 2008. The project construction is expected to begin in late 2009-2010. The beach nourishment project is likely to enhance beach mouse habitat by providing an additional buffer to the dune habitats from storm events.

The Pensacola Naval Air Station has proposed to dredge their navigation channel resulting in the need to place eight million cubic yards of dredged material that is beach compatible. Because of cost, Perdido Key is the closest area to receive the material. Receiving areas include the Perdido Key Gulf beachfront (in lieu of the County implementing their project described above), PKSP, and GINS, Escambia County. The project could result in the placement of dredged material on 16 miles of beachfront including private, county, state, and Federal lands. The Navy has received their permits to complete the project. The Service completed an endangered species consultation for the project in 2007. The full project is on hold due to funding. However, the Federal navigation channel in the lower portion of the project area is expected to be maintenance dredged in 2009-2010.

Gulf County is currently completing a beach restoration project on St. Joseph peninsula and St. Joseph Peninsula State Park. The project will cover approximately 7.5 miles of Gulf of Mexico beachfront. The Service completed an endangered species consultation for the project. The project was completed in 2008.

CONCLUSION

Sea Turtles

After reviewing the current status of the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles, the environmental baseline for the action area, the effects of the proposed activities, the "Conservation Measures," and the cumulative effects, it is the Service's biological opinion that work conducted under the Statewide Programmatic action, as proposed, is not likely to jeopardize the continued existence of the loggerhead, green, leatherback, hawksbill or Kemp's ridley sea turtles. Critical habitat has been designated for the NWAO DPS of the loggerhead sea turtle. **Table 4** has the list of the critical habitat units within the project area.

The conservation of the five loggerhead recovery units in the Northwest Atlantic is essential to the recovery of the loggerhead sea turtle. Each individual recovery unit is necessary to conserve genetic and demographic robustness, or other features necessary for long-term sustainability of the entire population. Thus, maintenance of viable nesting in each recovery unit contributes to the overall population. Three of the five loggerhead recovery units in the Northwest Atlantic occur within the action area, the PFRU, the DTRU, and the NGMRU. Sand placement is not expected to occur within the DTRU. The NGMRU averages about 1,000 nests per year. Northwest Florida accounts for 92 percent of this recovery unit in nest numbers (920 nests) and consists of approximately 234 miles of nesting shoreline. Of the available nesting habitat within the NGMRU, with most sand placement projects have a project life of five to seven years and channel maintenance activities occurring every two to three years, on average, sand placement impacts will

occur on 8.8 miles of sea turtle nesting shoreline per year. This is based on the average linear feet of beach on which sand placement occurred during nonemergency years from 2001 to 2008.

The PFRU averages 64,513 nests per year. The entire recovery unit occurs within Florida and consists of approximately 595 miles of sandy shoreline (http://www.dep.state.fl.us/beaches/publications/pdf/fl_beach.pdf). Of the available nesting habitat within the PFRU, sand placement activities will occur on 18.9 miles of nesting shoreline per year during nonemergency years. This is based on the average linear feet of beach on which sand placement occurred during non-emergency years from 2001 to 2008.

Generally, green, leatherback, hawksbill, and Kemp's ridley nesting overlaps with or occurs within the beaches where loggerhead sea turtles nest on both the Atlantic and Gulf of Mexico beaches. Thus, for green, leatherback, hawksbill, and Kemp's ridley sea turtles, sand placement activities will affect an average of 27.7 miles of shoreline per year. This is based on the average linear feet of beach on which sand placement occurred during nonemergency years from 2001 to 2008.

For all species of sea turtles, post-hurricane sand placement activities occurred on approximately 205 miles of shoreline for the 2004-2005 period following the emergency events (declared disasters and Congressional Orders). These activities are within the approximately 1,400 miles of available sea turtle nesting habitat in the southeastern U.S.

Research has shown that the principal effect of sand placement on sea turtle reproduction is a reduction in nesting success, and this reduction is most often limited to the first year following project construction. Research has also shown that the impacts of a nourishment project on sea turtle nesting habitat are typically short-term because a nourished beach will be reworked by natural processes in subsequent years, and beach compaction and the frequency of escarpment formation will decline. Although a variety of factors, including some that cannot be controlled, can influence how a nourishment project will perform from an engineering perspective, measures can be implemented to minimize impacts to sea turtles.

Beach Mice

The PKBM, CBM, and SABM occur on both public and private lands throughout their historical ranges. Both the SEBM and the AIBM are located completely on county, state, or federally protected lands, except for a small area in St. Johns County in which the AIBM are found on private lands along the Florida coast.

After reviewing the current status of the species of the SEBM, AIBM, PKBM, CBM, and SABM, the environmental baseline for the action area, the effects of beach nourishment and dredged material placement and associated activities, the "Conservation Measures," and the cumulative effects, it is the Service's biological opinion that the Statewide Programmatic action for these projects, as proposed, is not likely to jeopardize the continued existence of any of the above subspecies of beach mice and is not likely to destroy or adversely modify designated critical habitat for the PKBM, CBM, or SABM.

As discussed in the Effects of the Action section of this SPBO, we would not expect the carrying capacity of beach mouse habitat within the action area to be reduced. Beach mouse habitat will continue to provide for the biological needs of the subspecies as demonstrated below:

1. No permanent loss of beach mouse habitat will occur within the action area from the project construction or maintenance;

2. Temporary impacts to beach mouse habitat will be restored within the action area after project completion; and

3. A full complement of beach mouse habitat will remain within the action area after project completion.

Temporary impacts are expected to be limited to the construction/maintenance phase of the project and habitat restoration period following the project, which could be completed between one month and two years.

While a few beach mice may be lost, beach mice recover well from population size reductions (Wooten 1994) given sufficient habitat is available for population expansion after the bottleneck occurs. Therefore, we do not consider the potential loss of individuals to be significant.

Also, 50 feet of beach mouse critical habitat for each subspecies (PKBM, CBM, and SABM) could be temporarily affected each time a project is completed as a result of the sand placement activities. We would not anticipate that the loss of the critical habitat would alter or affect the remaining critical habitat in the action area for each subspecies (PKBM, CBM, and SABM) to the extent that it would appreciably diminish the habitat's capability to provide the intended conservation role for the subspecies in the wild.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the

agency action is not considered to be prohibited under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary and shall be implemented by the Corps so that they become binding conditions of any grant or permit issued to the Applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps shall report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF ANTICIPATED TAKE

Sea Turtles

The Service anticipates that no more than 27.7 miles of highly eroded shoreline along the Florida coastline (no more than 8.8 miles within the NGMRU and no more than 18.9 miles within the PFRU) would receive sand placement per year during nonemergency calendar years with a maximum of 102 miles of shoreline (38 miles within the NGMRU and 64 miles of shoreline within the PFRU) receiving sand during or following an emergency event (declared disaster or Congressional Order) as a result of the Statewide Programmatic action. This represents two percent of the entire shoreline per year during a nonemergency year and seven percent of the entire shoreline during an emergency year. Over the last 10 years, one Congressional Order occurred due to emergency events in the 2004-2005 period. The increased sand placement on 102 miles of shoreline is expected to occur once in a 10-year period due to emergency events. Incidental take of sea turtles will be difficult to detect for the following reasons:

1. Turtles nest primarily at night and all nests are not located because
    a. Natural factors, such as rainfall, wind, and tides may obscure crawls; and
    b. Human-caused factors, such as pedestrian and vehicular traffic, may obscure crawls, and result in nests being destroyed because they were missed during a nesting survey and egg relocation program;

2. The total number of hatchlings per undiscovered nest is unknown;

3. The reduction in percent hatching and emerging success per relocated nest over the natural nest site is unknown;

4. An unknown number of females may avoid the project beach and be forced to nest in a less than optimal area;

5. Lights may misdirect an unknown number of hatchlings and cause death; and

6. Escarpments may form and prevent an unknown number of females from accessing a suitable nesting site.

However, the level of take of these species due to disturbance and sand placement on suitable turtle nesting beach habitat can be anticipated because (1) turtles will continue to nest within the project site during and following sand placement; (2) sand placement activities will likely occur during a portion of the nesting season; (3) sand placement activities will modify the incubation substrate, beach slope, and sand compaction; and (4) artificial lighting will deter or misdirect nesting females and hatchlings during and following sand placement.

Take is expected to be in the form of: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the project areas; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the projects; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the sand placement areas or on adjacent beaches during sand placement or construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service.

According to Schroeder (1994), there is an average survey error of seven percent; therefore, there is the possibility that some nests within the Action Area may be misidentified as false crawls and missed. However, due to implementation of the sea turtle protection measures, we anticipate that the take will not exceed seven percent of the nesting average in the action area. This number is not the level of take anticipated because the exact number cannot be predicted nor can the level of incidental take be monitored.

Beach Mouse

The Service has reviewed the biological information and other information relevant to this action. Based on this review, incidental take is anticipated from the sand placement activities may occur any time of the year within a ten-year period. The Service anticipates incidental take of beach mice would be difficult to detect for the following reasons: (1) an unknown number of beach mice may be injured, crushed or buried during beach access construction work and remain entombed in the sand; (2) beach mice are nocturnal, are small, and finding a dead or injured body is unlikely because of predation, and (3) changes in beach mouse essential life behaviors may not be detectable in standardized monitoring surveys.

For projects that occur within beach mouse habitat it is anticipated that no more than 50 linear feet of beach mouse habitat could be affected per sand placement activity for beach access within a subspecies range statewide as a result of the sand placement activities.

The incidental take is expected to be in the form of: (1) harm or harassment to all beach mice occupying the created or expanded beach access points; (2) harassment of beach mice from disturbance of foraging opportunities within the access areas during the construction period; (3) harassment of beach mice from temporary loss of foraging and burrow habitat; and (4) harassment of beach mice from temporary restriction of movement across access areas.

EFFECT OF THE TAKE

Sea Turtles

In the SPBO, the Service determined that the level of anticipated take is not likely to result in jeopardy to the loggerhead, green, leatherback, hawksbill or Kemp's ridley sea turtles. Loggerhead critical habitat has been designated in the project area. Based on the Corps incorporation of the conservation measures into the project, the Service concurs that the project may affect but is not likely to adversely affect nor adversely modify NWAO loggerhead critical habitat in the terrestrial environment. The Corps will consult with the NMFS on any impacts to critical habitat in the marine environment.

Incidental take of loggerhead nesting and hatchling sea turtles and sea turtle nests is anticipated to occur during project construction and during the life of the project. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU and 18.9 miles of shoreline per year within the PFRU during a nonemergency year. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where groin maintenance is located but is not expected to exceed 102 miles of shoreline (38 miles of shoreline per year within the northwest portion of Florida for the NGMRU and 64 miles of shoreline per year within the PFRU) during an emergency (declared disasters or Congressional Orders) year. The increased sand placement of 102 miles of shoreline is expected to occur once in a 10-year period due to emergency events.

Incidental take of green, leatherback, hawksbill and Kemp's ridley nesting and hatchling sea turtles and sea turtle nests is anticipated to occur during project construction and during the life of the project or while placed sand remains on the beach. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 27.7 miles (8.8 miles within the northwest portion of Florida and 18.9 miles within the northeast, south and west portion of Florida) of shoreline per year during a nonemergency year. Take will occur on nesting habitat consisting of the length of the beach where the material will be placed or where jetty or groin maintenance is located but is not expected to exceed 102 miles of shoreline (38 miles of shoreline per year within the northwest portion of

Florida for the NGMRU and 64 miles of shoreline per year within the PFRU) during an emergency (declared disasters or Congressional Orders) year.

Beach Mouse

In the SPBO, the Service determined that this level of anticipated take is not likely to result in jeopardy to AIBM, SEBM, PKBM, CBM, and SABM or in adverse modification or destruction of designated critical habitat for the PKBM, CBM, or SABM. Critical habitat for the SEBM and AIBM has not been designated; therefore, the project will not result in destruction or adverse modification of critical habitat for these subspecies.

Incidental take of SEBM, AIBM, PKBM, CBM, and SABM is anticipated to occur at beach access locations for the sand placement activities. Take will occur during project construction where beach access points are expanded or created and where equipment is staged or stored within beach mouse habitat along approximately 50 feet of vegetated dunes for beach access.

REASONABLE AND PRUDENT MEASURES

The Service has determined that the following reasonable and prudent measures are necessary and appropriate to minimize take of the loggerhead, green, leatherback, hawksbill, and Kemp's ridley sea turtles; SEBM, AIBM, CBM, PKBM, and SABM in the action area for the following activities:

A. Sand placement from beach nourishment, sand bypass, and sand back pass activities;

B. Sand placement from navigation channel maintenance; and

C. Groin and jetty repair or replacement.

If the Corps is unable to comply with the Reasonable and Prudent Measures and Terms and Conditions, the Corps as the construction agent or regulatory authority may:

1. Inform the Service why the term and condition is not reasonable and prudent for the specific project or activity and request exception under the SPBO or
2. Initiate consultation with the Service for the specific project or activity. The Service may respond by either of the following:
    a. Allowing an exception to the terms and conditions under the SPBO or
    b. Recommending or accepting initiation of consultation (if initiated by the Corps) for the specific project or activity.

Post construction requirements are listed in Reasonable and Prudent measures, A11, A12, A13, and A14. These post construction requirements may besubject to congressional authorization and the allocation of funds. Florida State statutes apply. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps must reinitiate consultation.

REASONABLE AND PRUDENT MEASURES for:

A. Projects that include sand placement from beach nourishment, sand bypass, and sand back pass activities primarily for shore protection (these projects are usually larger scaled) shall include the following measures:

A1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice shall be implemented in the Corps federally authorized project or regulated activity.

A2. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence and beach mouse burrow construction shall be used for sand placement.

A3. Sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching, to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation. In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties, sand placement shall not occur from May 1 through October 31. In St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte counties, sand placement shall not occur from June 1 through September 30. This time frame does not include Venice Beach and which has low density nesting. In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte (except Manasota Key), Sarasota (except Manasota Key), Manatee, Hillsborough, Pinellas, Franklin (except St. George Island), Gulf (except St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas), Bay, Walton, Okaloosa, Santa Rosa, and Escambia counties, Florida, sand placement may occur during the sea turtle nesting season.

A4. All derelict material or other debris shall be removed from the beach prior to any sand placement.

A5. The beach profile template for the sand placement project shall be designed to mimic, the native beach berm elevation and beach slopes landward and seaward of the equilibrated berm crest.

A6. If a dune system is already part of the project design, the placement and design of the dune shall emulate the natural dune system to the maximum extent possible, including the dune configuration and shape.

A7. Predator-proof trash receptacles shall be installed and maintained at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice.

A8. A meeting between representatives of the Applicant's or Corps, Service, FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on this project.

A9. If the beach nourishment project will be conducted during the sea turtle nesting season, surveys for nesting sea turtles must be conducted by the FWC-authorized Marine Turtle Permit Holder. Surveys for early and late nesting sea turtles shall be conducted where appropriate.

A10. If nests are constructed in the area of proposed sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

A11. A post construction survey(s) of all artificial lighting visible from the project beach shall be completed by the Applicant or Corps.

A12. The Applicant or Corps shall ensure that daily nesting surveys are conducted by the FWC Marine Turtle Permit Holder for two nesting seasons following construction if the new sand still remains on the beach.

A13. Sand compaction shall be monitored and tilling shall be conducted if needed to reduce the likelihood of impacting sea turtle nesting and hatching activities.

A14. Escarpment formation shall be monitored and leveling shall be conducted if needed to reduce the likelihood of impacting nesting and hatchling sea turtles.

A15. Construction equipment and materials including pipes shall be stored off the beach in a manner that will minimize impacts to nesting and hatchling sea turtles and beach mice.

A16. Lighting associated with the project construction including on the dredge shall be minimized to reduce the possibility of disrupting and disorienting nesting and hatchling sea turtles and nocturnal activities of beach mice.

A17. During the sea turtle nesting season, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length if a FWC permit holder is present) between dusk and the time of completion the following day's nesting survey to reduce the impact to emerging sea turtles and burial of new nests.

A18. All vegetation planting shall be designed and conducted to minimize impacts to sea turtles and beach mice.

A19. Beach mouse habitat shall be avoided to the maximum extent possible when selecting sites for access corridors, storage and staging of equipment.

A20. Equipment and construction materials shall not be stored near the seaward dune toe in areas of occupied beach mouse habitat. This area is highly utilized by beach mice.

A21. Existing vegetated habitat at beach access points and travel corridors shall be protected to the maximum extent possible to ensure vehicles and equipment transport stay within the access corridor.

A22. Expanded or newly created beach access points shall be restored following construction.

A23. A report describing the actions taken shall be submitted to the Service following completion of the proposed work.

A24. The Service and the FWC shall be notified if a sea turtle adult, hatchling, or egg, or beach mouse is harmed or destroyed as a direct or indirect result of the project.

TERMS AND CONDITIONS

All conservation measures described in the Corps' Programmatic Biological Assessment are hereby incorporated by reference as Terms and Conditions within this document pursuant to 50 CFR §402.14(I) with the addition of the following Terms and Conditions. In order to be exempt from the prohibitions of section 9 of the Act, the Corps shall comply with the following Terms and Conditions, which implement the Reasonable and Prudent Measures, described above and outline reporting/monitoring requirements.

These Terms and Conditions are nondiscretionary.

Post construction requirements are listed in Terms and Conditions A11, A12, A13, and A14. These post construction requirements may be subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Terms and Conditions, the Corps must reinitiate consultation.

TERMS AND CONDITIONS for:

A. Projects that include sand placement from beach nourishment, sand bypass, and sand back pass activities primarily for shore protection shall include the following conditions:

All beaches

A1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice listed on pages 9 and 10 of the SPBO shall be implemented in the Corps federally authorized project or regulated activity.

A2. Beach-compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. 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. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). If a variance is requested from FDEP, the Service must be contacted to discuss whether the project falls outside of the SPBO. A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

A3. Sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

a. Sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward counties shall be started after October 31 and be completed before May 1. During the May 1 through October 31 period, no construction equipment or pipes may be placed and/or stored on the beach.

b. Sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties may occur during the sea turtle nesting season except on publicly owned conservation lands such as state parks and areas where such work is prohibited by the managing agency or under applicable local land use codes (see exceptions in A3.c below).

c. For higher density nesting beaches in Gulf and Franklin counties sand placement shall not occur during the main part of the nesting season (June 1 through September 30). On Manasota Key located in Sarasota and Charlotte counties (excluding Venice Beach), sand placement shall not occur during the main part of the nesting season (May 1 through October 31). These beaches include St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, and St. George Island in Franklin County.

The Service shall be contacted for coordination, on a project-by-project basis, if sand placement is needed on publicly owned conservation lands and in these higher density nesting beaches in Gulf and Franklin Counties and on Manasota Key in Sarasota and Charlotte counties during the above exclusionary period. The Service will determine whether work (1) may proceed in accordance with the Terms and Conditions; (2) may proceed in accordance with the Terms and Conditions and other requirements as developed by the Service; or (3) would require an individual emergency consultation.

Land managers on publicly owned conservation lands must be involved in the project coordination.

A4. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach to the maximum extent possible prior to any sand placement in accordance with the dates in A3. If debris removal activities take place during shorebird breeding or peak sea turtle nesting season (**Tables 17 and 18**), the work shall be conducted during daylight hours only and shall not commence until completion of daily seabird, shorebird or marine turtle surveys each day.

A5. The beach profile template for the sand placement project shall be designed to mimic, the native beach berm elevation and beach slopes landward and seaward of the equilibrated berm crest. Prior to drafting the plans and specifications for a beach nourishment project, the Corps must meet with the Service, FWC, and FDEP to discuss the beach profile surveys, dune formation (specifically on high density green turtle nesting beaches), and the sea turtle monitoring reports from previous placement events. The meeting will be used to discuss modifications to the beach profile based on the post-construction monitoring data.

