OKALOOSA COUNTY, FLORIDA, COASTAL STORM RISK MANAGEMENT

Integrated Feasibility Study With Environmental Assessment

September 2021

Final Report

US Army Corps
of Engineers
Mobile District

EXECUTIVE SUMMARY

This Final Integrated Feasibility Report with Environmental Assessment documents the results of engineering, economic, environmental, and real estate investigations performed to date for the Okaloosa County, Florida Coastal Storm Risk Management (CSRM) Feasibility Study.

The U.S. Army Corps of Engineers (USACE), Mobile District is the lead Federal agency for the study and Okaloosa County is the non-Federal Sponsor (NFS). The Eglin Air Force Base (Eglin AFB), Florida Department of Transportation (FDOT), National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), and the National Park Service (NPS) are cooperating agencies for the study.

The authority for this study is contained in House Resolution 2758 adopted June 28, 2006. This feasibility study is partial response to the study authority. The Bipartisan Budget Act of 2018 (Public Law 115-123), Division B, Subdivision 1, Title IV, appropriated funding for the study at full Federal expense. As identified under this "Supplemental Appropriation" bill, the study is subject to additional reporting requirements and is expected to be completed within three years and for $3 million dollars.

Okaloosa County boasts multiple significant resources and economic drivers including the County beaches, which are important tourist destinations because of the white sand and emerald green-colored waters. There is Federal interest in addressing the risk and vulnerability to coastal storms throughout Okaloosa County, which is expected to be compounded by the climate change effects such as sea level change. The most recent reminder of coastal storm vulnerability within Okaloosa County was Hurricane Michael, classified as a Category 5 storm, which made landfall within 75 miles of the area in 2018.

Okaloosa County is located in the panhandle area of the state of Florida. The study area includes the coastal shoreline of Okaloosa County fronting the Gulf of Mexico as well as the back bay shorelines along Choctawhatchee Bay. Figure ES-1 presents the study area.

Numerous measures were initially considered for alternative development to provide CSRM for Okaloosa County. Those measures can be classified as either non-structural or structural. Non-structural measures consist of actions that: control or regulate the use of land and buildings such that damages to property are reduced or eliminated. This can be accomplished by acquiring threatened or damageable property, or retreat which is relocation of threatened property. Structural measures are composed of those actions that contain/manage the coastal storm hazard to compensate for erosion. Typically, structural measures consist of seawalls, bulkheads, revetments, breakwaters, groins, or beach nourishment.

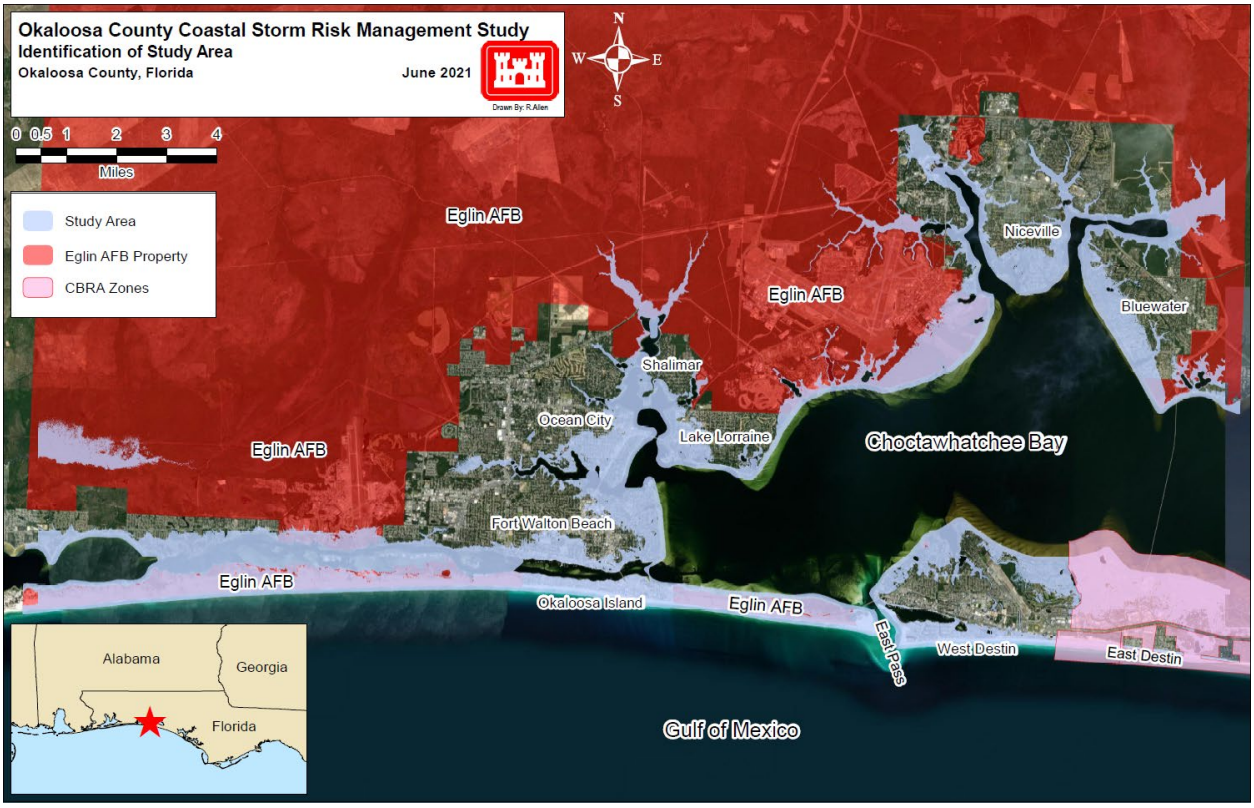

Figure ES-1. Okaloosa County Study Area

Measures can be stand-alone or can be combined to form alternatives for CSRM. Screening of the measures and alternatives developed for the back bay area determined that there was little likelihood of an economically feasible alternative to reduce the coastal storm risk. Likewise, screening of an array of measures and alternatives for the Gulf shoreline resulted in identifying two CSRM alternatives that, with further refinement and analysis, resulted in the development of the Tentatively Selected Plan (TSP), and ultimately a Recommended Plan (RP).