Beach profile may vary depending on location, shoreline dynamics, nature of the fill material, and other factors. If a native beach berm elevation is not possible, due to the beach width, impacts to nearshore hardbottom, or other considerations, as discussed during the meeting, the alternative template shall include features to minimize impacts to sea turtle nesting success and the potential for ponding and escarpment formation for that beach. For all high density green turtle nesting beaches (http://ocean.floridamarine.org/SeaTurtleNesting/), the formation of a dune, either through direct creation or natural accretion, will be included in the project design. Dunes and other construction features must be within the scope of the Congressionally-authorized project, if it is a civil works project, and constructible without impacting other resources. If a recommended dune is not possible, the Corps will contact the Service to see if consultation needs to be reinitiated or discuss features incorporated with the profile that will enhance the existing dune. Dune features included in the profile design (or project) shall have a slope of 1.5:1 followed by a gradual slope of 4:1 for approximately 20 feet seaward on a high erosion beach (**Figure 13)** or a 4:1 slope (**Figure 14**) on a low erosion beach. The Corps must explore options to include a dune system in the project design for existing authorized projects and new non-Federal projects. If another slope is proposed for use, the Corps shall consult the Service. The seaward toe of the dune should be at least 20 feet from the waterline.

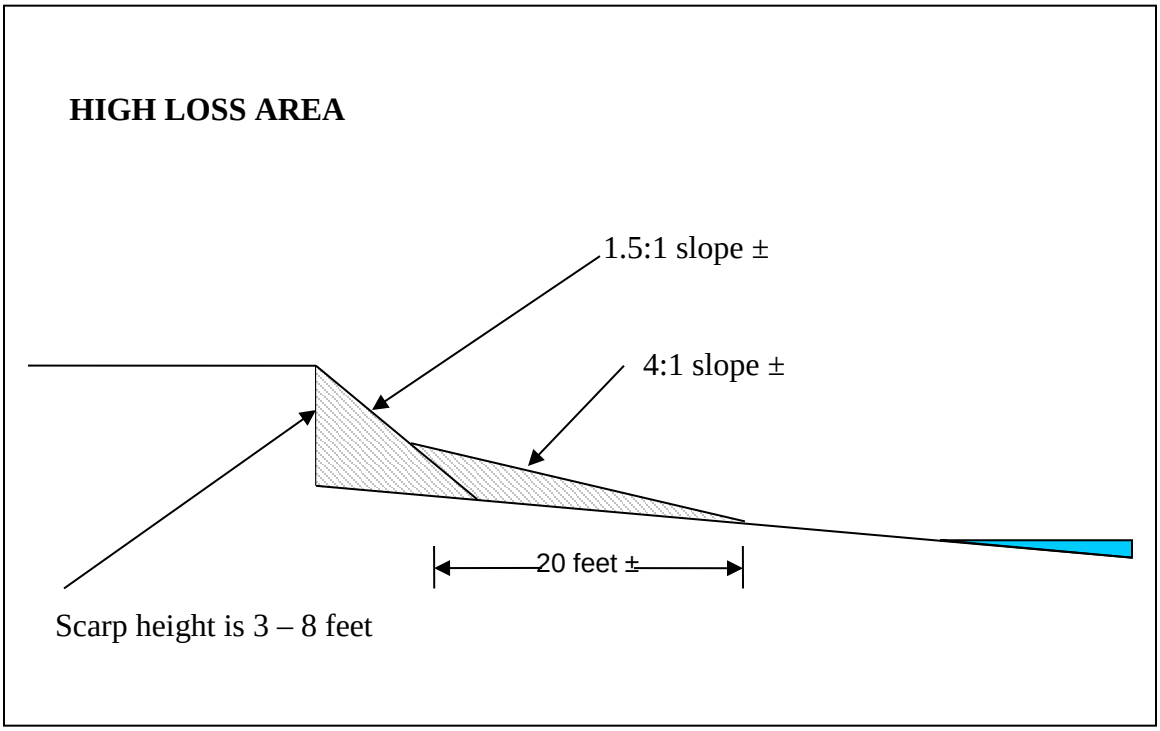

Figure 13. Recommended slope on a high erosion beach for sand placement projects that include the creation of a dune.

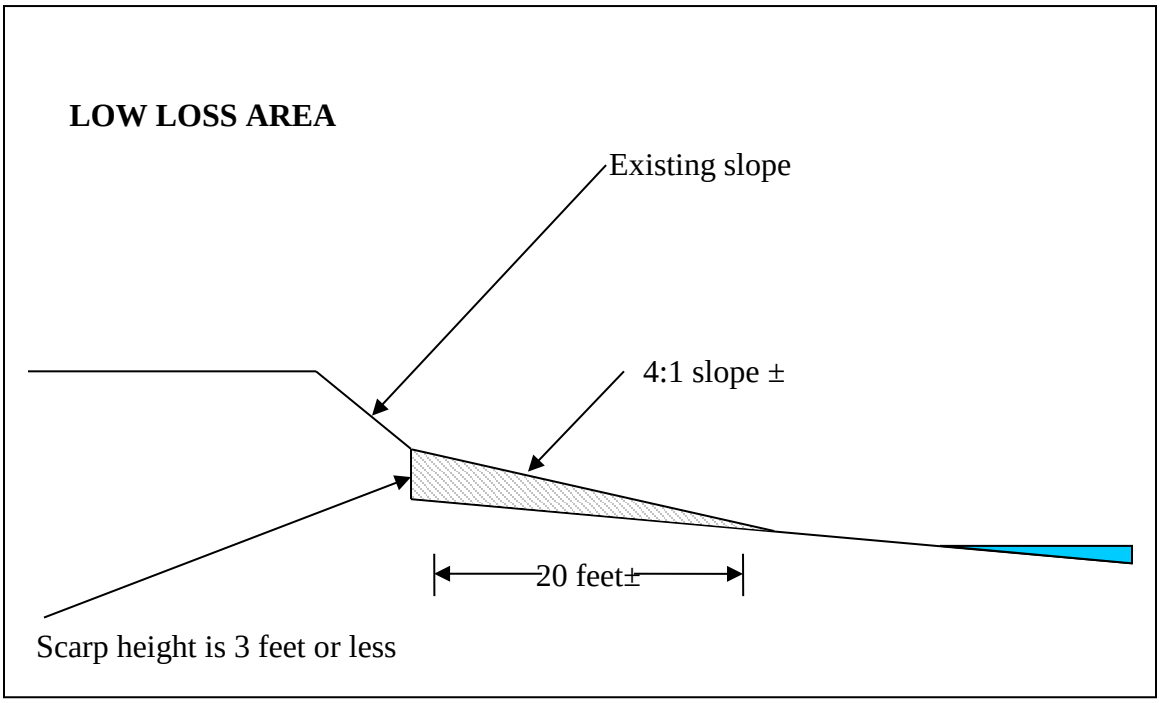

Figure 14. Recommended slope on a low erosion beach for sand placement projects that include the creation of a dune.

A6. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix F**). The Corps shall provide predator-proof trash receptacles for the construction workers. The Corps shall brief workers on the importance of not littering and keeping the project area trash and debris free.

A7. A meeting between representatives of the Corps (including the Corps project manager and/or the managing contractor), the Service, the FWC, the FWC Marine Turtle Permit Holder, and other species surveyors, as appropriate, shall be held prior to the commencement of work on projects. At least 10 business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle and beach mouse protection measures as well as additional guidelines when construction occurs during the sea turtle nesting season, and will include the following

a. Staging locations, storing equipment including fuel stations
b. Coordination with the Marine Turtle Permit Holder on nesting surveys and any nighttime work
c. Pipeline placement (between 5 to 10 feet from dune)
d. Minimizing driving
e. Egg relocation- permit holder and location (must be approved by FWC)
f. Free-roaming cat observation (for projects in or near beach mouse habitat)
g. Follow up lighting surveys - dates and inspector
h. Follow up coordination during construction and post construction
i. Coordination on construction lighting including dredge lighting and travel within and adjacent to the work area
j. Direction of the project including progression of sand placement along the beach
k. Late season nests present in project area (if any)
l. Plans for compaction monitoring or tilling
m. Plans for escarpment surveys

At the preconstruction meeting, the Corps shall also provide the Service with specific anticipated shoreline lengths and anticipated duration using the form on the following web link: http://www.fws.gov/northflorida/SeaTurtles/Docs/Corp%20of%20Engineers%20Sea%20Turtle%20Permit%20Information.pdf. Only the following information should be filled out: Corps Permit Number, FWS Log Number, Project Location, Construction Activity, Duration of Protect, and Actual Take (linear feet of beach). This form shall be emailed to the Service at seaturtle@fws.gov. This form is in addition to the annual report listed below.

Sea Turtle Protection

A8. Daily early morning surveys for sea turtle nests shall be required and continue throughout the season as outlined in **Tables 16 and 17 (Nesting Season Monitoring)** if construction

occurs during the nesting and hatching season. Any known nests recorded just prior to the beginning of Nesting Season Monitoring must be relocated if it will be impacted by the construction activity or marked and avoided if feasible.

Table 16. Beach Sand Placement and Sea Turtle Nest Monitoring/Relocation Windows, Brevard through Broward Counties, Coast of Florida.

Region	Nest Laying Season	Hatching Season Ends (Last day requiring prior monitoring/relocation)	Beach Placement Window	Early Season Relocation*	Late Season Relocation**	Nesting Season Monitoring (monitoring throughout season)
Brevard, Indian River, St. Lucie, and Broward Counties	25 Feb - 11 Nov	15 Jan	1 Nov - 30 Apr	1 Mar - 30 Apr In Brevard, Indian River, St. Lucie, & Broward counties nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded	65 days prior to Jan 15 (11 Nov) (or 65 days prior to start of construction **)	1 Mar - 11 Nov ***
Martin and Palm Beach Counties	12 Feb – 17 Nov	21 Jan	1 Nov - 30 Apr	1 Mar - 30 Apr In Martin and Palm Beach Counties, nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded	65 days prior to 21 Jan (17 Nov) (or 65 days prior to start of construction**)	1 Mar - 17 Nov***

** Relocation can only begin after FWC authorizes nest relocation in accordance with Florida Statute 379.2431 (1).
*** (For late season monitoring: 7 days without a nest, can stop monitoring once electronic mail concurrence is received from FWS or FWC).

Table 17. Beach Sand Placement and Sea Turtle Nest Monitoring/Relocation Windows, Outside of Brevard through Broward Counties, Coast of Florida.

Region	Nest Laying Season	Hatching Season Ends (Last day requiring prior monitoring/ relocation)	Beach Placement Window	Nesting Season Monitoring and Relocation (monitoring throughout season)
Nassau, Duval, Flagler, St. Johns, and Volusia Counties	2 Apr. – 24 Oct	28 Dec	All Year	15 Apr – 24 Oct ***
Miami-Dade County	11 Feb – 25 Sep	29 Nov	All Year	1 Mar – 25 Sep***
Gulf County (St. Joseph Peninsula State Park, St. Joseph peninsula, Cape San Blas) & Franklin County (St. George Isl)	1 May - 4 Sep	13 Nov	1 Oct - 31 May	1 May – 4 Sep***
All other beaches in Gulf and Franklin Counties, and Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties	2 May – 16 Sep	24 Nov	All Year	1 May - 16 Sep***
Sarasota and Charlotte Counties (Manasota Key)	24 Apr – 7 Sep	11 Nov	1 Nov - 30 Apr (except Venice beach)	15 Apr – 7 Sep***
All other beaches in Sarasota and Charlotte Counties	24 Apr – 12 Sep	16 Nov	All Year	15 Apr – 12 Sep***
Pinellas, Hillsborough, Manatee, Lee, Collier, and Monroe Counties	20 Apr – 19 Sep	23 Nov	All Year	15 Apr – 19 Sep***

*** (For late season monitoring: 7 days without a nest, can stop monitoring once electronic mail concurrence is received from FWS or FWC).

A9. If nests are constructed in the area of anticipated sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation as outlined in a through f. If nests are laid on the dune outside of the immediate sand placement area, the Corps must contact the Service to discuss whether relocation or mark and avoidance is required. Any known nests recorded just prior to the beginning of Nesting Season Monitoring must be relocated if it will be impacted by the construction activity or marked and avoided if feasible.

a. For sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties that occur during the earlier part of the nesting season (see Table 14) through April 30, daily early morning surveys shall begin March 1 and continue through the end of the beach placement window, with egg relocation continuing only until completion of fill placement. Eggs shall be relocated per the following requirements (i through iii below). For sand placement projects that occur during the period from November 1 through the end of hatching season (see Table 16), daily early morning sea turtle nesting surveys shall be conducted 65 days prior to project initiation and continue through November 11, and eggs shall be relocated per the requirements listed in (a)i through (a)iii. The Corps must contact the Service if there are any nests still incubating after November 30.

i. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at mtp@myfwc.com for information on the permit holder in the project area. Relocation cannot begin until the Corps has a copy of the FWC permit authorizing relocation for construction purposes at that particular sand placement project. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones).

ii. Only those nests that may be affected by sand placement activities will be relocated. Nest relocation shall not occur upon completion of the project. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, predation, or be subject to artificial lighting. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests.

iii. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the nourished berm prior to tilling shall be marked and left in situ unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity will occur within this area nor will any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

Daytime surveys shall be conducted for leatherback sea turtle nests beginning March 1. Nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded within the project area through April 30 or until completion of the project (whichever is earliest). Nightly nesting surveys shall be conducted from 9 p.m. until 6 a.m. The project area shall be surveyed at 1-hour intervals (since leatherbacks require at least 1.5 hours to complete nesting, this will ensure all nesting leatherbacks are encountered) and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

b. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties that occur during the period of sea turtle nest laying (**see Table 17**), daily early morning (before 9 a.m.) surveys and egg relocation shall be conducted. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin, Gulf, Sarasota, and Charlotte Counties in A10.d. below).

c. For Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, nesting surveys shall be initiated 70 days prior to sand placement activities (incubation periods are longer in these counties) or by nesting season monitoring (see Table 17) whichever is later. Nesting surveys shall continue through the end of nesting season monitoring (see Table 17) with relocation only through the end of fill placement. Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin and Gulf Counties in A10.d. below).

d. For St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte Counties, sand placement activities shall occur only during the Beach Placement Window indicated in Table 17 (except on Venice Beach), outside the period of peak sea turtle egg laying and egg hatching for this area. If nests are laid

in the early part of the nesting season monitoring during the beach placement window in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

e. For Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by the beginning of the nesting season monitoring indicated in Table 17 whichever is later. Nesting surveys shall continue through the end of nesting season monitoring (see Table 17), with egg relocation continuing only through the end of fill placement. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Sarasota and Charlotte Counties in A10.d. above).

f. For Miami-Dade County, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by the beginning of the nesting season monitoring indicated in Table 17, whichever is later. Nesting surveys shall continue through the end of the nesting season monitoring and egg relocation shall continue through the end of sand placement. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii

g. For Volusia, Flagler, St. Johns, Duval, and Nassau Counties, nesting surveys shall be initiated 65 days prior to sand placement activities or by the beginning of the nesting season monitoring indicated in Table 17, whichever is later. Nesting surveys shall continue through the end of nesting season monitoring indicated in Table 17 and egg relocation shall continue through the end of sand placement. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

A10. Two surveys shall be conducted of all lighting visible from the beach placement area by the Applicant or Corps, using standard techniques for such a survey (**Appendix C**), in the year following construction. The first survey shall be conducted between May 1 and May 15 and a fill out FWS Sea Turtle Lighting Survey Form (**Appendix D**) and send electronically to seaturtle@fws.gov. The second survey shall be conducted between July 15 and August 1. A summary report of the surveys, including any actions taken, shall be submitted to the Service by December 31 of the year in which surveys are conducted. After the annual report is completed, a meeting shall be set up with the Applicant, county or municipality, FWC, Corps, and the Service to discuss the survey report, as well as any documented sea turtle disorientations in or adjacent to the project area. If the project is completed during the nesting season and prior to May 1, the Corps may conduct the lighting surveys during the year of construction.

A11. Daily nesting surveys shall be conducted for two nesting seasons following construction in accordance with **Table 18** and reported in accordance with **Table 20** by the Corps or the Applicant if placed material still remains on the beach. Post construction year-one surveys shall record the number of nests, nesting success, reproductive success, disorientations, and lost nests due to erosion and/or inundation. Post construction year-two surveys shall only need to record nest numbers, nesting success, and disorientations (**Table 20**). This information will be used to periodically assess the cumulative effects of these projects on sea turtle nesting and hatchling production and monitor suitability of post construction beaches for nesting.

Table 18. Post-Construction Sea Turtle Monitoring.

Region	Nest Laying Season	Years 1 and 2 Post-Construction Monitoring
Brevard, Indian River, St. Lucie, and Broward Counties Martin and Palm Beach Counties	25 Feb – 11 Nov 12 Feb – 17 Nov	Daily surveys: 1 Mar - 31 Oct (for late season: 15 days without a nests, can stop monitoring-email FWS and FWC to stop
Nassau, Duval, and St. Johns, Counties	2 Apr. – 24 Oct.	Daily surveys: 1 May – 30 Sep
Flagler and Volusia Counties	2 Apr. – 24 Oct.	Daily surveys: 15 Apr- 15 Oct
Miami-Dade County	11 Feb – 25 Sep	Daily surveys: 1 Apr – 30 Sep
Gulf County (St. Joseph Peninsula State Park, St. Joseph peninsula, Cape San Blas) and Franklin County (St. George Island) All other beaches in Gulf and Franklin Counties, and Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties	1 May – 4 Sep 2 May – 16 Sep	Daily surveys: 1 May – 31 Aug
Sarasota and Charlotte Counties (Manasota Key) All other beaches in Sarasota and Charlotte Counties Pinellas, Hillsborough, Manatee, Lee, Collier, and Monroe Counties	24 Apr – 7 Sep 24 Apr – 12 Sep 20 Apr – 19 Sep	Daily surveys: 15 Apr –15 Sep

A12. Sand compaction shall be monitored in the area of sand placement immediately after completion of the project and prior to the dates in **Table 19** for 3 subsequent years.

Table 19. Dates for Compaction Monitoring and Escarpment Surveys by County.

County where project occurs	Date
Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Miami-Dade, and Monroe	Work must be completed by Mar 1
Miami-Dade, Monroe	Work must be completed by April 1
Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf, Franklin, Volusia, Flagler, St. Johns, Duval, Nassau, Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier	Work must be completed by Apr 15

If tilling is needed, the area shall be tilled to a depth of 36 inches. Each pass of the tilling equipment shall be overlapped to allow more thorough and even tilling. All tilling activity shall be completed at least once prior to the nesting season. An electronic copy of the results of the compaction monitoring shall be submitted electronically to seaturtle@fws.gov prior to any tilling actions being taken or if a request not to till is made based on compaction results. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post construction compaction levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.

(NOTE: If tilling occurs during shorebird nesting season (February 15-August 31), shorebirds surveys prior to tilling are required per the Migratory Bird Treaty Act. See Appendix E for shorebird conditions recommended by FWC.

a. Compaction sampling stations shall be located at 500-foot intervals along the sand placement template. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates at each depth). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each

depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.

c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the appropriate date listed in **Table 19**.

d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

e. Tilling shall occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

A13. Visual weekly surveys for escarpments along the project area shall be made immediately after completion of the sand placement and within 30 days prior to the start dates for Nesting Season Monitoring in **Table 19** for 3 subsequent years if sand in the project area still remains on the dry beach.

Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by the dates listed in **Table 19**. Any escarpment removal shall be reported by location in the annual report. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. If during weekly escarpment surveys, it is found that subsequent reformation of escarpments interferes with sea turtle nesting or that they exceed 18 inches in height for a distance of 100 feet during the nesting and hatching season, the Service shall be contacted immediately to determine the appropriate action to be taken. If it is determined by the Service or FWC that that escarpment leveling is required during the nesting or hatching season the Service, in coordination with the FWC, will provide a brief written authorization within 5 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be sent electronically to seaturtle@fws.gov. A summary is required even when no action has been taken (**Table 3**).