The RP for the Okaloosa County CSRM Feasibility Study consists of berm and dune nourishment in the Okaloosa Island and West Destin reaches of the Okaloosa County shoreline. In the Okaloosa Island reach, the RP consists of providing a dune with a crest design elevation of 14 feet-North American Vertical Datum of 1988 (NAVD88) and a crest width of 10 feet with seaward and landward slope of 1 vertical (V):5 horizontal (H); and a berm having a design crest width of 10 feet at a crest elevation of 5.5 feet NAVD88 then sloping seaward at 1V:15H. The Okaloosa Island reach extends approximately 16,500 feet between Eglin AFB property lines near FDEP monuments R-1 and R-15 with transitions of 450 feet on the Air Force property. The initial nourishment in this area will require about 100,000 cubic yards (cy) of fill material being placed primarily within the dune system. In the West Destin reach, the RP consists of providing a dune with a design crest elevation of 14 feet NAVD88 and a crest width of 10 feet with seaward and landward slope of 1V:5H, and a berm having a design crest

width of 30 feet at a crest elevation of 5.5 feet NAVD88 then sloping seaward at 1V:15H. The West Destin reach extends approximately 16,000 feet from FDEP monument R-18 to R-32 with transitions of 450 feet at each terminus. The initial nourishment in this area will require about 460,000 cy of fill material.

The average annual cost for the RP is $3,625,000 with average annual benefits of $6,063,000. Net benefits for the RP are $2,438,000 with a benefit to cost ratio of 1.7. The RP annual costs and benefits are presented in Table ES-1. The RP estimated costs and cost share for the initial construction and future renourishments are shown in Table ES-2. Cost sharing for CSRM projects is 65/35 (Fed/non-Fed) for initial construction and 50/50 for renourishments although adjustments can be made depending on property ownership and whether developed or not. Consequently, the cost share presented in Table ES-2 was adjusted for present conditions. Further adjustment to the cost share can occur due to a Federal requirement that nourished beaches must be available for public use which includes reasonable access and parking. For those reaches that are not available for public use, any construction proposed in those areas would be at local expense. The actual project cost share will be based on conditions, including parking and access availability, at the time the Project Partnership Agreement is executed between the NFS and the Government.

Initial construction of the RP will require the placement of approximately 560,000 cy of material. During the 50-year life of the project it was determined that the project will require periodic renourishment. Four renourishments will occur on a 10-year cycle and require an estimated total of about 10,473,000 cy of material for the RP. Material for the initial fill placement and renourishments will come from a nearby offshore borrow area that has already been permitted by the FDEP and determined to have compatible material for placement on the Okaloosa County shoreline. An additional borrow area is available for consideration if the first borrow area lacks adequate supply. Although this second borrow site is further from the shoreline and at present not permitted for use by the FDEP, it has been found to contain compatible material for placement.

The RP was developed with respect to sea level change. Increases in the sea level can seriously affect the functioning of a CSRM project. Observed data was used to develop projections of anticipated increases over time. Alternatives developed considered the current trend (20 years of data) to assess project performance for the 50-year period of analysis. Additionally, an assessment was made as to the possible changes for the project area beyond the period of analysis up to 100 years. Because the projections are not certain, the NFS should closely monitor changes in the sea level and shoreline changes, particularly those beyond the 50-year period of analysis, that could affect the project functioning or dictate additional measures that may need to be applied locally to address these changes. Additionally, the storm environment may be affected due to climate change. It is difficult to determine if the number and intensity of storms may be affected but changes to the shoreline could occur and the extent of these changes should also be monitored to determine if modifications could be needed.

Table ES-1. RP Annual Costs and Benefits

Economic Summary	Storm Risk Management + Land-Loss Benefits (Primary)	Storm Risk Management + Land-Loss + Recreation
Price Level	**FY21**	**FY21**
FY20 Water Resources Discount Rate	2.5%	2.5%
Storm Risk Management + Land-Loss Benefits	$4,159,000	$4,159,000
Recreation Benefits	$0	$1,904,000
Total Benefits	$4,159,000	$6,063,000
Total Cost	$3,625,000	$3,625,000
Net-Benefits	$534,000	$2,438,000
Benefit to Cost Ratio	1.1	1.7

Table ES-2. RP First Costs[1]

Reach	Initial Construction	Renourishments	Totals
Okaloosa Island	$8,621,000	$36,359,000	$44,980,000
West Destin	$22,736,000	$108,473,000	$131,209,000
Total	$31,357,000	$144,832,000	$176,189,000

[1] Real Estate cost estimations included in this table are subject to the appraisal and crediting requirements outlined in ER 405-1-12 and ER 405-1-04, in addition to the cost principals outlined at 2 CFR Part 225.

Note: First Costs shown (Oct 2021 Effective Price Level) are based on best available data and are subject to change.

Environmental Impacts

Impacted shoreline has degraded the beach and dune ecosystem that provides nesting and foraging habitat for five species of Federally protected sea turtles. Two Federally

protected species of shorebirds (piping plover and red knot) use the beach and dune habitat for overwintering. Various other shorebirds utilize the area for breeding, migratory stopover and overwintering. In addition, one Federally endangered mammal species, the Choctawhatchee beach mouse, inhabits the coastal dune within designated critical habitat along Henderson Beach State Park near Destin, Florida.

The RP may likely adversely affect nesting sea turtles (green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), loggerhead sea turtle (*Caretta caretta*), leatherback sea turtle (*Dermochelys coriacea*), and Kemps' ridley sea turtle (*Lepidochelys kempii*). The RP may affect but is not likely to adversely affect West Indian manatee (*Trichechus manatus latirostris*), Choctawhatchee beach mouse (*Peromyscus polionotus allophrys)* piping plover (*Charadrius melodus*), giant manta ray (*Manta birostris*), and the rarely occurring red knot. Impacts to these species would be temporary during construction activities, and conservation measures would be employed to minimize any impacts.

The project may adversely affect Gulf coast lupine (*Lupinus westianus*) and Cruise's goldenaster (*Chrysopsis gossypina cruseana*) should they be present in proposed project limit. The endangered perforate reindeer lichen (*Cladonia perforata)* is known to occur on Okaloosa Island on adjacent Eglin AFB managed lands, and although unlikely to be present within the proposed project area, activities may affect, but are not likely to adversely affect this species should it occur in the project area. The newly petitioned Gulf coast solitary bee (*Hesperapsis oracria)* is not known to be present in the project area; however, its host plant, the narrow-leafed honeycombhead (*Balduina angustifolia*) occurs on dunes along the Okaloosa County coastline. The proposed project will have no effect to this insect.

Within the nearshore, Gulf sturgeon (*Acipenser oxyrinchus desotoi)* and sea turtles may frequent the project area. The giant manta ray and whale species, including Bryde's whale *(Balaenoptera brydei)*, are not typically found in such shallow areas; thus, likelihood of occurrence within the project area is low. Critical Habitat for Gulf sturgeon is within the Okaloosa County CSRM study limits. The proposed activity may affect but is not likely to adversely affect the Gulf sturgeon and is not likely to destroy or adversely modify its critical habitat. The USACE has consulted with Federal resource agencies, U.S. Fish and Wildlife Service (USFWS) and NMFS-Protected Resources Division (PRD) to address all issues related to these resources. The NMFS-PRD has provided letter of concurrence that the proposed action. Likewise, the USFWS provided a combined Endangered Species Act (ESA)/Fish and Wildlife Coordination Act Report (FWCAR) document that determined that no long term adverse effects will occur to listed species with implementation of the Statewide Programmatic Biological Opinion of 2015 Terms and Conditions during all RP activities.

Two Coastal Barrier Resource Act (CBRA) units are located along the eastern beach front that start from the boundary of the state park and extend into adjacent Walton County beyond the study limit. The RP will have no effect on the two CBRA units as

they are outside the project footprint; however, without implementation of the RP, continued erosion from storm waves and flooding events pose significant risk to the resources within the dune and beach ecosystems of Okaloosa County, Florida. Identified habitats could continue to degrade or become permanently lost, which would put wildlife, especially Federal protected species, at further risk of imperilment.

Although temporary adverse impacts to resources such as protected species, surface water quality, fish and wildlife, cultural, and recreation will occur during dredging and beach placement operations, the project will provide overall benefits to the dune, beach and nearshore ecosystems. Increasing stability will lessen impacts of coastal erosion and establish improved resiliency to protect wildlife habitat. Enhanced dune and beach will improve nesting opportunities for sea turtles, and also nesting, foraging, and lay-over for shorebirds, wading birds, and migrating birds. Enhanced biodiversity of dune vegetation will attract much needed pollinator fauna such as butterflies or hummingbirds, and possibly encourage usage by the Gulf coast solitary bee. Furthermore, restoration of dunes adjacent to the Choctawhatchee beach mouse Critical Habitat may encourage expansion of its population into newly established quality habitat. Once completed, the project will provide aesthetically pleasing beaches and vegetated dunes for recreational activities for the tourist industry as well as for full or part time residents of Okaloosa County. The RP will have no effect on the two CBRA units as they are outside of the project footprint. No effects to cultural resources are anticipated as a result of project activities due to the high level of pre-existing disturbance within the project area.

The project should only have temporary adverse effect to essential fish habitat as such impacts primarily occur during the construction activities. The two borrow areas may temporarily impact infauna during dredging operations but are expected to recover within several months to about 2 years after operations cease. Placement of quality sand from these two sites will closely match and quickly incorporate with the existing material.

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Note: * indicates content required for NEPA compliance

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Abbreviations and Acronyms			
AAEQ	Average Annual Equivalent	FDEP	Florida Department of Environmental Protection
AEP	Annual Exceedance Probability	FDOT	Florida Department of Transportation
AFB	Air Force Base	FEMA	Federal Emergency Management Agency
APE	Area of Potential Effect	FNAI	Florida Natural Area Inventory
BCR	Benefit to Cost Ratio	FONSI	Finding of No Significant Impacts
BGEPA	Bald and Golden Eagle Protection Act	FWCAR	Fish and Wildlife Coordination Act Report
CAA	Clean Air Act	FWOP	Future Without Project
CBM 1	Choctawhatchee Beach Mouse Critical Habitat Unit 1	FWC	Florida Fish and Wildlife Conservation Commission
CBRA	Coastal Barrier Resources Act	FY	Fiscal Year
CEQ	Council of Environmental Quality	GINS	Gulf Islands National Seashore
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	GIWW	Gulf Intracoastal Waterway
CFR	Code of Federal Regulation	GRBO	Gulf Regional Biological Opinion
CM	Construction Management	H	Horizontal
CSRM	Coastal Storm Risk Management	HCD	Habitat Conservation Division
CVM	Contingent Valuation Method	HTRW	Hazardous, Toxic and Radioactive Waste
CWA	Clean Water Act	HUD	US Housing and Urban Development
CZMA	Coastal Zone Management Act	IDB	Input Database
DE	Damage Element	IDC	Interest During Construction
EA	Environmental Assessment	IPCC	Intergovernmental Panel on Climate Change
ECL	Erosion Control Line	IWR	Institute of Water Resources
EFH	Essential Fish Habitat	JCP	Joint Coastal Permit
EO	Executive Order	LiDAR	Light Detection and Ranging
EOP	Environmental Operating Principles	LMS	Local Mitigation Strategies
EP	Engineering Pamphlet	MBTA	Migratory Bird Treaty Act
EQ	Environmental Quality	MFR	Memorandum for Record
ER	Engineer Regulation	MHW	Mean High Water
ERDC	Engineering Research and Development Center	MLW	Mean Low Water
ESA	Endangered Species Act	mm	millimeters
F	Fahrenheit	MPH	Miles Per Hour