A14. Staging areas for construction equipment shall be located off the beach during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see table 14) and peak nesting season (May 1 through October 31) for the remaining counties. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach shall be located as far landward as

possible without compromising the integrity of the dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune if the width of the beach allows. Temporary storage of pipes shall be off the beach to the maximum extent possible. If the pipes are stored on the beach, they shall be placed in a manner that will minimize the impact to nesting habitat and shall not compromise the integrity of the dune systems. If the pipes placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune during nesting and hatching season, the Corps must reinitiate consultation with the Service as this represents adverse effects not addressed in this SPBO. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

A15. Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 14) and peak nesting season (May 1 through October 31) for the remaining counties, and shall comply with safety requirements. A light management plan for the dredge and the work site shall be submitted for approval by the Service and FWC prior to the pre-construction meeting. In accordance with this plan, lighting on all equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing on dredge and land-based lights and be large enough to block light from all lamps from being transmitted outside the construction area or to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

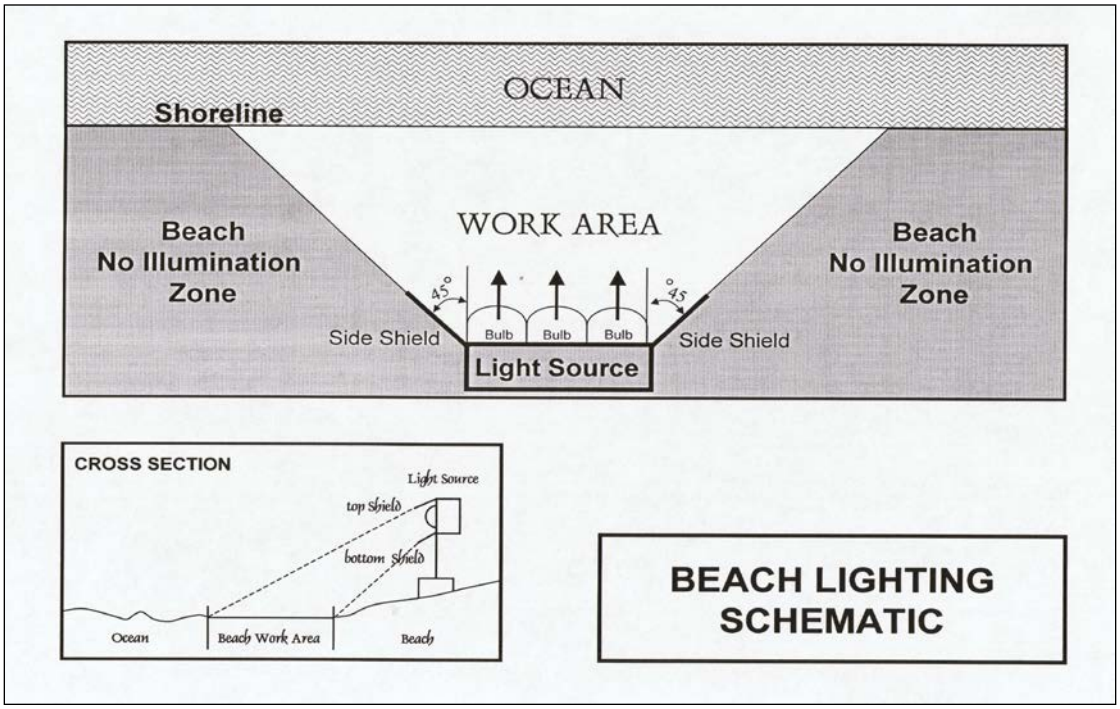

Figure 15. Beach lighting schematic.

A16. During the early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 14) and peak nesting season (May 1 through October 31) for the remaining counties, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length) along the shoreline between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, an agreed upon distance will be decided on during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the Corps will be allowed to proceed with the placement of fill during daylight hours until dusk at which time the 500-foot length (or other agreed upon length) limitation shall apply. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest.

<u>Dune Planting</u>

A17. All vegetation planting shall be designed and conducted to minimize impacts to sea turtles and beach mice. Dune vegetation planting may occur during the sea turtle nesting season under the following conditions.

a. Daily early morning sea turtle nesting surveys (before 9 a.m.) shall be conducted during the Nest Laying period for all counties in Florida where sea turtle nesting occurs (see Tables 16 and 17). Nesting surveys shall only be conducted by personnel with prior experience and training in nesting surveys. Surveyors shall have a valid FWC permit. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (all times). No dune planting activity shall occur until after the daily turtle survey and nest conservation and protection efforts have been completed. Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys;

b. Any nests deposited in the dune planting area not requiring relocation for conservation purposes shall be left in place. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 3-foot radius around the nest. No planting or other activity shall occur within this area nor will any activities be allowed that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the planting activity;

c. If a nest is disturbed or uncovered during planting activity, the Corps, or the Applicant shall cease all work and immediately contact the project turtle permit holder. If a nest(s) cannot be safely avoided during planting, all activity within 10 feet of a nest shall be delayed until hatching and emerging success monitoring of the nest is completed;

d. All dune planting activities shall be conducted by hand and only during daylight hours;

e. All dune vegetation shall consist of coastal dune species native to the local area; (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material for the plant size;

f. No use of heavy equipment shall occur on the dunes or seaward for planting purposes. A lightweight (all-terrain type) vehicle, with tire pressures of 10 psi or less may be used for this purpose; and

g. Irrigation equipment, if needed, shall be authorized under a FDEP permit.

<u>Beach Mouse Protection</u>

A18. Beach mouse habitat shall be avoided when selecting sites for equipment, pipes, vehicle storage and staging to the maximum extent possible. Suitable beach mouse habitat

constitutes the primary dunes (characterized by sea oats and other grasses), secondary dunes (similar to primary dunes, but also frequently includes such plants as woody goldenrod, false rosemary), and interior or scrub dunes.

A19. Equipment placement or storage shall be excluded in the area between 5 to 10 feet seaward of the existing dune toe or 10 percent of the beach width (for projects occurring on narrow eroded beach segments) seaward of the dune toe in areas of occupied beach mouse habitat (**Figure 16**). The toe of the dune is where the slope breaks at the seaward foot of the dune. If the pipes placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune as required during sea turtle nesting and hatching season, the Corps must reinitiate consultation with the Service as this represents adverse effects not addressed in this SPBO.

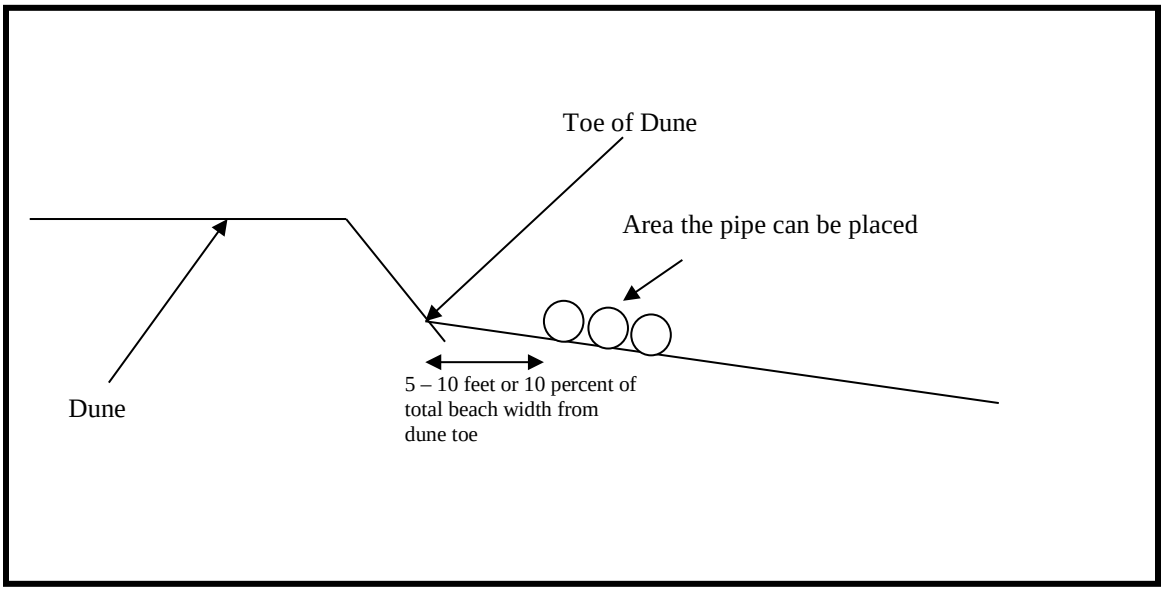

Figure 16. Equipment placement for projects occurring in beach mouse occupied habitat.

A20. Existing beach access points shall be used for vehicle and equipment beach access to the maximum extent possible. These access points shall be delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be fully restored to the preconstruction conditions following project completion. Parking areas for construction crews shall be located as close as possible to the work sites, but outside of vegetated dune areas to minimize impacts to existing habitat and transporting workers along the beachfront.

A21. The location of new or expanded existing beach access corridors for vehicles and equipment within beach mouse habitat consisting of vegetated dunes shall be spaced no closer than every four miles. The distribution of access areas will result in the least

number of access areas within beach mouse habitat as possible and delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be (1) no more than 25 feet wide for vehicles and (2) no more than 50 feet wide for equipment. Expanded or new beach access points that impact vegetated dunes shall be restored within 3 months following project completion. Habitat restoration shall consist of restoring the dune to preconstruction conditions with planting of at least three species of appropriate native dune vegetation (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Seedlings shall be at least one inch square with a 2.5-inch pot. Planting shall be on 18-inch centers throughout the created dune; however, 24-inch centers may be acceptable depending on the area to be planted. Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material, as appropriate, for the plant size. No sand stabilizer material (coconut matting or other material) shall be used in the dune restoration. The plants may be watered without installing an irrigation system. In order for the restoration to be considered successful, 80 percent of the total planted vegetation shall be documented to survive six months following planting of vegetation. If the habitat restoration is unsuccessful, the area shall be replanted following coordination with the Service.

Reporting

A22. A report with the following shall be submitted to the Service electronically (seaturtle@fws.gov) by December 31 after completion of construction.

i. A summary of the information listed in Table 20 for construction

ii. A summary of the information listed in Table 21 for post-construction

Table 20. Information to include in the report following the project completion.

All projects	**Project location (include Florida DEP R-monuments and latitude and longitude coordinates)**
	Project description (include linear feet of beach, actual fill template, access points, and borrow areas)
	Dates of actual construction activities
	Names and qualifications of personnel involved in sea turtle nesting surveys and relocation activities (separate the nests surveys for nourished and non-nourished areas)
	Descriptions and locations of sites where nests were relocated
Beach mice	**Acreage of new or widened access areas affected in beach mouse habitat**
	Vegetation completed for new or widened access areas
	Success rate of vegetation of restoration

Table 21. Sea turtle monitoring following sand placement activity.

Date	Duration	Variable	Criterion
Nesting Success	Year of in season construction, two years post construction if placed sand remains on beach and variable does not meet criterion based on previous year	Number of nests and non-nesting events	40 percent or greater
Hatching success	Year of in season construction and one year post construction if placed sand remains on beach and variable does not meet success criterion based on previous year	Number of hatchlings by species to hatch from egg	60 percent or greater (a statistically valid number of loggerhead and green nests, and all leatherback nests)
Emergence Success	Year of in season construction and one year post construction if placed sand remains on beach and variable does not meet success criterion based on previous year	Number of hatchlings by species to emerge from nest onto beach	80 percent or greater (a statistically valid number of loggerhead and green nests, and all leatherback nests)
Disorientations	Year of in season construction and two years post construction if placed sand remains on the beach	Number of nests and individuals that misorient or disorient	http://myfwc.com/media/418153/Seaturtle_Guidelines_A_LDIR_Directions.pdf
Lighting Surveys	Two surveys the year following construction, one survey between May 1 and May 15 and second survey between July 15 and August 1	Number, location and photographs of lights visible from nourished berm, corrective actions and notifications made	Lighting survey and meeting resulting with plan for reduction in lights visible from nourished berm within one to two month period
Compaction	Three seasons following construction. Not required if the beach is tilled prior to nesting season each year placed sand remains on beach	Shear resistance	Less than 500 psi
Escarpment Surveys	Weekly during nesting season for three years each year placed sand remains on the beach	Number of scarps 18 inches or greater extending for more than 100 feet that persist for more than 2 weeks	Successful remediation of all persistent scarps as needed

If nesting and reproductive (hatching and emergence) success is less than the criteria in the table above, the Corps and the Service must discuss during the annual meeting to review additional conditions prior to the next sand placement on this beach.

A23. In the event a sea turtle nest is excavated during construction activities, the project turtle permit holder responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

Upon locating a dead or injured sea turtle adult, hatchling, egg, or beach mouse that may have been harmed or destroyed as a direct or indirect result of the project, the Corps, Applicant shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922) and the appropriate Service Field Office immediately (**Table 3**).

Care shall be taken in handling injured sea turtles, eggs or beach mice to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

REASONABLE AND PRUDENT MEASURES for:

B. Projects that are navigation maintenance dredging with beach placement, swash zone placement, and submerged littoral zone placement (not including near shore placement for shore protection) shall include the following measures:

Historically, these sand placement events as a result of a navigation maintenance dredging project with no local sponsor are smaller scaled, conducted at closer time intervals, and the sand often does not remain on the beach for an extended period of time.

Post construction requirements are listed in Reasonable and Prudent Measures B10 and B11. These post construction requirements may be subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Reasonable and Prudent Measures, the Corps must reinitiate consultation.

B1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice shall be implemented in the Corps federally authorized project or regulated activity.

B2. Beach quality sand suitable for sea turtle nesting, successful incubation, and hatchling emergence and beach mouse burrow construction shall be used for sand placement.

B3. For dredged material placement on the beach, sand placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation. In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties, dredged material placement shall not occur from May 1 through October 31. In St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County dredged material placement shall not occur from June 1 through September 30. On Manasota Key in Sarasota and Charlotte Counties, dredged material placement shall

not occur from May 1 through October 31 (except Venice Beach). In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte (except Manasota Key), Sarasota (except Manasota Key), Manatee, Hillsborough, Pinellas, Franklin (except St. George Island), Gulf (except St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape Sand Blas), Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, sand placement may occur during the sea turtle nesting season (**Table 16 and Table 17**).

B4. For dredged material placement in the swash zone or submerged littoral zone during the nesting season, sand placement will be conducted at or below MLLW line.

B5. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach prior to any dredged material placement to the maximum extent possible.

B6. The Corps shall continue to work with FDEP, FWC, and the Service to create a sea turtle friendly beach profile for placement of material during construction.

B7. Predator-proof trash receptacles shall be installed and maintained at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix F**).

B8. A meeting between representatives of the Corps, Service, FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on this project.

B9. If the beach nourishment project will be conducted during the sea turtle nesting season, surveys for nesting sea turtles must be conducted. Surveys for early and late nesting sea turtles shall be conducted where appropriate. If nests are constructed in the proposed area of sand placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation.

B10. Sand compaction shall be monitored and tilling shall be conducted if needed to reduce the likelihood of impacting sea turtle nesting and hatching activities. Not required for dredged material placement in the swash and littoral zone.

B11. Escarpment formation shall be monitored and leveling shall be conducted if needed to reduce the likelihood of impacting nesting and hatchling sea turtles. Not required for dredged material placement in the swash and littoral zone.

B12. Construction equipment and materials shall be stored in a manner that will minimize impacts to nesting and hatchling sea turtles and beach mice.

B13. Lighting associated with the project construction shall be minimized to reduce the possibility of disrupting and disorienting nesting and hatchling sea turtles and nocturnal activities of beach mice.

B14. During the sea turtle nesting season, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length if a FWC sea turtle permit holder is present) between dusk and the time of completion of the following day's nesting survey to reduce the impact to emerging sea turtles and burial of new nests.

B15. Beach mouse habitat shall be avoided when selecting sites for storage and staging of equipment to the maximum extent possible.

B16. Equipment and construction materials shall not be stored near the seaward dune toe in areas of occupied beach mouse habitat. This area is highly utilized by beach mice.

B17. Existing vegetated habitat at beach access points and along shoreline travel corridors shall be protected to the maximum extent possible to ensure vehicles and equipment transport stay within the access and travel corridors.

B18. Expanded or newly created beach access points shall be restored.

B19. A report describing the actions taken shall be submitted to the Service work for each year when the activity has occurred.

B20. The Service and the FWC shall be notified if a sea turtle adult, hatchling, or egg, or beach mouse is harmed or destroyed as a direct or indirect result of the project.

TERMS AND CONDITIONS for:

B. Projects that are navigation maintenance dredging with beach placement, swash zone placement, and submerged littoral zone placement of Corps civil works project shall include the following measures:

Historically, these sand placement events as a result of a navigation maintenance dredging project with no local sponsor are smaller scaled, conducted at closer time intervals, and the sand often does not remain on the beach for an extended period of time.

Post construction requirements are listed in Terms and Conditions B10 and B11. These post construction requirements may be subject to congressional authorization and the allocation of funds. If the Corps or Applicant cannot fulfill these Terms and Conditions, the Corps must reinitiate consultation.

All beaches

B1. Conservation Measures included in the Corps' PBA that address protection of nesting sea turtles and beach mice listed on pages 9 and 10 of the SPBO shall be implemented in the Corps federally authorized project or regulated activity.

B2. Beach compatible fill shall be placed on the beach or in any associated dune system. Beach compatible fill must be sand that is similar to a native beach in the vicinity of the site that has not been affected by prior sand placement activity. The fill material must be similar in both coloration and grain size distribution to that native beach. 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. Fill material shall comply with FDEP requirements pursuant to the Florida Administrative Code (FAC) subsection 62B-41.005(15). A Quality Control Plan shall be implemented pursuant to FAC Rule 62B-41.008(1)(k)4.b.

B3. Dredged material placement shall not occur during the period of peak sea turtle egg laying and egg hatching to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

a. Dredged material placement in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties shall occur only during the beach placement window indicated in Table 16. construction equipment or pipes may be placed and/or stored on the beach only during the beach placement window indicated in Table 16.

b. Dredged material placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties may occur during the sea turtle nesting season except on publicly owned conservation lands such as state parks and areas where such work is prohibited by the managing agency or under applicable local land use codes (see exceptions in B3.c. below).

c. For higher density nesting beaches in Gulf and Franklin counties dredged material placement shall not occur during the main part of the nesting season June 1 through September 31. On Manasota Key in Sarasota and Charlotte Counties, dredged material placement shall not occur during the main part of the nesting season (May 1 through October 31). This timeframe does not include Venice Beach due to the low density nesting. These beaches include St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County, and Manasota Key in Sarasota and Charlotte Counties. See Table 17 for the Beach Placement Windows.

d. For dredged material placement in the swash zone (at or below the MHWL) or submerged littoral zone during the sea turtle nesting season (**Tables 16and 17**), the Corps shall contact the Service for coordination.

The Service shall be contacted for coordination, on a project-by-project basis, if sand placement is needed on publicly owned conservation lands and in these higher density nesting beaches in Gulf and Franklin Counties and on Manasota Key in Sarasota and Charlotte Counties during the above exclusionary period. The Service will determine whether work (1) may proceed in accordance with the Terms and Conditions; (2) proceed in accordance with the Terms and Conditions and other requirements as developed by the Service; or (3) would require that an individual emergency consultation be conducted.

B4. For dredged material placement in the swash zone or submerged littoral zone during the nesting and hatching season, sand placement will be conducted at or below the MLLW line. The swash zone is that region between the upper limit of wave run-up (approximately one-foot above MHW) and the lower limit of wave run-out (approximately one-foot below MLW). Material will not be placed so that it is exposed above the water during low tide during the nesting and hatching season. The Corps must consult with NMFS on impacts to hatchlings that emerge from those nests adjacent to the inwater construction area. The Service will discuss with the Corps and NMFS additional measures that could include caging nests close to the emergence date.

B5. All derelict concrete, metal, and coastal armoring geotextile material and other debris shall be removed from the beach prior to any dredged material placement to the maximum extent possible. If debris removal activities take place during the peak sea turtle nesting season (**Tables 16 and 17**), the work shall be conducted during daylight hours only and shall not commence until completion of the sea turtle nesting survey each day.

B6. The Corps shall continue to work with FDEP, FWC and the Service in conducting the second phase of testing on the sea turtle friendly profile during project construction. This includes exploring options to include a dune system in the project design for existing authorized projects and new non-federal projects and how the existing sand placement template may be modified.

B7. Predator-proof trash receptacles shall be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting predators of sea turtles and beach mice (**Appendix F**). The Corps shall provide predator-proof trash receptacles for the construction workers. All workers shall be briefed on the importance of not littering and keeping the project area trash and debris free.

B8. A meeting between representatives of the Corps, the Service, the FWC, the permitted sea turtle surveyor, and other species surveyors, as appropriate, shall be held prior to the commencement of work on projects. At least 10 business days advance notice shall be provided prior to conducting this meeting. The meeting will provide an opportunity for explanation and/or clarification of the sea turtle and beach mouse protection measures as well as additional guidelines when construction occurs during the sea turtle nesting season, such as storing equipment, minimizing driving, free-roaming cat observation, and reporting within the work area, as well as follow up meetings during construction (**Table 3**).