Abbreviations and Acronyms			
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act	RE	Real Estate
MSL	Mean Sea Level	RED	Regional Economic Development
NAAQS	National Ambient Air Quality Standards	RP	Recommended Plan
NED	National Economic Development	RSLC	Relative Sea Level Change
NEPA	National Environmental Policy Act	SAD	South Atlantic Division
NFS	Non-Federal Sponsor	SAV	Submerged Aquatic Vegetation
NHPA	National Historic Preservation Act	SBEACH	Storm Induced Beach Change Model
NHRP	National Register of Historic Places	SHPO	State Historic Preservation Office
NMFS	National Marine Fisheries Service	SIMM	Seagrass Integrated Mapping and Monitoring
NNBF	Natural and Nature-Based Features	SLR	Sea Level Rise
NOAA	National Oceanic Atmospheric Administration	SPBO	Statewide Programmatic Biological Opinion
NPS	National Park Service	SRD	Storm Response Database
NRCS	Natural Resource Conservation Service	SSC	Species of Special Concern
O&M	Operation and Maintenance	TCM	Travel Cost Method
OCCSRM	Okaloosa County, Florida Coastal Storm Risk Management	TSP	Tentatively Selected Plan
ODB	Output database	UDV	Unit Day Value Method
OFW	Outstanding Florida Waters	U.S.	United States
OMRR&R	Operations, Maintenance, Replacement, Repair and Rehabilitation	USACE	U.S. Army Corps of Engineers
OSE	Other Social Effects	USCS	Unified Soils Classification System
P&G	Principles and Guidelines	USDA	U.S. Department of Agriculture
PA	Programmatic Agreement	USEPA	United States Environmental Protection Agency
PDT	Project Delivery Team	USFWS	U.S. Fish and Wildlife Service
PED	Preconstruction Engineering and Design	USGS	U.S. Geological Survey
PGN	Planning Guidance Notebook	V	Vertical
POA	Period of Analysis	WQC	Water Quality Certification
PPA	Project Partnership Agreement	WRDA	Water Resources Development Act
PRD	Protected Resource Division	WRRDA	Water Resources Reform and Development Act
PV	Present Value	WTP	Willingness to Pay

SECTION 1.0 STUDY INFORMATION*

1.1 Introduction

This Final Integrated Feasibility Report with Environmental Assessment (EA) documents the results of engineering, economic, environmental, and real estate investigations performed to date for the Okaloosa County, Florida Coastal Storm Risk Management (OCCSRM) Feasibility Study. The U.S. Army Corps of Engineers (USACE), Mobile District is the lead Federal agency for the study and Okaloosa County is the non-Federal sponsor (NFS).

This Coastal Storm Risk Management (CSRM) Feasibility Study project was recommended for Emergency Supplemental funding after a series of hurricanes impacted the USACE South Atlantic Division (SAD) area of responsibility and Gulf Coast States in 2017. The purpose is to determine the extent of coastal storm related damages to areas impacted by Hurricanes Harvey, Irma, and Maria and to report on improvements for CSRM along the Okaloosa County, Florida coastline.

This report presents the results of the OCCSRM Feasibility Study. It integrates plan formulation with documentation of environmental effects, potential alternatives for CSRM, outlines the process used for selecting the Recommended Plan (RP) and concludes with recommendations for project implementation. It also documents compliance with the National Environmental Policy Act (NEPA) of 1969, and includes input from the NFS, natural resource agencies, and the public.

Sections in this "integrated report" that include the NEPA-required discussions are marked with an asterisk "*" in both the table of contents and within the body of the document to assist readers in identifying such material.

1.2 Study Authority*

The authority for this study is contained in House Resolution 2758 adopted June 28, 2006 which reads as follows:

> *"Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, in accordance with Section 110 of the Rivers and Harbors Act of 1962, the Secretary of the Army is requested to review the feasibility of providing shoreline erosion control, beach nourishment, storm damage reduction, environmental restoration and protection, and related improvements in Okaloosa County, Florida, taking into consideration the unique characteristics of the existing beach sand and the need to develop a comprehensive body of knowledge, information, and data on coastal area changes and processes as well as impacts from Federally constructed projects in the vicinity of Okaloosa County, Florida.*

This feasibility study is partial response to the above study authority. The Bipartisan Budget Act of 2018 (Public Law 115-123), Division B, Subdivision 1, Title IV, appropriates funding for the study at full Federal expense. Funds provided under the appropriation are for "flood and storm damage reduction, including shore protection…to reduce risk from future floods and hurricanes". As identified under this "Supplemental Appropriation" bill, studies are subject to additional reporting requirements and are expected to be completed within three years and for $3 million dollars.

1.3 Congressional Interests

Okaloosa County, Florida is part of the 1st Congressional District for the State of Florida and is represented by Matt Gaetz (R). United States Senators representing the State of Florida are Rick Scott (R) and Marco Rubio (R).