Sea Turtle Protection

B9. Daily early morning surveys for sea turtle nests shall be required as outlined in a through f. If nests are constructed in the area of sand proposed placement, the eggs shall be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation (**Tables 614 and 17**).

a. For sand placement projects in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties that occur during earlier part of the nest laying season through April 30, daily early morning surveys shall be conducted for sea turtle nests shall begin with the start of the nesting season monitoring (see Table 16) and continue through the end of the beach placement window, with egg relocation continuing only until completion of fill placement. Eggs shall be relocated per the following requirements. For sand placement projects that occur during the period from November 1 through the end of hatching season (see Table 16), daily early morning sea turtle nesting surveys shall be conducted 65 days prior to project initiation and continue through the end of the nest laying season indicated in Table 16, and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

i. Nesting surveys and egg relocations will only be conducted by persons with prior experience and training in these activities and who are duly authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at (561) 575-5407 for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones).

ii. Only those nests that may be affected by sand placement activities will be relocated. Nest relocation shall not occur upon completion of the project. Nests requiring relocation shall be moved no later than 9 a.m. the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests shall not be placed in organized groupings. Relocated nests shall be randomly staggered along the length and width of the beach in settings that are not expected to

experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, or subject to artificial lighting. Nest relocations in association with construction activities shall cease when construction activities no longer threaten nests.

iii. Nests deposited within areas where construction activities have ceased or will not occur for 65 days or nests laid in the nourished area prior to tilling shall be marked and left in situ unless other factors threaten the success of the nest. The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. No activity will occur within this area nor will any activities occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.

During the period from March 1 through April 30, daytime surveys shall be conducted for leatherback sea turtle nests beginning March 1. Nighttime surveys for leatherback sea turtles shall begin when the first leatherback crawl is recorded within the project or adjacent beach area through April 30 or until completion of the project (whichever is earliest). Nightly nesting surveys shall be conducted from 9 p.m. until 6 a.m. The project area shall be surveyed at 1-hour intervals (since leatherbacks require at least 1.5 hours to complete nesting, this will ensure all nesting leatherbacks are encountered) and eggs shall be relocated per the requirements listed in (a)i through (a)iii.

b. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties that occur during the nest laying period (**Table 17**), daily early morning (before 9 a.m.) surveys shall be conducted. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin, Gulf, Sarasota, and Charlotte Counties in B9.d. below).

c. For Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties, nesting surveys shall be initiated 70 days prior to sand placement activities (incubation periods are longer in these counties) or at the beginning of nesting season monitoring (see Table 17) whichever is later. Nesting surveys shall continue through the end of the nest laying season (see Table 17). Hatching and emerging success monitoring will involve checking nests beyond the completion date of the daily early morning nesting surveys. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Franklin and Gulf Counties in B9.d. below).

d. For St. Joseph Peninsula State Park, St. Joseph peninsula, and Cape San Blas in Gulf County, St. George Island in Franklin County sand placement activities shall occur only during the Beach Placement Window indicated in Table 17. For Manasota Key in Sarasota and Charlotte Counties (except Venice Beach), sand placement activities shall during the Beach Placement Window indicted in Table 15, the period of peak sea turtle egg laying and egg hatching for this area. If nests laid in the early part of the nest laying season during the beach placement window in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii below.

e. For Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier, and Monroe Counties, nesting surveys shall be initiated 65 days prior to nourishment or dredged channel material placement activities or by April 15, whichever is later. Nesting surveys shall continue through September 15. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii (see nest relocation exceptions for Sarasota and Charlotte Counties in B9.d. above).

f. For Miami-Dade County, nesting surveys shall be initiated 65 days prior to dredged material placement activities or by the beginning of the nesting season monitoring indicated in Table 17, whichever is later. Nesting surveys shall continue through the end of the nest laying season or the end of sand placement whichever comes first. If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

g. For Volusia, Flagler, St. Johns, Duval, and Nassau Counties, nesting surveys shall be initiated 65 days prior to dredged material placement activities or by the beginning of nest laying season (**Table 17**) whichever is later. Nesting surveys shall continue through the nesting season monitoring period (**Table 15).** If nests are laid in areas where they may be affected by construction activities, eggs shall be relocated per the requirements listed in (a)i through (a)iii.

B10. Sand compaction shall be monitored in the area of dredged material placement immediately after completion of the project and prior to the dates in **Table 19** for 3 subsequent years. Not required for dredged material placement in the swash and littoral zone.

If tilling is needed, the area shall be tilled to a depth of 36 inches. Each pass of the tilling equipment shall be overlapped to allow more thorough and even tilling. All tilling activity shall be completed at least once prior to the nesting season. An electronic copy of the results of the compaction monitoring shall be submitted seaturtle@fws.gov prior to any tilling actions being taken. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post construction compaction

levels. Additionally, out-year compaction monitoring and remediation are not required if placed material no longer remains on the dry beach.(NOTE: If tilling occurs during shorebird nesting season (February 15-August 31), shorebirds surveys prior to tilling are required per the Migratory Bird Treaty Act (http://myfwc.com/docs/Conservation/FBCI_BNB_SeaTurtleMonitors.pdf)

a. Compaction sampling stations shall be located at 500-foot intervals along the sand placement template. One station shall be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station shall be midway between the dune line and the high water line (normal wrack line).

b. At each station, the cone penetrometer shall be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates shall be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth shall be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.

c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area shall be tilled immediately prior to the appropriate date listed in **Table 19**.

d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the Service will be required to determine if tilling is required. If a few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

e. Tilling shall occur landward of the wrack line and avoid all vegetated areas 3 square feet or greater with a 3 square foot buffer around the vegetated areas.

B11. Visual weekly surveys for escarpments along the project area shall be made immediately after completion of the dredged material placement and within 30 days prior to the start dates for Nesting Season Monitoring in **Table 19** for 3 subsequent years if sand in the project area still remains on the dry beach. Not required for dredged material placement in the swash and littoral zone.

Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet shall be leveled and the beach profile shall be reconfigured to minimize scarp formation by the dates listed above. Any escarpment removal shall be

reported by location. If the project is completed during the early part of the sea turtle nesting and hatching season (March 1 through April 30), escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The Service shall be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined by the Service, in coordination with the FWC, that escarpment leveling is required during the nesting or hatching season, the Service will provide a brief written authorization within 30 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken shall be submitted electronic to seaturtle@fws.gov.

B12. If available, staging areas for construction equipment shall be located off the beach during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 16) and peak nesting season (May 1 through October 31) for the remaining counties. Nighttime storage of construction equipment not in use shall be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach shall be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune shall be 5 to 10 feet away from the toe of the dune if the width of the beach allows. Temporary storage of pipes shall be off the beach to the maximum extent possible. If the pipes are stored on the beach, they shall be placed in a manner that will minimize the impact to nesting habitat and shall not compromise the integrity of the dune systems. If the pipes that are placed parallel to the dune cannot be placed between 5 to 10 feet away from the toe of the dune during nesting and hatching season, the Corps must reinitiate consultation with the Service as this represents take that was not considered in the SPBO. If it will be necessary to extend construction pipes past a known shorebird nesting site or over-wintering area for piping plovers, then whenever possible those pipes shall be placed landward of the site before birds are active in that area. No pipe or sand shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

B13. Direct lighting of the beach and nearshore waters shall be limited to the immediate construction area during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 14) and peak nesting season (May 1 through October 31) for the remaining counties, and shall comply with safety requirements. Lighting on all equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to

block light from all lamps from being transmitted outside the construction area and to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

B14. During the period during early (before April 30) and late (after November 1) nesting season for Brevard through Broward counties (see Table 16) and peak nesting season (May 1 through October 31) for the remaining counties, the Corps shall not extend the beach fill more than 500 feet (or other agreed upon length if FWC sea turtle permit holder is present) along the shoreline between dusk and dawn of the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is a permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, an agreed upon distance will be decided on during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the Corps will be allowed to proceed with the placement of fill during daylight hours until dusk at which time the 500-foot length (or other agreed upon length) limitation shall apply. If any nesting turtles are sighted on the beach within the immediate construction area, activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest.

<u>Beach Mouse Protection</u>

B15. Beach mouse habitat shall be avoided when selecting sites for equipment, pipes, vehicle storage and staging, and beach travel corridors to the maximum extent possible. Suitable beach mouse habitat constitutes the primary dunes (characterized by sea oats and other grasses), secondary dunes (similar to primary dunes, but also frequently includes such plants as woody goldenrod, false rosemary), and interior or scrub dunes.

B16. Equipment placement or storage shall be excluded in the area between 5 to 10 feet seaward of the existing dune toe or 10 percent of the beach width (for projects occurring on narrow eroded beach segments) seaward of the dune toe in areas of occupied beach mouse habitat (**Figure 16**). The toe of the dune is where the slope breaks at the seaward foot of the dune.

B17. Existing beach access points shall be used for vehicle and equipment beach access to the maximum extent possible. These access points shall be delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The topography at the access points shall be fully restored to preconstruction conditions following project completion. Parking areas for construction crews shall be located as close as possible to the work sites, but outside of vegetated dune areas to minimize impacts to existing habitat and transporting workers along the beachfront.

B18. The location of new or expanded existing beach access corridors for vehicles and equipment within beach mouse habitat consisting of vegetated dunes shall be no closer

than every four miles. The distribution of access areas will result in the least number of access areas within beach mouse habitat as possible and delineated by post and rope or other suitable material to ensure vehicles and equipment transport stay within the access corridor. The access corridors shall be (1) no more than 25 feet wide for vehicles and (2) no more than 50 feet wide for equipment. Expanded or new beach access points that impact vegetated dunes shall be restored within 3 months following project completion. Habitat restoration shall consist of restoring the dune to preconstruction conditions with planting of at least three species of appropriate native dune vegetation (*i.e.*, native to coastal dunes in the respective county and grown from plant stock from that region of Florida). Seedlings shall be at least 1 inch square with a 2.5-inch pot. Planting shall be on 18-inch centers throughout the created dune; however, 24-inch centers may be acceptable depending on the area to be planted. Vegetation shall be planted with an appropriate amount of fertilizer and antidesiccant material, as appropriate, for the plant size. No sand stabilizer material (coconut matting or other material) shall be used in the dune restoration. The plants may be watered without installing an irrigation system. In order for the restoration to be considered successful, 80 percent of the total planted vegetation shall be documented to survive six months following planting of vegetation. If the habitat restoration is unsuccessful, the area shall be replanted following coordination with the Service.

Reporting

B19. An excel sheet with the information listed in **Table 20** shall be submitted to the Service electronically seaturtle@fws.gov by December 31 of the year following construction. A report with the information from Terms and Conditions B10 and B11 shall be submitted to the Service by December 31 of the year for 3 years following construction.

B20. In the event a sea turtle nest is excavated during construction activities, the project turtle permit holder responsible for egg relocation for the project shall be notified immediately so the eggs can be moved to a suitable relocation site.

Upon locating a dead or injured sea turtle adult, hatchling, egg, or beach mouse that may have been harmed or destroyed as a direct or indirect result of the project, the Corps, Applicant shall be responsible for notifying FWC Wildlife Alert at 1-888-404-FWCC (3922) and the appropriate Service Field Office immediately (**Table 3**).

Care shall be taken in handling injured sea turtles, eggs or beach mice to ensure effective treatment or disposition, and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

REASONABLE AND PRUDENT MEASURES for:

C. Projects that include groin or jetty repair or replacement within the existing footprint shall include the following measures:

In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties:

C1. Groin or jetty repair or replacement projects shall not occur during the period of peak sea turtle egg laying and egg hatching (May 1 through October 31), to reduce the possibility of sea turtle nest burial, crushing of eggs, or nest excavation.

C2. Maintenance of groin or jetty projects conducted during the early (February 1 through April 30) and late sea turtle nesting season (November 1 through November 30) shall adhere to the following conditions:

a. Install a barrier around the perimeter of the groin or jetty repair or replacement work area sufficient to prevent adult and hatchling sea turtles from accessing the project site.

b. For projects conducted during the early and late sea turtle nesting season, construction equipment and materials shall be stored in a manner that will minimize impacts to sea turtles to the maximum extent possible.

c. For projects conducted during the early and late sea turtle nesting season, no work may occur at night.

In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties:

C3. For maintenance of groin or jetty projects, conducted during the sea turtle nesting season.

a. Daily surveys shall be conducted by sea turtle permit holders. Nests laid adjacent to the work area shall be marked by flag and rope for avoidance.

b. A barrier shall be installed around the perimeter of the groin or jetty maintenance work area sufficient to prevent adult and hatchling sea turtles from accessing the project site.

c. Construction equipment and materials shall be stored in a manner that will minimize impacts to sea turtles and beach mice to the maximum extent possible.

d. No work shall occur at night.

In All Counties:

C4. If any safety lighting associated with the project is required, the Corps must coordinate with the Service. All safety lighting must be minimized to reduce the possibility of disrupting and disorienting nesting or hatchling sea turtles and nocturnal activities of beach mice. All lights shall be downward directed, full cut-off and fully shielded, and shall utilize long wavelength (greater than 590 nm) light sources.

C5. If entrapment of sea turtle hatchlings occurs in the groin or jetty system, the Corps shall meet with the Service to discuss a possible solution prior to the next nesting season.

C6. A report describing the projects conducted during the year and actions taken to implement the Reasonable and Prudent Measures and Terms and Conditions of this incidental take statement shall be submitted to the Service.

TERMS AND CONDITIONS for:

C. Projects that include groin or jetty repair or replacement within the existing footprint shall include the following conditions:

In Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties:

C1. Groin or jetty repair or replacement projects shall be started after October 31 and be completed before May 1.

C2. For groin or jetty repair or replacement projects conducted during the early (before April 30) and/or late (after November 1) sea turtle nesting season (see Table 16):

a. A barrier (e.g., hay bales, silt screens) sufficient to prevent adult and hatchling sea turtles from accessing the project site shall be installed in a 100-foot buffer around the perimeter of the project site. The barrier shall be placed parallel to shore, at mean high water (MHW), as close to the groin or jetty as feasible, particularly during the period from sunset to sunrise. The Corps must contact the Service if there are any existing nests within the 100-foot buffer area.

b. On-beach access to the construction site shall be restricted to the wet sand below MHW to the maximum extent possible. Travel corridors on the beach to the MHWL shall be delineated. If the project is conducted during the early (before April 30) and/or late (after November 1) sea turtle nesting season (see Table 16), daily morning surveys shall be conducted within the travel corridor. If nests are laid within the travel corridor, the travel corridor must be re-routed to avoid the nest. If re-routing is not possible, these nests shall be relocated per the requirements listed in A9 (a)i through (a)iii.

c. Staging areas for construction equipment shall be located off the beach to the maximum extent possible.

d. No construction shall be conducted at night.

e. Daily early morning surveys for sea turtle nests shall be required as outlined in e(i) and e (ii). All nests laid in the vicinity of the project area shall be marked for avoidance per the requirements specified below:

   i. Nesting surveys and nest marking will only be conducted by persons with prior experience and training in these activities and who are authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at mtp@myfwc.com for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones). The Corps shall not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

   ii. Nests deposited within the project area and access areas shall be left in place and marked for avoidance unless other factors threaten the success of the nest (nest laid below debris line marking the typical high tide, erosion). The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. The actual location of the clutch will be determined and nests will be marked. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 10-foot radius around the nest. No activity shall occur within this area nor will any activity occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the project activity. Nest relocation is only allowed if nests laid within the travel corridor (beach access to MHWL) cannot be rerouted to avoid the nest.

In Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, and Escambia Counties:

C3. For groin or jetty repair or replacement projects conducted during the sea turtle nesting season (see Table 17):

   a. Daily early morning surveys shall be conducted within the travel corridor.

b. A barrier (e.g., hay bales, silt screens) sufficient to prevent adult and hatchling sea turtles from accessing the project site shall be installed in a 100-foot buffer around the perimeter of the project site. The barrier shall be placed parallel to shore, at MHW, as close to the groin or jetty as feasible during the period from sunset to sunrise.

c. On-beach access to the construction site shall be restricted to the wet sand below MHW to the maximum extent possible. Travel corridors on the beach to the MHWL will be delineated. Nests laid within the travel corridor that would impede traffic will be relocated per the requirements listed in A9(a)i through (a)iii.. Nests laid in adjacent areas will be marked and avoided per the requirements listed in C(2)(e) i through iii. Staging areas for construction equipment shall be located off the beach to the maximum extent possible.

d. No nighttime construction may occur during the nesting season.

e. Material stockpiled on the beach shall only occur within the 200-foot barrier (100-foot area on either side). Construction activities shall not occur in any location prior to completion of the necessary sea turtle protection measures outlined below. If any nesting turtles are sighted on the beach, construction activities shall cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has marked the nest. All activities shall avoid the marked nest areas.

C4. All nests laid adjacent to the project area shall be marked for avoidance per the following requirements:

a. Nesting surveys and nest marking will only be conducted by persons with prior experience and training in these activities and who are authorized to conduct such activities through a valid permit issued by FWC, pursuant to FAC 68E-1. Please contact FWC's Imperiled Species Management Section in Tequesta at mtp@myfwc.com for information on the permit holder in the project area. Nesting surveys shall be conducted daily between sunrise and 9 a.m. (this is for all time zones). The Corps shall not initiate work until daily notice has been received from the sea turtle permit holder that the morning survey has been completed. Surveys shall be performed in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

i. Nests deposited within the project area and access areas shall be left in place and marked for avoidance unless other factors threaten the success of the nest (nest laid below debris line marking the typical high tide, erosion). The turtle permit holder shall install an on-beach marker at the nest site and a secondary marker at

a point as far landward as possible to assure that future location of the nest will be possible should the on-beach marker be lost. The actual location of the clutch will be determined and nests will be marked. A series of stakes and highly visible survey ribbon or string shall be installed to establish a 10-foot radius around the nest. No activity shall occur within this area nor will any activity occur that could result in impacts to the nest. Nest sites shall be inspected daily to assure nest markers remain in place and that the nest has not been disturbed by the project activity. Nest relocation is only allowed if nests laid within the travel corridor (beach access to MHWL) cannot be rerouted to avoid the nest.

In All Counties:

C5. To the maximum extent possible within the travel corridor, all ruts shall be filled or leveled to the natural beach profile prior to completion of daily construction.

C6. Exterior lighting shall not be permanently installed in association with the project. Temporary lighting of the construction area during the sea turtle nesting season shall be reduced to the minimum standard required by OSHA for general construction areas. Lighting on all equipment including offshore equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment shall be reduced to the minimum standard required by OSHA for general construction areas, in order not to misdirect sea turtles. Shields shall be affixed to the light housing and be large enough to block light from all lamps from being transmitted outside the construction area and to the adjacent sea turtle nesting beach in line-of-sight of the dredge (**Figure 15**).

C7. If entrapment of sea turtle hatchlings occurs in the groin or jetty system during construction, the Corps shall contact the Service immediately.

C8. A report describing the work conducted during the year and actions taken to implement the Reasonable and Prudent Measures and Terms and Conditions of this incidental take statement shall be submitted to the Service electronically to seaturtle@fws.gov by December 31 of each year when the activity has occurred. This report will include the following information:

Table 22. Information to include in the report following the project completion.