1.4 Location of the Study Area*

Okaloosa County is located approximately 40 miles east of Pensacola, Florida and 140 miles west of Tallahassee, Florida. The beaches of Okaloosa County encompass approximately 26 miles of shoreline extending eastward from the Santa Rosa/Okaloosa County line to the Okaloosa/Walton County line. The shoreline is interrupted by East Pass, an opening to the Gulf of Mexico from Choctawhatchee Bay located on the west side of the City of Destin, Florida. The Okaloosa County coastal shoreline includes about 6.8 miles of state-designated critically eroded beach, per the 2020 report by the Florida Department of Environmental Protection (FDEP), Office of Resilience and Coastal Protection. The study area includes the coastal shoreline of Okaloosa County as well as the back bay shorelines along Choctawhatchee Bay. Figure 1-1 presents the study location and area.

1.5 Study Area Extents

The study area as defined in Figure 1-1 was delineated and limited based on several factors. The first limiting factor is the avoidance of Federal land. Eglin Air Force Base (AFB) and Hulbert Field account for the majority of the back bay land as well as large stretches of the front beach on Okaloosa Island. East Destin is further limited by Coastal Barrier Resources Act (CBRA) zones shown in Figure 1-1. Lastly the study area was limited by the extents of a reasonable flood. Consideration was given to the floodplain of the 1% Annual Exceedance Probability (AEP) flood using the USACE high sea level rise curve and a 100-year adaptation horizon. The study team agreed that any area not impacted by a flood with a probability greater than a 1% AEP would not likely yield a Federal interest. This is discussed in more detail in Section 2 of this report which characterizes the future without project condition.

1.6 Study Purpose, Need, and Scope*

The purpose of this project is to assess the coastal storm damages, including inundation, waves and critical shoreline erosion, that are occurring along the approximately 26 miles of Okaloosa County beach front shorelines and identify potential solutions that are economically justified, environmentally sound and engineering feasible. There is a critical need to improve the coastal shoreline and interior marsh landforms which provides a significant buffer to communities, businesses, infrastructure, and critical habitats during major storm events.

The scope of this study is to define existing and future without project (FWOP) conditions, develop measures, assess alternatives, and identify potential CSRM opportunities that will reduce risks due to coastal storm hazards associated with inundation, waves and erosion along Okaloosa County, Florida. Loss of beach due to coastal erosion reduces visitation capacity and greatly affects regional economic development (RED) and habitat quality for environmental resources. According to the FDEP's post storm beach and coastal impact assessments recent hurricanes, such as Hurricane Sally in September 2020 caused minor to major beach and dune erosion along the study area shoreline (FDEP 2020).

1.7 Public Concerns

Based on information obtained through contact with residents of Okaloosa County, including a public workshop held November 15, 2018, shoreline property owners are concerned about the potential for shoreline erosion and impacts from coastal storm generated surge and waves. Property owners in the back bay area of Okaloosa County are concerned, but not to the same degree as Gulf facing coastal owners as much of the back bay development is elevated and the majority of developed shoreline has been armored with revetments or bulkheads. Coastal shoreline owners recognize that the beach and dunes provide storm damage reduction for their property. Additionally, residents of Okaloosa County recognize that the beach area provides for recreation and is a major facet of the economy of the area. Residents stated that any action that involves increasing or maintaining the beach or dune area by adding fill should use material that matches the existing beach. Further discussion regarding anticipated landowner sentiment within the project area is outlined in Appendix D, Real Estate.

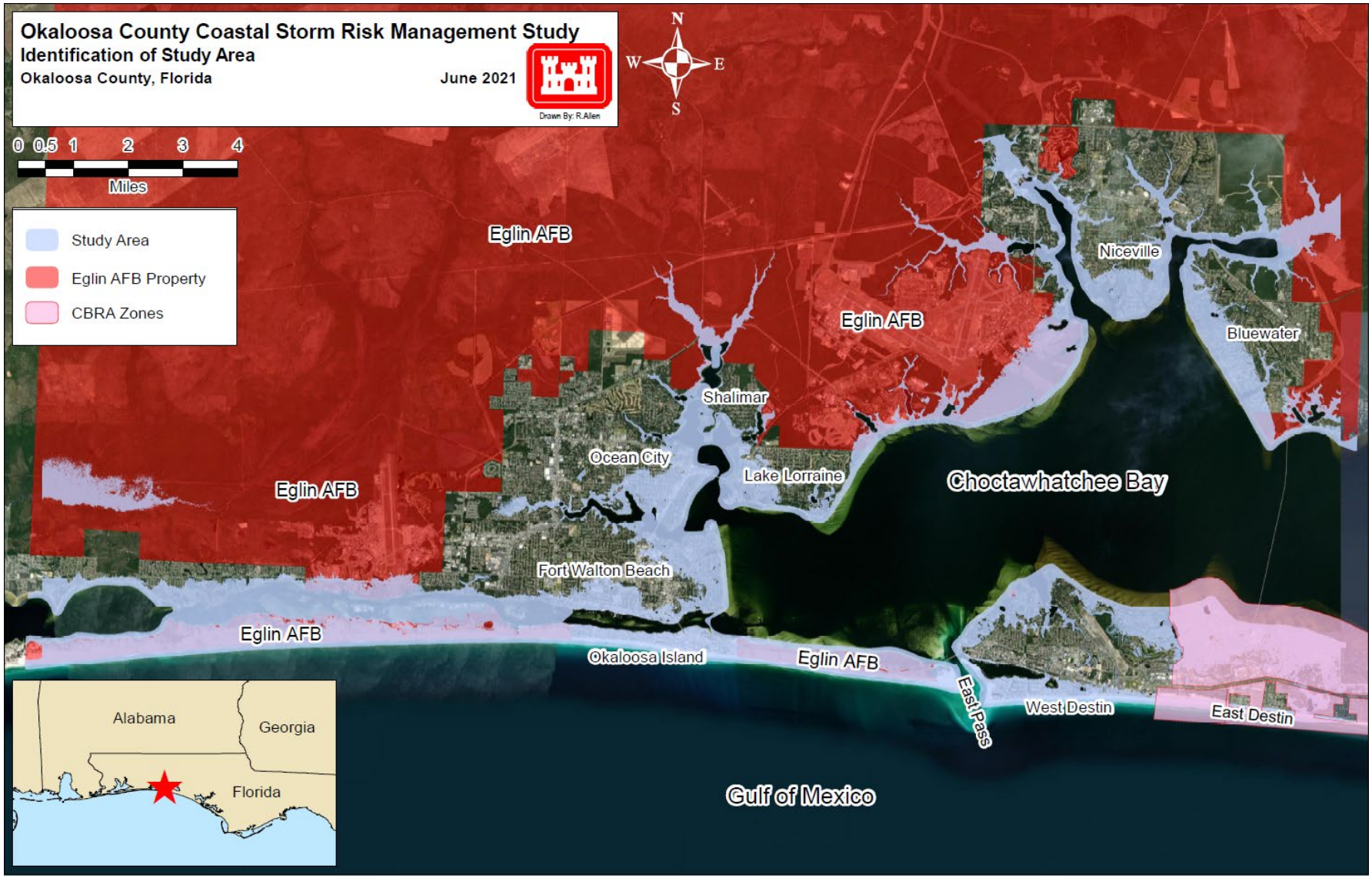


Figure 1-1. Okaloosa County Study Area

1.8 Prior Reports and Existing Projects

Prior investigations and reports have been prepared regarding the area. The most recent studies pertinent to, or supplying supplemental information regarding, erosion problems at Okaloosa County, Florida include:

- Critically Eroded Beaches in Florida, Office of Resiliency and Coastal Protection, Florida Department of Environmental Protection, July 2020.
- Strategic Beach Management Plan: Panhandle Gulf Coast Region, Office of Resiliency and Coastal Protection, Florida Department of Environmental Protection, April 2020.
- West Destin Coastal Alternatives Analysis Okaloosa County, Florida, Final Report for Okaloosa County, Florida, MRD Associates, June 2019.
- Okaloosa Island Beach Management Feasibility Study, Okaloosa County, Florida Final Report for Okaloosa County, Florida, Taylor Engineering Inc., November 2008.
- Beach Management Feasibility Study for Walton County and Destin Florida, Taylor Engineering, Inc., April 2003.
- State of the Beaches of Walton County, Florida, Walton County Tourist Development Council, 2002.
- Environmental Assessment to Preserve Santa Rosa Island Mission Capabilities, Science Applications International Corporation, March 2008.
- Hurricane Opal Beach and Dune Erosion and Structural Damage along the Panhandle Coast of Florida, Report No. BCS-98-01 Bureau of Beaches and Coastal Systems, Florida Department of Environmental Protection, January 1998.
- Hurricane Earl and Georges Beach and Dune Erosion and Structural Damage Assessment and Post-Storm Recovery Plan along the Panhandle Coast of Florida, Report No. BCS-99-01 Bureau of Beaches and Coastal Systems, Florida Department of Environmental Protection, January 1999.
- East Pass Inlet Management Plan, Florida Department of Environmental Protection, June 2000.

- Shoreline Change Rate Estimates, Okaloosa County, Bureau of Beaches and Coastal Systems, Florida Department of Environmental Protection, December 1999.

- Hurricane Ivan Beach and Dune Erosion and Structural Damage Assessment and Post-Storm Recovery Plan for the Panhandle Coast of Florida, Bureau of Beaches and Coastal Systems, Florida Department of Environmental Protection, October 2004.

- Hurricane Dennis and Hurricane Katrina Final Report on 2005 Hurricane Season Impacts to Northwest Florida, Bureau of Beaches and Coastal Systems, Florida Department of Environmental Protection, April 2006.

- Hurricane Sally Post-Storm Beach Conditions and Coastal Impact Report, Office of Resilience and Coastal Protection, Florida Department of Environmental Protection, November 2020.

Projects constructed or authorized in the area consist of:

- Gulf Intracoastal Waterway (GIWW). The existing project, authorized by the River and Harbor Acts of 1942, 1943, and 1966, provides for a through waterway with minimum dimensions of 12 by 125 feet from Apalachee Bay, Florida, to the Mexican Border via coastal bays, sounds and land cuts. The existing project transits through Choctawhatchee Bay in the study area.

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

- Walton County, Florida, Hurricane and Storm Damage Reduction. A study authorized by a resolution of both the United States Senate and the U.S. House of Representatives (Resolution Adopted July 15, 2002) to review the feasibility of providing beach nourishment, shore protection and environmental restoration and protection in the vicinity of Walton County, Florida. This project was

authorized in Water Resources Reform and Development Act (WRRDA) of 2014 but not constructed due to real estate issues.

1.9 Planning Process – Integrated Feasibility Report and EA

This report presents a collaboratively developed plan prepared in accordance with the USACE policies, principles and guidelines. It consists of an integrated Feasibility Report and EA, together with associated appendices, and identifies the expected benefits and estimated cost. Furthermore, it provides implementation responsibilities as well as adequate engineering, construction, and design details for the RP. This report will provide the results of the feasibility study and serve as the USACE decision document for the RP and provides the EA prepared pursuant to the NEPA.

According to ER 1105-2-100, the Federal objective of water and related land resources project planning is to contribute to national economic development (NED) consistent with protecting the Nations environment, pursuant to national environmental statutes, applicable executive orders (EO) and other Federal planning requirements. Contributions to the NED are increases in the net value of the national output of goods and services, expressed in monetary units. A plan that reasonably maximizes net NED benefits, consistent with the Federal objective, is to be formulated. This plan is to be identified as the NED plan.