All projects	Project location (include Florida DEP R-monuments and latitude and longitude coordinates)
	Project description
	Dates of actual construction activities
	Names and qualifications of personnel involved in sea turtle nesting surveys and mark and avoid activities
	Nesting survey, mark and avoid activities, and nest relocation results

The Service believes that incidental take will be limited to the 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU (38 miles during an emergency year) and 18.9 miles of shoreline within the PFRU (64 miles during an emergency year) of beach that have been identified for sand placement. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. The Service believes that no more than the following types of incidental take will result from the proposed action: (1) destruction of all nests that may be constructed and eggs that may be deposited and missed by a nest survey and egg relocation program within the boundaries of the project areas; (2) destruction of all nests deposited during the period when a nest survey and egg relocation program is not required to be in place within the boundaries of the projects; (3) reduced hatching success due to egg mortality during relocation and adverse conditions at the relocation site; (4) harassment in the form of disturbing or interfering with female turtles attempting to nest within the sand placement areas or on adjacent beaches during and after sand placement or construction activities; (5) misdirection of nesting and hatchling turtles on beaches adjacent to the sand placement or construction area as a result of project lighting including the ambient lighting from dredges; (6) behavior modification of nesting females due to escarpment formation within the project area during a nesting season, resulting in false crawls or situations where they choose marginal or unsuitable nesting areas to deposit eggs; and (7) destruction of nests from escarpment leveling within a nesting season when such leveling has been approved by the Service. The amount or extent of incidental take for sea turtles will be considered exceeded if the project results in more than a 8.8 miles of shoreline per year within the northwest portion of Florida for the NGMRU (38 miles during an emergency year) and 18.9 miles of shoreline within the PFRU (64 miles during an emergency year) of sand on the of beach that have been identified for sand placement. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and

threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. For sand placement projects in Nassau, Duval, St. Johns, Flagler, Volusia, Miami-Dade, Monroe, Collier, Lee, Charlotte, Sarasota, Manatee, Hillsborough, Pinellas, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa and Escambia Counties, construction activities should be planned to take place outside the main part of the sea turtle nesting and hatching season (May 1 through October 31).
2. Work cooperatively with the Service, FWC, County or Municipality, to reduce sea turtle disorientations in the sand placement areas. After the annual report is completed, a meeting shall be set up with the Applicant, county or municipality, FWC, Corps, and the Service to discuss the survey report, as well as any documented sea turtle disorientations in or adjacent to the project area.
3. Work cooperatively with the Service to mimic the native beach berm elevation and beach slopes landward and seaward of the equilibrated berm crest. For all high density green turtle nesting beaches (http://ocean.floridamarine.org/SeaTurtleNesting/), the formation of a dune, either through direct creation or natural accretion, will be included in the project design. Prior to drafting the plans and specifications for a beach nourishment project, the Corps must meet with the Service, FWC, and FDEP to discuss the beach profile surveys, dune formation (specifically on high density green turtle nesting beaches), and the sea turtle monitoring reports from previous placement events.
4. If public driving is allowed on the project beach, and if the Corps has the authority, we recommend it exercise its discretionary authority to require the local sponsor or Applicant to have authorization from the Service for incidental take of sea turtles, their nests, and hatchlings and beach mice, as appropriate, due to such driving or provide written documentation from the Service that no incidental take authorization is required. If required, the incidental take authorization for driving on the beach should be obtained prior to any subsequent sand placement events.
5. Beach nourishment should not occur on publicly owned conservation lands during the sea turtle nesting season.
6. All created dunes should be planted with at least three species of appropriate native salt-resistant dune vegetation. Examples along the Atlantic coast include: bitter panicgrass, sea oats (grown from local genetic stock), beach morning-glory, or railroad vine. Examples along the Northwest Florida coast includes: bitter panicgrass, little bluestem (Schizachyrium scoparium), sea oats (grown from local genetic stock), beach morning-glory, or railroad vine. Examples along the Southwest Florida coast include: sea oats (grown from local genetic stock), bitter panicgrass, beach morning-glory, and railroad vine.
7. If the project area is within a local municipality that has not adopted a lighting ordinance, and lighting is shown to be an issue on a nourished beach, and if the Corps has the authority, we recommend it exercise its discretionary authority to require an ordinance be adopted prior to any subsequent sand placement event.

8. To increase public awareness about sea turtles and beach mice, informational signs should be placed at beach access points where appropriate. The signs should explain the importance of the beach to sea turtles and beach mice.
9. If the Corps has the authority, we recommend it exercise its discretionary authority to require predator control programs (including education of pet owners and cat colony supporters) should be implemented that target free-roaming cats.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. Reinitiation of formal consultation is also required ten years after the issuance of this SPBO. In instances where the amount or extent of incidental take is exceeded, any operations causing such take shall cease pending reinitiation.

The above findings and recommendations constitute the report of the Service. If you have any questions about this SPBO, please contact Ann Marie Lauritsen of this office at (904) 525-0661, Richard Zane of the Panama City Field Office at (850) 769-0552, or Jeffrey Howe of the South Florida Field Office at (772) 562-3909.

Sincerely,

for Larry Williams
State Supervisor

cc:
FWC, Lake City, Florida (Melissa Tucker)
FWC, Lake City, Florida (Nancy Douglass)
FWC, Lake City, Florida (Terry Doonan)
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Service, Atlanta RO digital version in Word
Service, Panama City, Florida, (Patricia Kelly, Lisa Lehnhoff)
Service, St. Peteresburg, Florida (Ann Marie Lauritsen)
Service, Vero Beach, Florida (Jeffrey Howe)

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Appendix A

PREVIOUS FORMAL CONSULTATIONS/BIOLOGICAL OPINIONS WITHIN FLORIDA THAT HAVE BEEN ISSUED FOR ALL PROJECTS THAT HAD ADVERSE IMPACTS TO THE SEA TURTLES ON THE NESTING BEACH

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
STATEWIDE	Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Monroe, Miami-Dade, Collier, Lee, Charlotte, Sarasota, Manatee, Pinellas, Pasco, Franklin, Gulf, Bay, Walton, Okaloosa, Santa Rosa, Escambia	FEMA Emergency Beach Berm Repair	2007-F-0430		Repair of 5-year beach berms post-disaster	75 miles
JAX FIELD OFFICE						
1991	Brevard	Lighting at Cape Canaveral Air Force and Patrick Air Force Station	4-1-91-028	Lighting at both installations	Sea turtle lighting	75 disoriented loggerhead nests; 2 green turtles nests at CCAFS and 2 loggerhead nests at PAFB
1993	Brevard	Beach nourishment on Cape Canaveral	4-1-93-073C		Beach nourishment	2 miles
1995	Brevard	Inlet Bypass on Brevard County Beach at Cape Canaveral		R-1 to R-14	Inlet bypass	
1996	Brevard	Canaveral Port Authority Dredge and Beach Disposal		R-34 to R-38	Dredge and beach restoration	
1998	Brevard	Inlet bypass on Brevard County Beach at Cape Canaveral		R-1 to R-14		
2000	Brevard	Amended Lighting at Cape Canaveral Air Force and Patrick Air Force Station	00-0545	Lighting at both installations	Sea turtle lighting	2 percent hatchling and nesting female disorientations at each installation.
2001	Brevard	Brevard County Shore Protection Project (North Reach)		R-5 to R-12 and R-13 to R-54.5	Beach nourishment	9.4 miles
2001	Brevard	Patrick Air Force Base Beach Restoration		R-53 to R-70	Beach nourishment	

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2002	Brevard	Brevard County Shore Protection Project (South Reach)		R-123.5 to R-139	Beach nourishment	3.02 miles
2002	Brevard	Brevard County Shore Protection Project (North Reach)		R-4 to R-20	Beach nourishment	
2002	Brevard	Permanent Sand Tightening of North Jetty at Canaveral Harbor	02-1090	North jetty at Canaveral Inlet	Sand tightening and extension of existing jetty	500 feet
2003	Brevard	Brevard County Shore Protection Project (South Reach)		R-118.3 to R-123.5		0.94 mile
2004	Brevard	Canaveral Harbor Federal Sand Bypass and Beach Placement	04-0077	R-14 to R-20	Inlet bypass and beach nourishment	18,600 linear feet
2005	Brevard	Brevard County Shore Protection Project (North and South Reach)	05-0443	R-5 to R-20 and R-21 to R-54.5 and R-118 to R-139	Beach nourishment	13.2 miles
2005	Brevard	Brevard County FEMA Berm and Dune Restoration	05-1054	R-75 to R-118	Dune repair	12 miles
2005	Brevard	Patrick Air Force Base Beach Restoration	05-0258	R-54.5 to R-75.3	Beach nourishment	
2005	Brevard	Sloped Geotexile Revetment Armoring Structures	05-0454	5 tubes along north and south Melbourne beach	Protec tube installation	4,600 linear feet
2006	Brevard	Brevard County FEMA Berm and Dune Restoration	41910-2006-F-0189	R-75 to R-118	Dune repair	12 miles
2006	Brevard	Amended Lighting at Cape Canaveral Air Force and Patrick Air Force Station	41910-2006-F-0841		Sea turtle lighting	3 percent hatchling and nesting female disorientations at each installation
15 Feb 2008	Brevard	Patrick Air Force Base Dune Restoration	41910-2008-F-0150	R-65 to R-70	Dune restoration	6,000 linear feet
25 Jan 2008	Brevard	Brevard County's Dune Restoration	41910-2008-F-0189	R-75 to R-118 and R-138 to R-202	Dune restoration	140,000 cy along 3,000 linear feet
2009	Brevard	Brevard County's Dune Restoration	41910-2009-F-0125	R 75.4 to R 118.3 and R-139 to R-213	Dune restoration	22 miles
2009	Brevard	Mid Reach		R-75 to R119	Beach berm repair (permanent)	40,748 linear feet
2009	Brevard	South Beach		R-139 to R-215	Beach berm repair (permanent)	70,385 linear feet

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2009	Brevard	Patrick Air Force Base Dune Restoration and Beach Nourishment	41910-2009-F-0336	R-36 to R-75, R-53 to R-65	Sand placement	8,500 linear feet for dune restoration and 11,235 linear feet for beach nourishment.
2009	Brevard	Brevard Dune Restoration	41910-2009-F-0125	R-75.4 to R-118.3, R-139 to R-213	Dune restoration	Periodically on no more than 22 miles.
2009	Brevard	Mid Reach Shore Protection	41910-2008-F-0547	R-119 to R-75.4	Sand placement	7.7 linear miles
2009	Brevard	Canaveral Harbor Sand Bypass	41910-2008-F-0547	Canaveral Harbor	Sand bypass	18,600 linear no more than every 2 years
2009	Brevard	Kennedy Space Center Lighting	41910-2009-F-0306			3% of all hatchling disorientation events
2009	Brevard	South Beach Renourishment	41910-2009-F-0327			7.8 miles
1991	Duval	Duval County Beach Erosion Control		R-44 to R-52.5	Beach nourishment	9,000 linear feet
1996	Duval	Duval County Beach Erosion Control		R-47 to R-80	Beach nourishment	5 miles
2003	Duval	Duval County Beach Erosion Control		R-72 to R-80	Beach nourishment	
2005	Duval	Duval County Beach Erosion Control	05-1544	R-43 to R-53 and R-57 to R-80	Beach nourishment	5.7 miles
2010	Duval	Duval County Hurricane and Storm Damage Reduction	2010-CPA-0045	V-501 to R-80	Beach nourishment	52,800 linear feet
2005	Flagler	Road Stabilization from SR A1A	41910-2006-IE-0173		Seawall	140 linear feet
2009	Flager	State Road (SR) A1A Shoreline Stabilization	41910-2007-F-0495	200 feet south of South 28th Street to 980 feet south of Osprey Point Drive	Sand placement, revetments, and seawalls	5.2 miles = length of take; 3,000 linear feet of anticipated incidental take
2005	Hillsborough	Egmont Key Nourishment	05-1845	R-2 to R-10	Beach nourishment	8,000 linear feet
1993	Manatee	Anna Maria Island Beach Restoration		R-2 to R-36	Beach nourishment	4.7 miles
1997	Manatee	Dredge Material Disposal and Longboat Key Beach Restoration		R-48 to R-51	Dredge and beach nourishment	
2002	Manatee	Anna Maria Island Beach Restoration		R-7 to R-10 and R-12 to R-36	Beach nourishment	5.2 miles
2005	Manatee	Anna Maria Island Shore Protection Project	41910-2006-F-0079	R-7 to R-10	Beach nourishment	3,000 linear feet

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
2005	Manatee	Anna Maria Island Emergency Beach Restoration	05-1227	R-2 to R-41	Beach nourishment	4.2 miles
2005	Manatee	Town of Longboat Key Beach Renourishment	4-1-04-TR-4529	R-44.5 to R-46	Beach nourishment	0.34 mile
2007	Manatee	Longboat Key Groin Installation	41910-2007-F-0521		Groin installation	2,210 linear feet
2009	Manatee	Anna Maria Island Beach Nourishment	41910-2008-F-456	R-7 to R-10, R-35 +790 feet and R-41 +365 feet	Sand placement	8,000 linear feet
2010	Manatee	Longboat Key North End Nourishment	41910-2010-F-0301			4,015 linear feet of beach
1994	Nassau	South Amelia Island Beach Restoration		R-60 to R-78	Beach nourishment	
1997	Nassau	Dredging of Sawpit Creek Cut and Beach Disposal		R-73.5 to R-78	Dredge and beach nourishment	2,900 linear feet
2002	Nassau	South Amelia Island Beach Restoration		R-50 to R-80	Beach nourishment	3.4 miles
2002	Nassau	Fernandina Harbor Dredge and Beach Disposal		R-1 to R-9	Dredge and beach nourishment	8,000 linear feet
2004	Nassau	Nassau County Shore Protection Project at Amelia Island	05-1355	R-9 to R-33	Beach nourishment	3.6 miles
2005	Nassau	Nassau County Shore Protection Project at Amelia Island	05-1355	R-11 to R-34	Beach nourishment	4.3 miles
2005	Nassau	Dredging of Sawpit Creek Cut and Beach Disposal	41910-2006-F-0254	R-73.5 to R-78	Dredge and beach nourishment	2,900 linear feet
1988	Pinellas	Sand Key/Redington Beach Restoration		R-99 to R-107	Beach nourishment	
1990	Pinellas	Sand Key/Indian Rocks Beach Restoration		R-72 to R-85	Beach nourishment	
1991	Pinellas	Long Key Beach Restoration		R-144 to R-147	Beach nourishment	0.45 mile
1991	Pinellas	Johns Pass Dredge Material Disposal		R-127 to R-130	Dredge disposal and sand placement	
1992	Pinellas	Sand Key/Redington Beach Restoration		R-99 to R-107	Beach nourishment	
1992	Pinellas	Sand Key/Indian Shore Beach Restoration		R-85 to R-99	Beach nourishment	
1996	Pinellas	Treasure Island Beach Restoration		R-138 to R-142	Beach nourishment	2,500 linear feet
1996	Pinellas	Long Key Beach Restoration		R-144 to R-146	Beach nourishment	0.45 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
1998	Pinellas	Sand Key/Belleair Beach Restoration		R-56 to R-66	Beach nourishment	
1999	Pinellas	Sand Key Beach Restoration		R-71 to R-107	Beach nourishment	
2000	Pinellas	Treasure Island Beach Restoration		R-136 to R-141	Beach nourishment	2.0 miles
2000	Pinellas	Terminal Groin at North End of Treasure Island			Groin construction	
2000	Pinellas	Long Key Beach Restoration		R-144 to R-145.6	Beach nourishment	2,800 linear feet
2000	Pinellas	Dredge Material Disposal and Honeymoon Island Beach Restoration		R-10 to R-12	Dredge disposal and sand placement	
2004	Pinellas	Treasure Island Beach Restoration	04-1247	R-136 to R-141	Beach nourishment	5,000 feet
2004	Pinellas	Long Key Beach Restoration	04-1247	R-144 to R-148	Beach nourishment	4,000 linear feet
2005	Pinellas	Sand Key Emergency Renourishment	05-0627	R-56 to R-66 and R-72 to R-106	Beach nourishment	8.6 miles
2006	Pinellas	Treasure Island, Sunset, Long Key, Pass a Grill Emergency Renourishment	41910-2006-F-0480	R-126 to R-146	Beach nourishment	9.5 miles
2006	Pinellas	Dredge Material Disposal and Mullet Key and Fort DeSoto Beach Restoration	41910-2006-F-0692	R-177 to R-179.5 and R-181 to R-183	Dredge disposal and sand placement	4,500 linear feet
2009	Pinellas	Treasure Island Beach Nourishment	41910-2009-F-0250	R-136 to R-141, R-144 to R-148	Sand placement	11,375 linear feet
1997	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D	R-197 to R-209		
2001	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D			
2002	St. Johns	St. Johns County Shore Protection Project at St. Augustine		R-137 to R-152	Beach nourishment	2.5 miles
2003	St. Johns	St. Johns County Shore Protection Project at St. Augustine		R-132 to R-152	Beach nourishment	3.8 miles

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2003	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	98-171D	R-197 to R-209	Beach nourishment	
2005	St. Johns	St. Johns County Shore Protection Project at St. Augustine	05-0446	R-137 to R-150	Beach nourishment	2.5 miles
2006	St. Johns		TE091980-0		Beach driving	41.1 linear miles
2007	St. Johns	Maintenance Dredging of Matanzas Inlet and Sand Placement at Summer Haven	41910-2007-F-0305	R-200 to R-208	Beach nourishment	4,000 linear feet
2009	St. Johns	Beach berm repair		R-201 to R-203, R-207 to R-208	Beach berm repair	7,000 linear feet
2009	St. Johns	Matanzas Inlet Maintenance Dredge and Summer Haven Sand Placement	41910-2009-F-0462	R-200 to R-208	Sand placement	8,000 linear feet
2009	St. Johns	St. Augustine Shore Protection Project	41910-2009-F-0444	600 feet north of R-137 and 600 feet south of R-151	Sand placement	15,280 linear feet
2010	St. Johns	St. Augustine Inlet Dredge and Sand Placement	41910-2010-F-0105			20,000 linear feet
2004	Volusia	Volusia County FEMA Berm	05-1074	R-40 to R-145 and R-161 to R-208	Beach nourishment	
2005	Volusia	Ponce de Leon Dredge and Beach Placement	05-0884	R-143 to R-145	Dredge and sand placement	3,000 linear feet
2005	Volusia		TE811813-11		Beach driving	50 miles
2006	Volusia	New Smyrna/Silver Sands Dune Restoration	05-1007	R-161 to R-175	Beach restoration	5.4 miles
2006	Volusia	Volusia County FEMA Berm	41910-2006-F-0831		Repair of right of way and beach placement	230 linear feet
2007	Volusia	Ponce de Leon Dredge and Beach Placement	41910-2007-F-0109	R-158 to R-175	Dredge and sand placement	3.2 miles
2009	Volusia	Ponce de Leon Inlet Maintenance Dredging and Sand Placement	41910-2009-F-0362	R-143 to R-145	Sand placement	8,000 linear feet
PANAMA CITY FIELD OFFICE						
8 April 1998	Bay	Panama City Beach Beach Nourishment	4-P-97-108	R-4.4 and R-93.2	Beach nourishment new project	16 miles
24 June 1998	Bay	Tyndall AFB Driving on the Beach	4-P-98-020	V-9 (virtual) to R-122	Driving on the beach for military missions	18 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
31 July 1998	Bay	Lake Powell Emergency Opening	4-P-97-089	R- 0.5	Emergency outlet opening	1,500 feet
16 April 1999	Bay	Panama City Beach Beach Nourishment Amendment 1	4-P-97-108	R-0.5 to R-9	Beach nourishment completion	16 miles (no additional take provided from original)
9 March 2000	Bay	Panama City Beach Beach Nourishment Amendment 2	4-P-97-108	R-35 to R-71	Relief from tilling requirement beach nourishment	16 miles (no additional take provided from original)
10 April 2000	Bay	Panama City Beach Beach Nourishment Amendment 3	4-P-97-108	R-35 to R-71	Relief from tilling requirement beach nourishment	16 miles (no additional take provided from original)
18 December 2000	Bay	Panama City Beach Beach Nourishment Amendment 4	4-P-97-108	R-35 to R-71	Relief from tilling depth requirement and compaction testing sample numbers beach nourishment	16 miles (no additional take provided from original)
4 January 2001	Bay	East Pass Re-Opening	4-P-00-211	No R-monuments	Dredging of a closed inlet and dredged material placement on beach	2 miles
29 March 2001	Bay	Panama City Beach Beach Nourishment Amendment 5	4-P-97-108	R-35 to R-71	Relief from tilling depth requirement beach nourishment	16 miles (no additional take provided from original)
7 Sept 2001	Bay	City of Mexico Beach Sand Bypass System	4-P-01-178	Mexico Beach canal	Dredging and spoil disposal	3,700 feet 2.0 acres
14 January 2005	Bay	Panama City Beach Beach Nourishment Amendment 5	4-P-97-108	R-4.4 and R-93.2	Post hurricane restoration	16 miles (no additional take provided from original)
2006	Bay	Tyndall Air Force Base INRMP	4-P-05-240	V-9 (virtual) to R-122	Integrated Natural Resources Management Plan	18 miles
26 March 2006	Bay	Mexico Beach Canal Sand By Pass Amendment 1	4-P-05-281 2007-F-0205	R-127 to R-129	By pass system improvements	5,000 feet
24 May 2007	Bay	Panama City Beach Beach Nourishment Amendment 6	4-P-97-108 2007-TA-0127	R-4.5 to R-30 and R-76 to R-88	New work and post hurricane restoration	31,500 feet of 16 miles total no additional take provided
25 October 2007	Bay	Panama City Beach Nourishment Amendment 8	2008-F-0004	2008 project: R-74 to R-91; Entire project: R-0.5 to R-91	Beach nourishment	17.9 miles
29 Feb 2008	Bay	Panama City Harbor (revised BO)	2008-F-0168	R-97	Navigation channel maintenance dredging and beach placement of dredged material.	500 ft of beachfront at St. Andrew State Park