The purpose of the economic analysis in this study is to estimate the net NED and RED benefits associated with CSRM alternatives designed to reduce coastal storm related damages in Okaloosa County, Florida. The purpose of the environmental analysis in this study is to assess the natural environmental quality (EQ) and impacts of proposed actions. The appendices provide detailed supporting information for all the investigations and tasks conducted for the project effort. The project considers a host of reasonable measures and alternatives including:

- Measures and alternatives considered under previously initiated and existing projects or studies
- Recommendations from the project delivery team (PDT), including the NFS (Okaloosa County)
- Recommendations from other Federal, non-Federal agencies, stakeholders and the public.

The RP has been approved by USACE, SAD in accordance with the provisions and requirements of the Planning Guidance Notebook (Engineering Regulation (ER) 1105-2-100), Section 1001 of the Water Resources Reform and Development Act of 2014 (WRRDA 2014), as well as the implementation guidance for Section 1001 of WRRDA 2014, as set forth in the memorandum from the Chief, Planning and Policy Directorate of Civil Works, dated 09 April 2015, SUBJECT: "Implementation Guidance for Section 1001 of the Water Resources Reform and Development Act of 2014 (WRRDA 2014) – Vertical Integration and Acceleration of Studies".

1.9.1 USACE Civil Works Guidance and Initiatives

The 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Implementation Studies (Principles and Guidelines or P&G) provide for the formulation of reasonable plans responsive to National, state and local concerns. The Planning Guidance Notebook (PNG), ER 1105-2-100, provides the overall direction to formulate, evaluate and select projects for implementation. According to the PNG, the Federal objective of water and related land resources planning is to contribute to NED consistent with protecting the Nation's environment, in accordance with National environmental laws, EOs and other Federal planning requirements.

The study was conducted under the USACE's Civil Works Planning modernization process by utilizing SMART planning metrics to effectively execute and deliver the study in a timely manner.

1.9.2 National Environmental Policy Act (NEPA) Compliance Requirements

The NEPA, 43 U.S.C. 4321 et seq., is the Nation's charter legislation for protection of the environment. The Federal regulations for implementing the NEPA are found in Title 40, Code of Federal Regulations (CFR) Parts 1500-1508. Other regulations, at 33 CFR §230 et seq., describe how the USACE is to implement the NEPA. The intent of the NEPA is to ensure that information is made available to the public regarding major actions taken by Federal agencies that significantly affect the quality of the human environment, and to identify and consider concerns and issues raised by the public.

Study scoping was developed in a scoping Charette workshop held in Okaloosa County in October 2018. Scoping identified concerns regarding effects of a project on the local community and environment, impacts of a project during construction, and impacts on public safety.

This report documents the USACE study of CSRM for Okaloosa County, Florida in compliance with NEPA requirements. It employs three concepts to establish the Council of Environmental Quality (CEQ) NEPA regulations that are appropriate to the planning and design process for this study. Integration is based on the CEQ provision to combine documents, which states, "any environmental document in compliance with the NEPA may be combined with any other agency document to reduce duplication and paperwork" (40 CFR §1506.4). The USACE regulations permit an EA to be either a self-standing document combined with and bound within a feasibility report ("agency document"), or an integration of the NEPA-required discussions in the text of the report. In view of the ecosystem impact aspect of this study, to reduce paperwork and redundancies, and consolidate documentation into one consistent report, the USACE elected to integrate discussions that normally would appear in an EA into this report. This document follows the Update to the Regulations Implementing the Procedural Provisions of the NEPA, published in the Federal Register on July 16, 2020, and affects all documents, including this one, published on or after September 14, 2020 (85 FR 43304).

SECTION 2.0 EXISTING CONDITIONS (AFFECTED ENVIRONMENT)/FUTURE WITHOUT PROJECT*

The affected environment, or existing condition, is a baseline from which all the future conditions are built. The FWOP condition is the anticipated future for a given resource if no action is taken or implemented.

Conditions described herein focus on summarizing technical evaluations of the NEPA resources that drive the NED as appropriate. This section discusses only those NEPA resources that occur within the study area that could be directly impacted by the proposed alternatives. Details on both the existing and FWOP condition are detailed in the following sections.

2.1 Physical Conditions - General Environmental Setting of the Study Area*

2.1.1 Climate*

Coastal Okaloosa County encompasses several municipal communities including Fort Walton Beach and Destin. Characteristically, the summers are long, hot, and oppressive; the winters are moderately cold and windy; and it is frequently wet and partly cloudy year-round. Over the course of the year, the temperature typically varies from 45° Fahrenheit (F) to 88°F; it is rarely below 31°F or above 93°F. The hot season typically lasts for 4.2 months, from May 24 to September 30, with an average daily high temperature above 83°F. The hottest day of the year is July 23, with an average high of 88°F and low of 76°F. The coolest season lasts for about 3.0 months, from December 4 to March 3, with an average daily high temperature around 66°F. The coldest time of year is around mid-January, with an average low of 45°F and high of 61°F (Regional Climate Data NOAA, 2019). Figure 2-1. U.S. Climate Data for the Ft. Walton Beach - Destin Region details the temperature and precipitation averages for the area.

The region has a very complex tropical storm history. Records from 1851-2020 indicate that 148 storms have passed within 100 nautical miles and over 309 storms within 200 nautical miles of Okaloosa County (NOAA, 2020). The area sustains direct or indirect tropical storm strikes on average of 2.63 years. The average wind speed is 105 miles per hour (mph), equivalent to a category 1 hurricane. The tropical storm to hurricane ratio is 52% to 48% (http://www.hurricanecity.com/city/fortwalton.htm). On July 10, 2005 Hurricane Dennis, with 120 mph winds, made landfall near Navarre, just west of the Okaloosa County line. Although structures were mostly spared, the storm caused significant damage to roadways, beaches and infrastructure due to storm surge. The most catastrophic hurricane to affect the region was on October 10, 2018, when Hurricane Michael, a category 5 event (as classified by the National Oceanic Atmospheric Administration (NOAA)), passed by the Okaloosa County coastline with winds of 160+ mph heading to Mexico Beach where it made final landfall. Nearby Fort