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
8 June 2009	Bay	Panama City Harbor Navigation Channel Amendment 1	2009-F-0175	R-92 to R-97	Maintenance navigation channel dredging and dredged material placement	0.85 mile
2009	Bay	City of Mexico Beach		R-128.5 to R-138.2	Beach berm repair (emergency)	9,393 linear feet
06 Jan 2010	Bay	Lake Powell Outlet Emergency Opening	2009-F-0226	R-0-A and R-1	Emergency opening of the outlet to the Gulf of Mexico	2,400 feet
7 August 2000	Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf, Franklin	Destin Dome OCS Offshore Oil and Gas Drilling	4-P-00-003	Gulf of Mexico federal waters	Oil and gas offshore exploration	Formal consultation with no take
3 June 2002	Escambia	Pensacola Beach Beach Nourishment	4-P-02-056	R-108 to R-143	Beach nourishment	8.3 miles Loggerhead 14 nests Green 1 nest Leatherback < 1 nest Kemp's ridley <1 nest
9 June 2009	Escambia	Perdido Key Beach Nourishment	2008-F-0059	R-1 to R-34	New beach nourishment	6.5 miles
9 Sept 2010	Escambia	Pensacola Navigation Channel	2009-F-0205; using statewide programmatic 41910-2010-F-0547	R-32 to R-64	Navigation channel maintenance and dredge material disposal	6.3 miles
11 Jan 2010	Escambia	FEMA Perdido Key Upland Berm	Using statewide programmatic 41910-2010-F-0547	R-21.5 to R-31.5	Post Tropical Storm Gustav berm	2.0 miles
8 April 2005	Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf	FEMA Beach Berms Post Hurricane Ivan Emergency Coordination (consultation incomplete)		UK	Emergency beach berms	Walton 20 miles Okaloosa 4.2 miles Mexico Bch 1 mile Panama City Bch UK St Joseph peninsula UK Perdido Key UK Navarre UK
10 May 2004	Franklin	Alligator Point Beach Nourishment	4-P-02-163	R-207 to R-210	Beach nourishment	2,500 feet Loggerhead,: 2 nests, green 1 nest; leatherback 1 nest
17 May 2007	Gulf	St. Joseph Peninsula Beach Nourishment	4-P-07-056 2007-F-0220	R-67 to R-105.5	Beach nourishment	7.5 miles
31 Jan 2008	Gulf	St. Joseph Peninsula Beach Nourishment; Amendment 2	2008-F-0161	R-67 to R-105.5	Beach nourishment – change from work in 2 to 1 season.	7.5 miles; no increase in IT.
2009	Gulf	St. Joseph Peninsula Beach		R-95.3 to R-105.5	Beach berm repair (emergency)	10,300 linear feet

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
25 April 2001	Okaloosa	Eglin AFB Porous Groin within Season	4-P-00-207	Eglin AFB Test Sites 1 and 3	Experimental porous groin system	
18 June 2002	Okaloosa	Eglin 737 Sensor Test Site 13-A SRI	4-P-02-088	V-507	Military testing	0.01 acre 0.12 mile
2009	Okaloosa	City of Destin		R-17.37 to R-19	Beach berm repair (emergency)	1,260 linear feet
23 Dec 2009	Okaloosa	East Pass at Destin Navigation Channel	2009-F-0096	R-17 to R-25.5	Navigational channel maintenance	1.7 miles
21 March 2003	Okaloosa Santa Rosa	Eglin Marine Expeditionary Unit Training	4-P-03-052	V-621 to V-501	Military marine training	
9 October 2003	Okaloosa Santa Rosa	Eglin AFB U.S. Army Ranger Los Banos	4-P-03-289	V-502 to V-533	Military army training	7 miles
25 February 2004	Okaloosa, Santa Rosa	Eglin AFB Advance Skills Training	4-P-03-264	R-502 to R-534	Military training	7 miles 70 acres
4 June 2004	Okaloosa Santa Rosa	Eglin AFB Airborne Littoral Reconnaissance Test	4-P-04-225	V-501 to V-514	Military naval testing	0.5 mile 15.2 acres
1 December 2005	Okaloosa Santa Rosa	Eglin Air Force Base Military Mission & Training Santa Rosa Island Programmatic	4-P-05-242	V-621 to V-501	Military missions	17 miles
6 December 2007	Okaloosa Santa Rosa	Eglin AFB Airborne Littoral Reconnaissance Test	2008-F-0056	V-501 to V-514 Test Site A-15	Military naval testing	0.7 acre
3 June 2008	Okaloosa Santa Rosa	Eglin AFB Beach and Dune Restoration	2008-F-0139	V-551 to V-609 excluding non-AF lands and V-512 to V-518	Beach nourishment including dune restoration (new)	5.0 miles
28 August 2008	Okaloosa, Santa Rosa	Eglin Air Force Base Armoring Santa Rosa Island Test Sites A-3, A-6, A-13B	2008-F-061	Test Sites A-3, A-6, A-13B	Storm protection at air force facilities, Santa Rosa island	0.57 miles
21 April 2009	Okaloosa, Santa Rosa	East Pass Destin Navigation Channel	2009-F-0295	V-619.5 to V-621 and R-17	Maintenance navigation channel dredging and dredged material placement	1.6 miles
28 Dec 2009	Okaloosa, Santa Rosa	Eglin Air Force Base protection of Test Sites A-3, A-13, and A-13b	2008-F-061 amendment 1	V-608 and V-512	Sand placement 100% proposed at sites A-3 and 50% of proposed between sites A-13b and A-13.	A-3, = 7,000 feet; between A-13b and A-13.5=5,500-7,000 feet

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
28 Dec 2009	Okaloosa, Santa Rosa	Eglin Air Force Base	2008-F-039 amendment 1	V-608 and V-512	Sand placement 100% proposed at sites A-3 and 50% of proposed between sites A-13b and A-13.	A-3, = 7,000 feet; between A-13b and A-13.5=5,500-7,000 feet
26 March 2002	Santa Rosa, Okaloosa, Gulf	Eglin AFB INRMP		V-621 to V-501	Integrated natural resources management program	17 miles
19 July 2005	Santa Rosa	Navarre Beach Nourishment Emergency Coordination (consultation incomplete)	4-P-04-244	R-192.5 to R-213.5	Emergency beach nourishment	4.1 miles
24 Aug 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
30 Aug 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
29 Nov 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
28 August 2008	Santa Rosa	Eglin AFB SRI Armoring at Test Sites	2008-F-0061	V-608, V-551, and V-512	Bulkheads around test sites A-3, A-6, and A-13B	0.57 mile
7 Dec 2006	Santa Rosa	Navarre Beach Restoration Amendment 1	4-P-04-244 2007-F-0139		Walkover construction associated with beach nourishment	4.1 miles (no additional take provided from original)
9 October 2009	Santa Rosa	Navarre Beach Restoration Amendment 7	2010-F-0036	R-192 to R-194	Emergency beach restoration	1,800 feet
30 April 2004	Walton, Okaloosa	Walton County-Destin Beach Nourishment	4-P-01-149	R-39 (Okaloosa Co.) to R-21.93 (Walton Co.)	New beach nourishment	6.7 miles Loggerhead: 11 nests; green 1 nests; leatherback & Kemp's ridley: < 1 nests
8 May 2006	Walton	Western Lake Emergency Opening	4-P-01-105	R-72 to R-73	Emergency outlet opening	0.5 miles 3.0 acres
26 October 2007	Walton	Eastern Lake Emergency Opening	2007-F-0627	R-94 to R-95	Emergency opening of coastal dune lake to GOM	0.5 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
9 November 2007	Walton	Alligator Lake Emergency Opening	2007-F-0031	R-68 to R-70	Emergency opening of coastal dune lake to GOM	0.5 mile
2 October 2008	Walton	Walton County Beach Nourishment Phase 2	2008-F-060	R-41 to R-67, R-78 to R-98, R-105.5 to R-127	Beach nourishment (new)	13.5 miles
SOUTH FLORIDA FIELD OFFICE						3,390 feet
11 March 2003	Broward	Broward County Shore Protection Project	4-1-99-F-506		Port Everglades dredging and beach nourishment	
4 Dec 2003	Broward	Diplomat Beach Nourishment	4-1-00-F-743		Nourishment and 200 feet of riprap	
25 Aug 2004	Broward	Fishermen's Pier	4-1-04-F-8366		Pier repair	14,910 square feet
18 June 2007	Broward	Hillsboro Inlet Maintenance Dredging and Sand Placement	41420-2006-FA-0896	315 feet of the Inlet and 500 feet of shoreline at R-25.	Inlet dredging and sand nourishment	500 feet
10 Dec 2007	Broward	Town of Hillsboro Beach Pressure Equalizing Modules (PEMs) Pilot Project	41420-2007-F-0859	300 feet north of R-7 to 100 feet south of R-12 1 mile of shoreline	Pilot project to investigate the effectiveness of the PEMs	1 mile
7 Mar 2008	Broward	Broward County Glass Cullet Pilot Project	41420-2007-FA-0599	Centered at R-103	Pilot project to examine the effectiveness of glass cullet as potential beach fill supplement material for shoreline stabilization.	333 feet
28 April 2008	Broward	Town of Hillsboro Truck Haul Beach Nourishment Project	41420-2008-FA-0187	330 feet north and 100 feet south of R-7	Temporary beach nourishment	0.08 mile (430 feet)
3 Sept 2008	Broward	Hillsboro Inlet Maintenance Dredging and Sand Placement	41420-2006-FA-0896	500 feet south of R-25	Inlet dredging and sand placement. This is an amended BO in regard to the original BO completed on 18 June 2007.	500 feet
28 May 2010	Broward	Port Everglades Jetty Repair	41420-2010-CPA-0144	South Jetty	Repair of the south jetty.	0.15 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
18 June 2010	Broward	Hillsboro Beach Sand Placement	41420-2008-FA-0187	R-5 +300 to R-12 +450 feet	Beach nourishment	1.35 miles
23 March 2005	Charlotte	Manasota Key Groin Construction	4-1-04-F-8338	R-19 to R-20	Stump Pass dredging (material placed on beach); and groin construction	1,000 feet
29 March 2006	Charlotte	Stump Pass Dredging and Beach Nourishment	4-1-04-F-8338	R-16.5 to R-18	Stump Pass dredging and beach nourishment	1,500 feet
26 April 2010	Charlotte	Stump Pass Dredging and Sand Placement	41420-2008-FA-0425	R-14.4 to R-20 R-22 to R-23 R-29 to R-39	Stump Pass dredging and sand placement	3.5 miles
3 April 2003	Collier	Keewaydin Island Limited Partnership T-Groin Project	4-02-F-1099	R-90 to R-91	Gordon Pass – maintenance dredge; nourish the section of beach where groins are to be constructed; construct three t-groins	1,000 feet
14 March 2005	Collier	Hideaway Beach	4-1-04-F-6342	H-1 to H-5 and H-9 to H-12	Beach nourishment and t-groin construction	1.4 miles
20 Sept 2005	Collier	Collier County Beach Re-Nourishment Project	4-1-04-TR-8709	Segments within R-22 and R-79	Beach nourishment	13.4 miles
14 Nov 2005	Collier	South Marco Island Beach Re-Nourishment	4-1-04-TR-11752	R-144 to G-2	Beach nourishment	0.83 mile
28 August 2008	Collier	Doctor's Pass North Jetty Repair	41420-2008-FA-0432	R-57 plus 500 feet south	Removing the existing 240 feet of existing jetty and constructing a new jetty within generally the same footprint.	0.25 mile
27 October 2009	Collier	Hideaway Beach Erosion Control	41420-2008-FA-0935	H-4 to H-9	Sand placement and construction of six T-head groins.	0.47 mile
18 August 2010	Collier	Gordon Pass Erosion Control Project – Phase 2 (T-head groins)	41420-2008-FA-0765	R-91 to R-92	Construction of two T-head groins.	0.19 mile
28 Oct 2010	Collier	Collier County Truck Haul Sand Placement (Park Shore & Naples Beach)	41420-2010-F-0225	R-45 +600 feet to R-46 +400 feet; R-58A -500 feet to R-58	A truck haul sand placement project	0.37 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
12 Oct 2004	Indian River	Issuance of Permits to Homeowners for Emergency Coastal Armoring	10(a)(1)(B) permit			3,196 feet
28 Feb 2005	Indian River	Indian River County Beach Nourishment - Sectors 3 and 5	4-1-05-F-10922	Gaps between R-21 and R-107	Dune restoration and beach nourishment	5.90 miles dunes 0.8 mile beach
22 Nov 2005	Indian River	Indian River County Beach Nourishment – Sector 7	4-1-05-TR-9179	R-97 to R-108	Beach nourishment	2.2 miles
31 Oct 2006	Indian River	Indian River County Beach Nourishment – Sectors 1 and 2	41420-2006-FA-1491	R-3.5 to R-12	Dune enhancement and beach nourishment	1.62 miles
10 Sept 2007	Indian River	Sebastian Inlet Channel and Sand Trap Dredging, Sectors 1 and 2 Beach Nourishment	41420-2007-F-0864	R-3 to R-12	Sand trap dredging and beach nourishment	1.61 miles
10 October 2008	Indian River	Baytree and Marbrisa Condominium Dune Restoration	41420-2008-FA-0007	200 feet south of R-46 to 200 feet south of R-48	Dune restoration/enhancement	0.38 mile
16 October 2009	Indian River	City of Vero Beach, Outfall Pipe Installation	41420-2009-FA-0255	220 feet north and 930 feet south of R-83	Outfall pipe installation	0.22 mile
2 December 2009	Indian River	Indian River County Beach Nourishment Sector 3	41420-2007-F-0839	Phase 1 = R-32 to R-55 Phase 2 = R-20 to R-32	Beach and dune nourishment	Phase 1 = ~4.4 miles Phase 2 = ~2.3 miles
24 July 2002	Lee	Gasparilla Island Beach Nourishment	4-01-F-765	R-10 to R-26.5 R-25, R-25.5, R-26	Beach nourishment; breakwater construction; and two t-head groins	3.2 miles
19 June 2003	Lee	Bonita Beach Re-nourishment	4-1-02-F-1736		Beach nourishment	3,922 feet
4 March 2005	Lee	Sanibel and Captiva Island Beach Nourishment	4-1-04-F-9180	R-83 to R-109 and R-110 to R-118	Beach nourishment	6.0 miles
14 March 2007	Lee	Gasparilla Island Beach Nourishment (BO amendment)	41420-2007-FA-0509	South of R-26A	Beach nourishment	
27 August 2007	Lee	North Captiva Island Beach Nourishment	41420-2007-FA-1023	R-81 and 208 feet south of R-81A	Beach nourishment	0.23 mile
5 August 2009	Lee	Matanzas Pass Reopening	41420-2009-FA-0132	North end of Estero Island	Channel dredging	0.14 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
21 March 2008	Lee	Blind Pass Reopening	41420-2006-FA-1549	R-109 to R-114	Reopening Blind Pass and then nourishing the shoreline between R-112 and R-114.	0.95 mile
7 Dec 2009	Lee	Sanibel Island Sand Placement	41420-2009-FA-0066	R-174A to Bay 1A	Beach nourishment	0.25 mile
15 Sept 2010	Lee	Big Hickory Island Sand Placement and Groin Construction	41420-2010-CPA-0100	R-222.3 to R-223.8	Beach nourishment and groin construction	0.47 mile
31 Jan 2002	Martin	Jupiter Island	4-1-05-TR-13281	R-75 to R-117	Beach nourishment	6.5 miles
5 Jan 2005	Martin	Martin County Shore Protection Project	4-1-05-F-10476	R-1 to R-25.6	Beach nourishment	4.1 miles
2 Dec 2005	Martin	Jupiter Island Modification	4-1-05-TR-13281	R-76 to R-84 and R-87 to R-11	Beach nourishment	5 miles
2 Feb 2007	Martin	Sailfish Point Marina Channel Dredging and Beach Nourishment	41420-2007-FA-0196	R-36 to R-39	Channel dredging and beach nourishment	0.66 mile
6 October 2009	Martin	Bathtub Beach Park Sand Placement	41420-2009-FA-0110	R-34.5 to R-36	Beach nourishment	0.24 mile
8 June 2010	Martin	Martin County Beach Erosion Control Project	41420-2009-FA-0190	R-1 to R-25	Beach nourishment	~ 4 miles
23 Sept 2005	Miami-Dade	Bal-Harbour T-Groin Reconstruction	4-1-05-12842	R-27 to R-31.5	Groin removal and reconstruction	0.85 mile
11 Oct 2005	Miami-Dade	Bakers Haulover AIW Maintenance Dredging	4-1-04-TR-8700	R-28 to R-32	Dredging and beach nourishment	0.85 mile
7 June 2006	Miami-Dade	Miami-Dade Beach Nourishment	41420-2006-FA-0028	3 segments within R-48.7 and R-61	Beach nourishment	3,716 feet
25 July 2007	Miami-Dade	Miami Beach Nourishment	41420-2006-F-0028	R-67 to R-70	BO modification to June 7, 2006 BO	3,000 feet
5 Nov 2008	Miami-Dade	Baker's Haulover Dredging and Sand Placement	41420-2008-FA-0729	R-28 to R-32	BO modification to the October 11, 2005 BO. Dredging and sand placement events will be biannual.	4,000 feet
12 Nov 2008	Miami-Dade	DERM Truck Haul Sand Placement	41420-2008-FA-0776	R-27 to R-29 R-7 to R-12 R-43 to R-44+500 feet	Beach nourishment	1.78 miles
25 Nov 2009	Miami-Dade	DERM 27th Street Sand Placement	41420-2009-FA-0045	R-60 to R-61	Beach nourishment	0.19 mile
17 Dec 2009	Miami-Dade	32nd and 63rd Streets Sand Placement	41420-2009-FA-0415	R-37.75 to R-46.25 R-53.7 to R-55.5 R-60 to R-61	Sand placement	2.14 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
31 March 2010	Miami-Dade	55th Street Sand Placement	41420-2009-FA-0046	R-48.7 to R-50.7	Sand placement	0.38 mile
30 April 2010	Miami-Dade	44th Street Sand Placement	41420-2009-FA-0047	R-53.7 to R-55.5	Sand placement	0.34 mile
25 June 2010	Miami-Dade	Bal Harbour Sand Placement	41420-2009-FA-0593	R-29 to R-32	Sand Placement – truck haul	0.60 mile
28 June 2010	Miami-Dade	Sunny Isles BeachSand Placement	41420-2009-FA-0594	R-12 to R-15)	Sand Placement – truck haul	0.58 mile
30 July 2010	Miami-Dade	Miami Beach sand placement	41420-2009-FA-0595	R-45 to R-48 +700 feet	Sand Placement – truck haul	0.78 mile
13 Sept 2010	Miami-Dade	Miami Beach sand placement	41420-2009-FA-0527	R-43 to R-44 + 500 feet	Sand Placement – truck haul	0.26 mile
8 October 2010	Miami-Dade	Sunny Isles Beach Sand Placement	41420-2009-FA-0526	R-7 to R-12	Sand Placement – truck haul	0.95 mile
8 October 2010	Miami-Dade	Bal Harbour Sand Placement	41420-2009-FA-0525	R-27 to R-29	Sand Placement – truck haul	0.38 mile
2009	Monroe	Reclaimed sand placement and sand cleaning (seaweed removal)	41420-2010-F-0006	No R-monuments	Sand placement and cleaning	1,462 linear feet
2009	Monroe	City of Key West (South Beach)	41420-2010-F-0013	No R-monuments	Beach repair (emergency)	235 linear feet
2009	Monroe	City of Key West (Rest Beach)	41420-2010-F-0014	No R-monuments	Beach repair (emergency)	640 linear feet
2009	Monroe	City of Marathon, Sombrero Beach	41420-2010-F-0001	No R-monuments	Beach repair (emergency)	1,380 linear feet
5 March 2010	Monroe	City of Key West – Simonton Beach	41420-2010-FC-0412	Approximately 350 feet ENE of V-416 (latitude 24.562, longitude -81.8054	Emergency beach repair	95 linear feet
5 March 2010	Monroe	City of Key West – Dog Beach	41420-2010-FC-0413	Between V-414 and V-413 (latitude 24.5473, longitude -81.7929	Emergency beach repair	35 linear feet
13 May 2010	Monroe	City of Key West, Smathers Beach	41420-2008-FA-0185	No R-monuments	Sand placement	0.57 mile
27 March 2003	Palm Beach	Palm Beach Harbor M & O	4-1-03-F-139	200 feet south of the south jetty	Jetty sand tightening	200 feet
16 March 2004	Palm Beach	Boca Raton Inlet Sand Bypassing	4-1-04-F-4688	200 feet south of R-223	Inlet sand bypassing and beach nourishment	500 feet
11 Feb 2005	Palm Beach	Palm Beach Shoreline Protection Project - Delray Segment	4-1-05-F-10767	R-175 to R-188	Beach restoration	2.7 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
24 Feb 2005	Palm Beach	Palm Beach Shoreline Protection Project - Ocean Ridge Section	4-1-05-F-10787	R-153 to R-159	Beach nourishment	1.12 miles
11 April 2005	Palm Beach	South Lake Worth Inlet Sand Transfer Plant Reconstruction and Bypassing	4-1-04-F-8640	135 feet south of R-151, to 275 feet south of R-152	STP reconstruction and bypassing	900 feet
5 Dec 2005	Palm Beach	Mid-Town Beach Nourishment Project (Reach 3 & 4)	4-1-00-F-742	R-90.4 to R-101.4	Beach nourishment	2.4 miles
23 Dec 2005	Palm Beach	Palm Beach Harbor M & O	4-1-05-TR-13258	R-76 to R-79	Dredging and beach nourishment	3,450 feet
23 Feb 2006	Palm Beach	Boca Raton Central Beach Nourishment Project	4-1-01-F-1795	R-216 to R-222	Dredge shoal fronting Boca Raton Inlet and beach nourishment	1.3 miles
23 Feb 2006	Palm Beach	Boca Raton South Beach Nourishment Project	41420-2008-FA-0777 Old database number 41-01-F-652	R-223.3 to R-227.9	Dredge shoal fronting Boca Raton Inlet and beach nourishment	Approx. 1 mile
28 April 2006	Palm Beach	Palm Beach Nourishment Project – Reach 8	41420-2006-F-0018	R-125 to R-134	Beach nourishment	2.17 miles
31 July 2006	Palm Beach	Sea Dunes Condominium Seawall	41420-2006-FA-1108		Seawall construction	0.03 acre
15 Dec 2006	Palm Beach	North Ocean Boulevard Rock Revetment	41420-2006-FA-1490	290 feet north of R-84; 1,150 feet south of R-85	Rock revetment construction	0.34 mile
5 Feb 2007	Palm Beach	Palm Beach Sand Transfer Plant Reconstruction	41420-2006-FA-1447	R-76 to R-79	Sand transfer plant reconstruction and discharge pipe extension	0.57 mile
28 March 2007	Palm Beach	Lake Worth Inlet Jetty Repair	41420-2007-FA-0221	200 feet north of R-75 and 200 feet south of R-76	Jetty repair	400 feet
25 May 2007	Palm Beach	Singer Island and South Palm Beach Emergency Dune Restoration	41420-2007-FA-1001	385' south of R-137 to 500' north of R-136; 500'south of R-60 to 850' south of R-65	Dune Restoration	6,135 feet
25 May 2007	Palm Beach	Jupiter Island ICWW Maintenance Dredging and Beach Nourishment	41420-2006-FA-1582	16,000 feet (130,000 cy) of the ICWW dredged; material placed between R-13 and R-19.	Channel dredging and beach nourishment	1.04 miles
20 July 2007	Palm Beach	North Boca Raton Beach Nourishment	41420-2007-FA-0477	T-205 to 181 feet south of R-212	Beach nourishment	1.45 miles

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
9 Nov 2007	Palm Beach	Jupiter Inlet and channel dredging	41420-2006-FA-1582	R-13 to R-17	Dune restoration	~ 4,000 linear feet
14 Nov 2007	Palm Beach	Jupiter Inlet Sand Trap Dredging and Sand Placement	41420-2007-FA-0600	Maintenance dredging of the inlet; beach compatible placed R-13 to R-19	Inlet dredging and beach nourishment	1.02 miles
28 Nov 2007	Palm Beach	Modification to a Sheet Pile and Rubble-Mound T-Head Groin System	41420-2007-FA-0574	500 feet north of R-94 south to R-95	T-groin repair, extension, construction	0.4 mile
5 Feb 2008	Palm Beach	Reach 8 Dune Restoration	41420-2006-F-0018	R-125 to 350 feet south of R-134	Dune restoration	2.17 miles
9 Sept 2008	Palm Beach	Juno Beach Sand Placement	41420-2008-FA-0081	R-26 to R-38	Sand placement	2.45 miles
4 Nov 2008	Palm Beach	Palm Beach Harbor M&O and Sand Placement	41420-2008-FA-0524	R-76 to R-79	Biannual Inlet dredging and sand placement events.	3,450 feet
2009	Palm Beach	Beach berm repair	41420-2010-F-0008	R-60 to R-68	Beach berm repair (permanent work)	6,880 linear feet
2009	Palm Beach	Beach berm repair	41420-2010-F-0009	R-135 to R-138	Beach berm repair (permanent work)	3,590 linear feet
2009	Palm Beach	Beach berm repair	41420-2010-F0010	R-137 to R-138	Beach berm repair (emergency)	125 linear feet
21 June 2010	Palm Beach	Mid-Town Reaches 3 & 4 Sand Placement	41420-2006-F-0011-R001	R-95 to R-100	Beach nourishment	0.95 mile
2 July 2010	Palm Beach	Phipps Ocean Park Reaches 7&8	41420-2010-CPA-0110	R-116 to R-125	Sand Placement	3.4 miles
3 Sept 2010	Palm Beach	Singer Island Breakwater	41420-2008-FA-0019	R-60.5 to R-66	Segmented, submerged breakwater	1.1 miles
19 June 2003	St. Lucie	Fort Pierce Shoreline Protection	4-1-03-F-1867 41420-2006-FA-1575	R-33.8 to R-41	Beach nourishment; berm expansion; and six t-head groins	1.3 miles
9 March 2006	St. Lucie	Blind Creek Restoration and South St. Lucie Emergency Berm Remediation Project	41420-2006-FA-0075	R-98 to R-115 R-88 to R-90	Wetland restoration and beach nourishment	3.6 miles
27 June 2008	St. Lucie	Fort Pierce Shoreline Protection Project	41420-2006-FA-1575	R-34 to R-41	Beach nourishment, berm expansion, and six t-head groins	1.3 miles
25 Aug 2004	Sarasota and Manatee	Longboat Key Beach Nourishment	4-1-04-F-4529	R-46A to R-29.5	Beach nourishment	9.45 miles
4 Oct 2005	Sarasota and Manatee	Longboat Key Beach Nourishment Project – BO Amendment	4-1-04-TR-4529	R-44 to R-44.5 and R-46A to R-44.5	Beach nourishment	0.47 mile

YEAR	COUNTY	PROJECT NAME	SERVICE FEDERAL ACTIVITY CODE	PROJECT LOCATION	PROJECT TYPE	ANTICIPATED INCIDENTAL TAKE (linear footage, no. of eggs, etc.)
20 Oct 2005	Sarasota	South Siesta Key	4-1-05-TR-12691	R-67 to R-77 plus 200 feet	Beach nourishment	2.1 miles
7 Dec 2007 (original BO) 28 July 08 (BO mod)	Sarasota	Lido Key Beach Fill Placement Project	41420-2007-F-0841	R-35.5 to R-44.2 2.27 miles	Beach nourishment with 425,000 cy of fill material.	2.27 miles
13 August 2008	Sarasota	Longboat Key Permeable Adjustable Groins	41420-2007-FA-0205	R-13 to R-13.5	Construction of two permeable adjustable groins.	0.09 mile project area 0.43 mile action area
2009	Sarasota		41420-2010-F-0003	R-77 to midpoint between R-77 and R-76	Beach restoration	700 linear feet
2009	Sarasota	Longboat Key Beach	41420-2010-F-0007	R-13 to R-14 Sarasota County; R-44 to R-5, and R-48.5 to R-49.5 Manatee County	Beach berm repair	951, 1,197, and 1,142 linear feet, respectively

Appendix B

NMFS Consultations

CONSULTATION ACTIVITY	TYPE OF ACTION	DATE SIGNED	ACTION AREA	INCIDENTAL TAKE STATEMENT (ANTICIPATED TAKE)									
				Loggerhead (NWAO & NP DPS)		Green Turtle		Leatherback		Hawksbill		Kemp's Ridley Olive Ridley	
				Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Non-Fishery Consultations													
North Carolina DENR Inshore Gillnet-Incidental Take Permit	Section 10(a)(1)(B)	9/6/13	North Carolina Inshore Waters	1-yr Estimate									
						330	165					98	49
				1-yr Observed									
				24		18		8		8		12	
Removal of Offshore Structures in the Gulf of Mexico Outer Continental Shelf	Oil & Gas	8/28/2006	Gulf of Mexico	6-yr Estimate									
				15*	0	3*	0	3*	0	3*	0	3*	0
Sinking Exercises (SINKEX) in the Western North Atlantic Ocean	Military	9/22/2006	Western North Atlantic Ocean	1-yr Estimate									
				ITS - We do not have information to determine an amount of take. Survey data for the SINKEX location is extremely limited and the densities or abundance of sea turtles within the area is not known. Therefore, we anticipate the extent of take would be within the water column that would be affected by the shock and pressure waves above levels of 12 psi and 182 dB re 1 μ Pa2-sec in the greatest 1/3 octave band. For the largest underwater detonations, the extent includes the volume within 2 nmi of the detonation. Thus, the extent of take includes the "exclusion zone" of the SINKEX.									
Issuance of multiple permits to conduct scientific research on Atlantic sturgeon pursuant to section 10 (a)(1) of the Endangered Species Act of 1973	Section 10(a)(1)(A) for Sturgeon Research	4/2/2012	U.S. Atlantic Coast (from ME to FL)	Anticipated take for the entire research permit (5 years)									
				4*	0	4*	0	4*	0	4*	0	4*	0
National Science Foundation - Marine Seismic Survey in the Central Pacific Ocean	Seismic	11/23/2011	Central Pacific Ocean	Anticipated take for the entire project period									
				ITS - We do not have information to determine an amount of take. Harassment of these sea turtles is expected to occur at received levels of seismic sounds above 166 dB re 1 μPa. Because density estimates of sea turtles in the survey area are unknown, we estimate take as the number of turtles exposed to seismic operations above 166 dB re 1 μPa during the proposed activities. These turtles could be of all ages and life stages in the survey area.									
Navy - Conduct of training in the Virginia Capes, Cherry Point and Jacksonville Range Complexes June 2011 to June 2012	Navy Activities	6/1/2011	Central Pacific Ocean	Anticipated take for the entire project period									
				485	9	311*	3*	20	1	311*	3*	557	5

Appendix C

ASSESSMENTS: DISCERNING PROBLEMS CAUSED BY ARTIFICIAL LIGHTING

LIGHTING INSPECTIONS

WHAT ARE LIGHTING INSPECTIONS?

During a lighting inspection, a complete census is made of the number, types, locations, and custodians of artificial light sources that emit light visible from the beach. The goal of lighting inspections is to locate lighting problems and to identify the property owner, manager, caretaker, or tenant who can modify the lighting or turn it off.

WHICH LIGHTS CAUSE PROBLEMS?

Although the attributes that can make a light source harmful to sea turtles are complex, a simple rule has proven to be useful in identifying problem lighting under a variety of conditions:

An artificial light source is likely to cause problems for sea turtles if light from the source can be seen by an observer standing anywhere on the nesting beach.

If light can be seen by an observer on the beach, then the light is reaching the beach and can affect sea turtles. If any glowing portion of a luminaire (including the lamp, globe, or reflector) is directly visible from the beach, then this source is likely to be a problem for sea turtles. But light may also reach the beach indirectly by reflecting off buildings or trees that are visible from the beach. Bright or numerous sources, especially those directed upward, will illuminate sea mist and low clouds, creating a distinct glow visible from the beach. This “urban skyglow” is common over brightly lighted areas. Although some indirect lighting may be perceived as nonpoint-source light pollution, contributing light sources can be readily identified and include sources that are poorly directed or are directed upward. Indirect lighting can originate far from the beach. Although most of the light that sea turtles can detect can also be seen by humans, observers should realize that some sources, particularly those emitting near-ultraviolet and violet light (e.g., bug-zapper lights, white electric-discharge lighting) will appear brighter to sea turtles than to humans. A human is also considerably taller than a hatchling; however, an observer on the dry beach who crouches to the level of a hatchling may miss some lighting that will affect turtles. Because of the way that some lights are partially hidden by the dune, a standing observer is more likely to see light that is visible to hatchlings and nesting turtles in the swash zone.

HOW SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Lighting inspections to identify problem light sources may be conducted either under the purview of a lighting ordinance or independently. In either case, goals and methods should be similar.

GATHER BACKGROUND INFORMATION

Before walking the beach in search of lighting, it is important to identify the boundaries of the area to be inspected. For inspections that are part of lighting ordinance enforcement efforts, the jurisdictional boundaries of the sponsoring local government should be determined. It will help to have a list that includes the name, owner, and address of each property within inspection area so that custodians of problem lighting can be identified. Plat maps or aerial photographs will help surveyors orient themselves on heavily developed beaches.

PRELIMINARY DAYTIME INSPECTIONS

An advantage to conducting lighting inspections during the day is that surveyors will be better able to judge their exact location than they would be able to at night. Preliminary daytime inspections are especially important on beaches that have restricted access at night. Property owners are also more likely to be available during the day than at night to discuss strategies for dealing with problem lighting at their sites.

A disadvantage to daytime inspections is that fixtures that are not directly visible from the beach will be difficult to identify as problems. Moreover, some light sources that can be seen from the beach in daylight may be kept off at night and thus present no problems. For these reasons, daytime inspections are not a substitute for nighttime inspections. Descriptions of light sources identified during daytime inspections should be detailed enough so that anyone can locate the lighting. In addition to a general description of each luminaire (e.g., HPS floodlight directed seaward at top northeast corner of the building at 123 Ocean Street), photographs or sketches of the lighting may be necessary. Descriptions should also include an assessment of how the specific lighting problem can be resolved (e.g., needs turning off; should be redirected 90° to the east). These detailed descriptions will show property owners exactly which luminaries need what remedy.

NIGHTTIME INSPECTIONS

A nighttime survey shall be conducted of all lighting visible from the beach placement area by the FWC permit holder, using standard techniques for such a survey. During the nighttime lighting surveys, the surveyor shall walk the length of the beach placement area looking for light from artificial sources. During the nighttime lighting surveys, a complete census shall be made of the number, types, locations, and custodians of artificial light sources that emit light visible from the beach. Because problem lighting will be most visible on the darkest nights, lighting inspections are to be conducted when there is no moon visible. Descriptions of light sources identified during the survey should be detailed enough so that anyone can locate the lighting. In addition to a general description of each luminaire (e.g., HPS floodlight directed seaward at top northeast corner of the building at 123 Ocean Street), photographs or sketches of the lighting may be necessary. Descriptions should also include an assessment of how the specific lighting problem can be resolved (e.g., needs turning off; should be redirected 90° to the east, etc.). A summary report of the survey shall be submitted to the Corps, FWC, and the Service.

Surveyors orienting themselves on the beach at night will benefit from notes made during daytime surveys. During nighttime lighting inspections, a surveyor walks the length of the nesting beach looking for light from artificial sources. There are two general categories of artificial lighting that observers are likely to detect:

1. **Direct lighting**. A luminaire is considered to be direct lighting if some glowing element of the luminaire (e.g., the globe, lamp [bulb], reflector) is visible to an observer on the beach. A source not visible from one location may be visible from another farther down the beach. When direct lighting is observed, notes should be made of the number, lamp type (discernable by color; style

of fixture), mounting (pole, porch, *etc.*), and location (street address, apartment number, or pole identification number) of the luminaire(s). If exact locations of problem sources were not determined during preliminary daytime surveys, this should be done during daylight soon after the nighttime survey. Photographing light sources (using long exposure times) is often helpful.

2. **Indirect lighting**. A luminaire is considered to be indirect lighting if it is not visible from the beach but illuminates an object (e.g., building, wall, tree) that is visible from the beach. Any object on the dune that appears to glow is probably being lighted by an indirect source. When possible, notes should be made of the number, lamp type, fixture style, and mounting of an indirect-lighting source. Minimally, notes should be taken that would allow a surveyor to find the lighting during a follow-up daytime inspection (for instance, which building wall is illuminated and from what angle?).

WHEN SHOULD LIGHTING INSPECTIONS BE CONDUCTED?

Because problem lighting will be most visible on the darkest nights, lighting inspections are ideally conducted when there is no moon visible. Except for a few nights near the time of the full moon, each night of the month has periods when there is no moon visible. Early-evening lighting inspections (probably the time of night most convenient for inspectors) are best conducted during the period of two to 14 days following the full moon. Although most lighting problems will be visible on moonlit nights, some problems, especially those involving indirect lighting, will be difficult to detect on bright nights.

A set of daytime and nighttime lighting inspections before the nesting season and a minimum of three additional nighttime inspections during the nesting-hatching season are recommended. The first set of day and night inspections should take place just before nesting begins. The hope is that managers, tenants, and owners made aware of lighting problems will alter or replace lights before they can affect sea turtles. A follow-up nighttime lighting inspection should be made approximately two weeks after the first inspection so that remaining problems can be identified. During the nesting-hatching season, lighting problems that seemed to have been remedied may reappear because owners have been forgetful or because ownership has changed. For this reason, two midseason lighting inspections are recommended. The first of these should take place approximately two months after the beginning of the nesting season, which is about when hatchlings begin to emerge from nests. To verify that lighting problems have been resolved, another follow-up inspection should be conducted approximately one week after the first midseason inspection.

WHO SHOULD CONDUCT LIGHTING INSPECTIONS?

Although no specific authority is required to conduct lighting inspections, property managers, tenants, and owners are more likely to be receptive if the individual making recommendations represent a recognized conservation group, research consultant, or government agency. When local ordinances regulate beach lighting, local government code-enforcement agents should conduct lighting inspections and contact the public about resolving problems.

WHAT SHOULD BE DONE WITH INFORMATION FROM LIGHTING INSPECTIONS?

Although lighting surveys serve as a way for conservationists to assess the extent of lighting problems on a particular nesting beach, the principal goal of those conducting lighting inspections should be to ensure that lighting problems are resolved. To resolve lighting problems, property managers, tenants, and owners should be give the information they need to make proper alterations to light sources. This information should include details on the location and description of problem lights, as well as on how the lighting problem can be solved. One should also be prepared to discuss the details of how lighting affects sea turtles. Understanding the nature of the problem will motivate people more than simply being told what to do.

Appendix D
Sea Turtle Lighting Survey Form

Lighting Survey Form

The lighting survey must be conducted to include a landward view from the seaward most extent of the beach profile. The survey must occur after 9 p.m. The survey must follow standard techniques for such a survey and include the number and type of visible lights, location of lights and photo documentation.

Date: _____

Contact information of person conducting the lighting survey: _____

_____

Location (name of beach): _____

Lighting ordinance (applicable County or Municipality): _____

Compliance Officer name and contact information: _____

Survey start time: _____

Survey end time: _____

Survey start location (include address or GPS location):_____

_____

_____

Survey end location (include address or GPS location): _____

_____

Date summarizing report sent to the following: marineturtle@myfwc.com, JCPCompliance@dep.state.fl.us, and seaturtle@fws.gov:_____

County or Municipality contact information for follow up meeting with the FWS and FWC:

_____

For each light visible from the nesting beach provide the following information:

Location of light (include cross street and nearest beach access)	GPS location of light	Description of light (type and location)	Photo take (YES/ NO)	Notification letter with recommendations sent? (YES/NO)

Location of light (include cross street and nearest beach access)	GPS location of light	Description of light (type and location)	Photo take (YES/ NO)	Notification letter with recommendations sent? (YES/NO)

Appendix E

Nesting Seabird and Shorebird Protection Conditions

a. Selection of Bird Monitors. The Permittee or designated representative ("Permittee") shall hire one or more Bird Monitors, depending on the size of the area to be affected, who shall monitor shorebird and seabird (shorebird) activity before, during, and after construction. Bird Monitors shall have proven seabird and shorebird identification skills and avian survey experience. Before hiring any Bird Monitors, the Representative shall provide a list of candidate Bird Monitors with (1) their contact information and (2) a summary of their qualifications, including bird identification skills and avian survey experience, to the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit) and copied to JCPCompliance@dep.state.fl.us for FWC approval before the Permittee hires the Bird Monitor(s).

b. The Bird Monitor(s) shall review and become familiar with the general information on the FWC's Florida Shorebird Database (FSD) website (www.FLShorebirdDatabase.org). They shall use the data-collection protocol and implement data-entry procedures as outlined in that website. An outline of data to be collected, including downloadable field data sheets, is available on the website.

c. Breeding season varies by species. Most species have completed the breeding cycle by September 1, but flightless young may be present through September. The following dates are based on the best available information regarding ranges and habitat use by species for this project: February 15 – September 1.

   Surveys during the breeding season shall begin on the first day of the breeding season or 10 days before any site work begins, whichever is later. Surveys shall be conducted through August 31 or until all breeding activity has concluded, whichever is later.

d. During the breeding season, the Bird Monitor(s) shall survey all potential beach-nesting bird habitats that may be affected by construction or pre-construction activities. The Bird Monitor(s) shall establish one or more shorebird survey routes in the FSD website to cover these areas.

e. During the pre-construction and construction phases of the project, the Bird Monitor(s) shall complete surveys on a daily basis to detect breeding activity and the presence of flightless chicks before (1) equipment is moved to the area, (2) vehicles are operated in the area, or (3) any other activities occur that have the potential to disrupt breeding behavior or cause harm to the birds or their eggs or young. Once construction is completed and all personnel and equipment have been removed from the beach, surveys may be conducted at weekly intervals.

f. The Bird Monitor(s) shall survey the project area by walking and looking for evidence of (1) shorebirds exhibiting breeding behavior, (2) shorebird chicks, or (3) shorebird juveniles, as outlined in the FSD's Breeding Bird Protocol for Shorebirds and Seabirds. The Bird Monitor(s) shall use binoculars for these surveys.

g. If an ATV or other vehicle is needed to cover large project areas, operators shall adhere to the FWC's Best Management Practices for Operating Vehicles on the Beach (http://myfwc.com/conservation/you-conserve/wildlife/beach-driving/). Specifically, the vehicle shall be operated at a speed under 6 mph and only on beaches at or below the high-tide line. The Bird Monitor(s) shall stop at no greater than 200-meter intervals to look for breeding activity.

h. Once the Bird Monitor(s) confirms that birds are breeding, as evidenced by the presence of a scrape, eggs, or young, the Bird Monitor(s) shall notify the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit) within 24 hours. The Bird Monitor(s) shall report all breeding activity to the FSD website within one week of data collection.

Seabird and Shorebird Buffer Zones and Travel Corridors

The Bird Monitor(s) shall establish a disturbance-free buffer zone around any location within the project area where shorebirds have been engaged in breeding behavior, including territory defense. The FWC considers a 300-foot-wide buffer to be adequate based on published studies; however, a smaller, site-specific buffer may be established if approved by the FWC Regional Species Conservation Biologist (see the attached FWC contact information exhibit). All sources of human disturbance (including pedestrians, pets, and vehicles) shall be prohibited in the buffer zone.

a. The Bird Monitor(s) shall keep breeding sites under sufficient surveillance to determine if birds appear agitated or disturbed by construction or other activities in adjacent areas. If birds do appear to be agitated or disturbed by these activities, then the Bird Monitor(s) shall widen of the buffer zone immediately to a sufficient size to protect breeding birds.

b. The Bird Monitor(s) shall ensure that reasonable and traditional pedestrian access is not blocked in situations where breeding birds will tolerate pedestrian traffic. This is generally the case with lateral movement of beach-goers walking parallel to the beach at or below the highest tide line. Pedestrian traffic may also be tolerated when breeding was initiated within 300 feet of an established beach access pathway. The Bird Monitor(s) shall work with the FWC Regional Species Conservation Biologist to determine if pedestrian access can be accommodated without compromising nesting success.

c. The Bird Monitor(s) shall ensure that the perimeters of designated buffer zones are marked with posts, twine, and signs stating "Do Not Enter, Important Nesting Area" or similar language. The signs shall include the name and a phone number of the entity responsible for posting. Posts shall not be higher than 3 feet once installed. "Symbolic fencing" (i.e., twine, string, or rope) shall be placed between all posts and be clearly visible to pedestrians. In areas where marine turtles nest, the ropes shall be at least 2.5 feet above the ground. If pedestrian pathways are approved by the FWC Regional Species Conservation Biologist within the 300-foot buffer zone, these shall be clearly marked. The Bird Monitor(s) shall ensure that the posting is maintained in good repair until breeding is completed or terminated. Although solitary nesters may leave the buffer zone with their chicks, the posted area continues to provide a potential refuge for the family until breeding is complete. Breeding is not considered to be completed until all chicks have fledged.

d. The Bird Monitor(s) shall ensure that no construction activities, pedestrians, moving vehicles, or stockpiled equipment are allowed within the buffer area.

e. The Bird Monitor(s) shall designate and mark travel corridors outside the buffer areas so as not to cause disturbance to breeding birds. Heavy equipment, other vehicles, or pedestrians may go past breeding areas in these corridors. However, other activities such as stopping or turning heavy equipment and vehicles shall be prohibited within the designated travel corridors adjacent to the breeding site.

f. When flightless chicks are present on the beach, the Bird Monitor(s) shall accompany any moving vehicles or equipment to ensure that no chicks are in the path of the moving vehicle and no tracks are left that could trap flightless chicks.

g. The FWC recommends that the Bird Monitor(s) ensure that some activity in the travel corridor is maintained on a daily basis in order to discourage birds from nesting within the travel corridor. These activities shall not be allowed to disturb shorebirds nesting on site or interfere with marine turtle nesting, especially if the corridors are established before construction has started.

h. *Notification.* If the Bird Monitor(s) find that shorebirds are breeding within the project area, he or she shall ensure that an informational bulletin board is placed and maintained in the construction staging area. This bulletin board shall display the location map of the construction site, depict the location(s) of the bird breeding areas, and include a clearly visible warning stating: "NESTING BIRDS ARE PROTECTED BY LAW INCLUDING THE FLORIDA ENDANGERED AND THREATENED SPECIES ACT AND THE STATE AND FEDERAL MIGRATORY BIRD ACTS".

Post-construction Conditions, Monitoring and Reporting

i. Shorebird: If beach cleaning will occur on the nourished beach, a minimum of 30 percent of the biotic material within the wrack line shall be left on the beach post-cleaning at the strand line in a natural configuration to ensure that the nourished beach re-establishes its function as foraging habitat for shorebirds. This shall occur for as long as the placed sand remains on the beach.

Appendix F

EXAMPLES OF PREDATOR PROOF TRASH RECEPTACLES

Example of predator proof trash receptacle at Gulf Islands National Seashore. Lid must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle anchored into the ground so it is not easily turned over.

Example of predator proof trash receptacle at Perdido Key State Park. Metal trash can is stored inside. Cover must be tight fitting and made of material heavy enough to stop animals such as raccoons.

Example of trash receptacle must be secured or heavy enough so it is not easily turned over.

APPENDIX D
ENVIRONMENTAL

D-3: Public and Agency Review Comments and USACE Responses

Integrated Feasibility Report and Environmental Assessment for Continuing Authorities Program Section 14 Emergency Streambank and Shoreline Protection project in Loiza, Puerto Rico

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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Table 1 Summary of USACE responses to comments received during the agency and public review and comment period of the draft Finding of No Significant Impact (FONSI) and Integrated Feasibility Report/Environmental Assessment (IFR/EA) for the Loíza Section 14 Continuing Authorities Program (CAP) project in the Municipality of Loíza in Puerto Rico

#	Commenter	Comment	Response
1	Environmental Protection Agency (EPA) – Region 2	EPA encourages project managers to utilize local and recycled materials; to recycle materials generated onsite; and to utilize technologies and fuels that minimize greenhouse gas emissions.	Best management practices will be incorporated into the project for the disposal of materials.
2	EPA – Region 2	If concrete removal occurs during repair of the existing structures, recycling and/or reuse of construction and demolition (C&D) material or beneficial reuse of dredged materials should be considered in order to lessen the impacts of increasing disposal at solid waste facilities.	Best management practices will be incorporated into the project for removal and disposal of materials. Dredging is not a component of this project.
3	EPA – Region 2	EPA recommends implementing diesel controls, cleaner fuel, and cleaner construction practices for on-road and off-road equipment used for transportation, soil/sand movement, or other construction activities.	Noted. Thank you for your comment.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

APR 06 2018

Department of the Army
Jacksonville, District, Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232-0019

Attn: Gina Ralph, Chief
Environmental Branch

Dear Ms. Ralph:

The U.S. Environmental Protection Agency (EPA), Region 2, has reviewed your March 2018 Draft Integrated Feasibility Report and Environmental Assessment (DIFR/EA) for Loiza, Puerto Rico. This report was prepared to address shoreline critical erosion problems at Loíza. Erosion in this area is threatening critical infrastructure, including a public road, a public school, and a community center, along approximately 1,050 feet of shoreline. The erosion at Loíza was further exacerbated by impacts from Hurricane Irma and Hurricane Maria. The road is in immediate need for protection as the 2017 hurricanes caused further shoreline erosion right up to the public road, causing it to be at partial failure.

The study shows that construction of a continuous rock revetment along approximately 1,050 feet of shoreline in front of the public road, Head Start public school, and community center is recommended to provide emergency shoreline protection at Loíza. Due to existing public sidewalk damage, the remaining sidewalk may need to be demolished and replaced with an over-wash protection zone. The over-wash protection zone would consist of high performance turf reinforcement mat keyed in between the existing road and revetment. Construction will take an estimated 11 months at an estimated FY19 total cost of $6,318,000.

During any phase of construction. EPA encourages project managers to utilize local and recycled materials; to recycle materials generated onsite; and to utilize technologies and fuels that minimize greenhouse gas emissions. If concrete removal occurs during repair of the existing structures, recycling and/or reuse of construction and demolition (C&D) material or beneficial reuse of dredged materials should be considered in order to lessen the impacts of increasing disposal at solid waste facilities. If this is the case, EPA recommends applying these practices and identifying them in your future reports. You may find more detailed information about recycling of C&D waste at:
http://www.epa.gov/osw/conserve/imr/cdm/recycle.htm

EPA recommends implementing diesel controls, cleaner fuel, and cleaner construction practices for on-road and off-road equipment used for transportation, soil/sand movement, or other construction activities, including:

- Strategies and technologies that reduce unnecessary idling, including auxiliary power units, the use of electric equipment, and strict enforcement of idling limits; and
- Use of clean diesel through add-on control technologies like diesel particulate filters and diesel oxidation catalysts, repowers, or newer, cleaner equipment.

For more information on diesel emission controls in construction projects, please see:
http://www.northeastdiesel.org/pdf/NEDC-Construction-Contract-Spec.pdf
http://www.epa.gov/cleandiesel/technologies/index.htm

Thank you for the opportunity to comment on the DIFR/EA for Loiza, PR, section 14 study area. Our comments contained in this letter are intended to help provide useful information that will ultimately inform local, state and federal decision-making and review related to land and water resource use and impacts. Should you have any questions regarding the comments detailed in this letter, please feel free to contact Michael Poetzsch of my staff at 212-637-4147. Please include us in your mailing list for any future related project changes.

Sincerely,

for GM.

Grace Musumeci, Chief
Environmental Review Section

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

Loiza, Puerto Rico
SECTION 14 STUDY

FINAL
FEASIBILITY REPORT and
Environmental Assessment

Appendix E
Pertinent Correspondence

GOVERNMENT OF PUERTO RICO
Department of Natural and Environmental Resources

JAN 31 2018

Eng. Jason A. Kirk
Colonel, U.S. Army
District Commander
DEPARTMENT OF THE ARMY
Jacksonville District Corps of Engineers
701 San Marcos Boulevard
Jacksonville, Fl. 32207

Dear Colonel Kirk:

This is to reaffirm the support of the Puerto Rico Department of Natural and Environmental Resources (DNER) for the Loíza, Section 14 of the Continuing Authorities Program (CAP) in Loíza, Puerto Rico. Puerto Rico DNER has the financial capability to execute a Project Partnership Agreement (PPA) for the Project should the Project Report be approved.

Once the Project Report is approved Puerto Rico DNER and the U.S. Army Corps of Engineers will negotiate and execute a second PPA for the construction phase of the project as well as which includes costs of the projects, acquiring necessary real estate interests, and performing necessary operation, maintenance, repair, rehabilitation, and replacement of the Project.

Sincerely,

Tania Vázquez-Rivera
Secretary

fc: Eng. Moisés Sánchez-Loperena
Acting Assistant Administrator
Water and Minerals Resources Area

Carr. 8838 Km 6.3 Sector El Cinco, Río Piedras, PR 00926 • PO Box 366147, San Juan, PR 00936
787.999.2200 787.999.2303 www.drna.pr.gov

COMMONWEALTH OF
PUERTO RICO
Department of Natural and
Environmental Resources

July 3rd, 2015

Col. Alan Dodd
Commander and District Engineer
U.S. Army Corps of Engineers
Jacksonville District
Attn: CESAJ PM WF
P.O. Box 4970
Jacksonville, FL 32232 0019

Dear Sir:

The Department of Natural and Environmental Resources (DNER) is responsible for the administration, conservation, and surveillance of the coastal public trust lands (maritime-terrestrial zone, territorial waters, and submerged lands) of Puerto Rico. DNER also leads the implementation of the Puerto Rico Coastal Zone Management Program (PRCZMP).

Through the PRCZMP, DNER has evaluates coastal hazards and conducts island wide sea level rise vulnerability assessments. Results from the latest storm surge modeling conducted in coordination with CariCOOS and the University of Puerto Rico can be viewed at: www.pr-ccc.org. As part of these assessments as well as a result of the evaluation of Loíza municipality citizens' complaints, DNER confirmed real erosion problems potentially aggravated by storm surge and winter swells at the Parcelas Suarez site. DNER Marine Resources Division also conducted a benthic habitat assessment (June 22, 2015) in order to evaluate benthic habitats condition as well as potential opportunities for coral reefs rehabilitation or the deployment of detached breakwaters or artificial reefs as means to dissipate wave energy, reduce erosion rates and potentially increase beach width through beach nourishment.

During 2014 and 2015, DNER and representatives of the Jacksonville District visited the Parcelas Suarez site at Loíza, and collected evidence of the erosion problem and the risk of greater impacts to communities' infrastructure such as a school and a community center as well as to a municipal road and private residences.

To that effect, I request that the U.S. Army Corps of Engineers, Jacksonville District, undertake an in-depth investigation of the Parcelas Suárez Sector, to address Loíza municipality's problems under the authority of Section 14 of the Flood Control Act of 1946, as amended. The Department of Natural and Environmental Resources (DNER) hereby expresses our willingness to serve as the study sponsor.

I understand that the first $100,000 of the initial investigations would be federally financed. DNER would further discuss with the USACE District Engineer how to proceed should additional costs be necessary to complete the study. DNER also understands that costs in excess of $100,000 for the rest of

P.O. Box 366147 San Juan Puerto Rico 00936
Tel: 787.999.2200 Fax: 787.999.2303
www.drna.gobierno.pr

DNER

the feasibility phase would be shared 50:50. It is important to emphasize that DNER favors natural, nature-based solutions to erosion problems, and a combination of nature based structural solution to the problem. DNER would consider to a lesser degree fully structural solutions as the favored option.

If studies indicate a viable solution, our objective will be to proceed with project planning, design, and eventual construction. We are capable of fulfilling our financial obligations for further study, design, construction, operation, and maintenance: In general, providing a minimum of 35percent of the total project costs, including furnishing lands, easements, right of way, relocations, and disposal areas. We are also aware that the Corps' and our responsibilities will be delineated in the Project Partnership Agreement, which both parties will execute before construction commences.

Should you need additional information, please contact Mr. Ernesto I. Diaz, Director of the Puerto Rico Coastal Zone Management Program at ediaz@drna.gobierno.pr or myself at cguerrero@drna.gobierno.pr at your earliest convenience.

Cordially,

Carmen R. Guerrero Pérez
Secretary

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

JUL 27 2011

Planning Division
Plan Formulation Branch

Honorable Daniel J. Galán-Kercadó
Secretary
Department of Natural and Environmental Resources
Post Office Box 366147
San Juan, Puerto Rico 00936-6147

Dear Secretary Galán:

At the request of the Department of Natural and Environmental Resources, the *Loiza Coastline, Puerto Rico Trip Report* has been completed by the Jacksonville District, U.S. Army Corps of Engineers (Corps). The report accompanies this letter and was completed under the authority of Section 22 of the Water Resources Development Act of 1974, which provides cost shared Water Resources Planning Assistance to the States.

The report details inspection, evaluation, and proposed alternatives for Hurricane and Storm Damage Reduction to infrastructure along the coast of Loiza, Puerto Rico. The non-federal sponsor for this report is the Puerto Rico Department of Natural and Environmental Resources (DNER). In summary, coastal storm damages including inundation, erosion, and wave attack along the Loiza shoreline threaten infrastructure such as roads, public buildings, private homes, and beach access for recreation. They also contribute to safety hazards to the public.

During a March 2010 site visit, Corps staff inspected three focus areas along the Loiza shoreline: Punta Iglesia West, Punta Iglesia East and Punta Uvero West. Alternatives to protect infrastructure along this stretch of shoreline were discussed with DNER and State Historic Preservation Office (SHPO) representatives, who also attended the site visit. These alternatives are evaluated in the trip report and include construction of new revetments, repair of existing revetments, beach nourishment, groins, dune creation, sand nets, and breakwaters.

Although further analysis may indicate that another alternative is preferable, based on available information, beach nourishment with select construction of vegetated dunes may be a viable alternative for Punta Iglesia West and the western extent of Punta Iglesia East. The mouth of the Rio Grande de Loiza is a potential sand source close enough to allow for economical dredging and pumping, or truck-haul, of sand.

Use of this source for beach nourishment would maintain sand in the coastal system and potentially relieve upstream flooding problems created when sand dams the river mouth. Such use would represent good Regional Sediment Management (RSM) strategy, potentially addressing both regional flooding and storm damage problems. Further analysis is recommended, including numerical modeling. If modeling determines that a nourishment project would be difficult to maintain in front of these areas, the addition of groins to stabilize the nourishment could be considered. Otherwise shoreline armoring with select construction of revetments should be investigated in greater detail.

Construction of new revetments and/or repair of existing revetments (armoring) could be a viable alternative for the eastern extent of Punta Iglesia East and Punta Uvero West which currently contain medium to high density armoring with little to no beach fronting the armor. It should be reiterated that while armoring protects landward property, adjacent unarmored beaches would likely experience increased erosion. Considering this point, if beach nourishment is determined to be viable for Punta Iglesia West, the viability of continuing nourishment further east should be investigated. This could reduce the need for armor construction while providing shore protection, environmental, and recreational benefits afforded by a nourished beach.

The alternatives recommended in this Trip Report are provided by the Corps as planning assistance under Section 22 of the Water Resources Development Act (WRDA) of 1974 (P.L. 930251), as amended. Any design, construction, or other work associated with implementing the alternatives would be the responsibility of the Puerto Rico Department of Natural and Environmental Resources.

Please contact Jorge M. Tous at (787) 378-1394 or Matthew Schrader at (904) 232- 2043 for additional information.

Sincerely,

Stuart J. Appelbaum
Chief, Planning & Policy Division

Enclosure