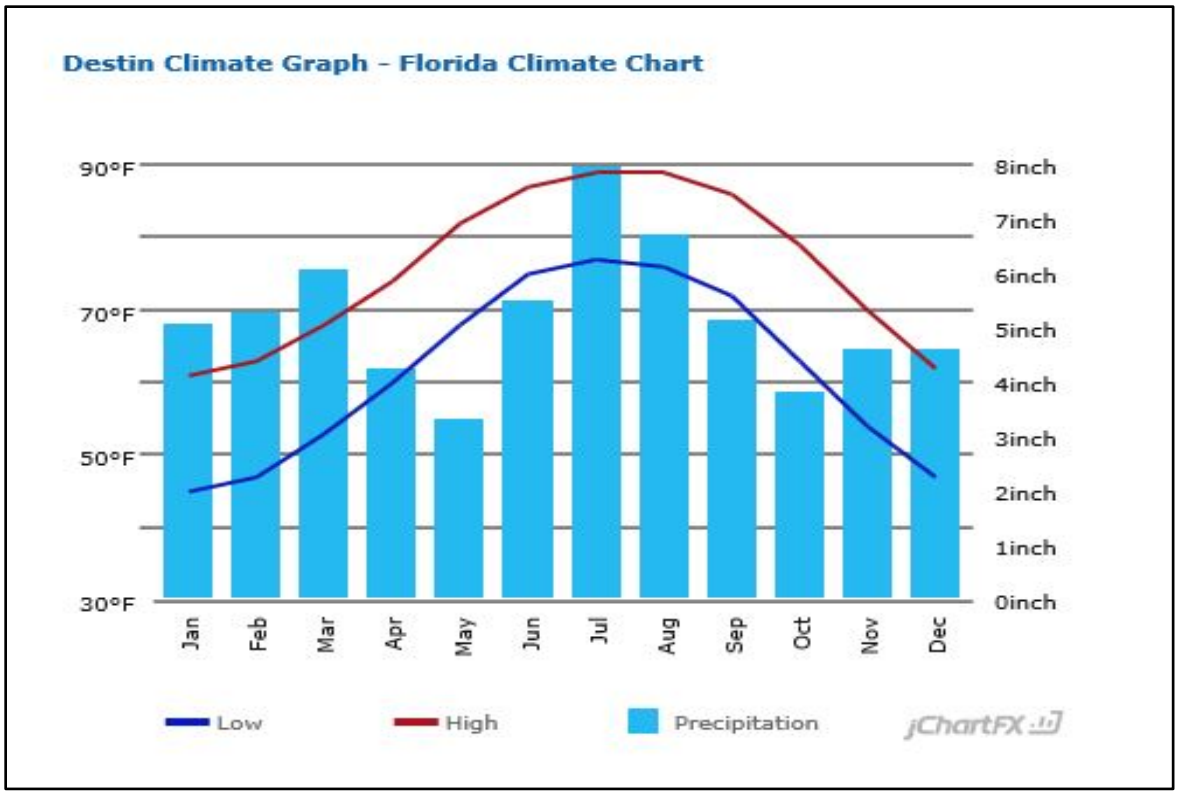


Figure 2-1. U.S. Climate Data for the Ft. Walton Beach - Destin Region

Walton Beach encountered wind gusts greater than 50 mph (US Climate Data, NOAA 2019). The most recent hurricane event was September 16, 2020, when category 2 Hurricane Sally made landfall near Gulf Shores, AL, passing over Okaloosa County as a tropical storm hours later. Maximum sustained winds of 60 mph slowly moved through the region, producing 20 to 30 inches of rainfall resulting in substantial flooding along with peak wind gusts of 78 mph recorded at Navarre Beach in Santa Rosa County (FDEP, 2020).

According to the American Meteorological Society's *State of the Climate in 2018*, (Blunden et al, 2019), 2018 was the fourth warmest year on record in all major global temperature datasets; only 2015 to 2017 were warmer. According to the NOAA 2018 Global Climate Summary, the combined land and ocean temperature has increased at an average rate of 0.07°C (0.13°F) per decade since 1880; however, the average rate of increase since 1981 (0.17°C / 0.31°F) is more than twice as great (NOAA, 2019). Sea level potentially changes as a result of climate change and the USACE projects can consequently be adversely impacted.

2.1.2 Tides

Okaloosa County astronomical tides are characterized as diurnal (one high and one low per day). No tidal reference stations are present within the study area. The closest tide

station to the west is the NOAA station 8729840 in Pensacola, FL (42 miles) and to the east NOAA Station 8729210 in Panama City Beach, FL (45 miles). The NOAA station 8729840 in Pensacola, FL is used for the tidal datums and historic water levels in this study because of proximity and length of record. Table 2-1 is a tabular format and Figure 2-2 is a graphical representation of the tidal datums (Epoch 1983-2001) referenced to NAVD88. Table 2-1 also includes the extreme water level return periods using the USACE percentile method except the 100-yr event which uses the NOAA GEV method since the recorded water levels do not exceed the 100-yr event.

Table 2-1. Tidal Datums and Historic Water Level Return Periods

Version of Data :	5/17/2017
STATION ID:	8729840
Reference Datum:	NAVD88
Name:	Pensacola, FL
HAT:	1.86
MHHW:	0.94
MHW:	0.91
MSL:	0.30
MLW:	-0.29
MLLW:	-0.32
NAVD88:	0.00
EWL Type:	USACE Percentile (NAVD88)
***100 Yr:**	N/A
50 Yr:	5.81
20 Yr:	4.63
10 Yr:	3.84
5 Yr:	3.23
2 Yr:	2.56
Yearly:	2.31
Monthly:	0.82
From:	1923
To:	2007
Years of Record:	84

All values expressed in feet above NAVD88

*Period of record less than return period

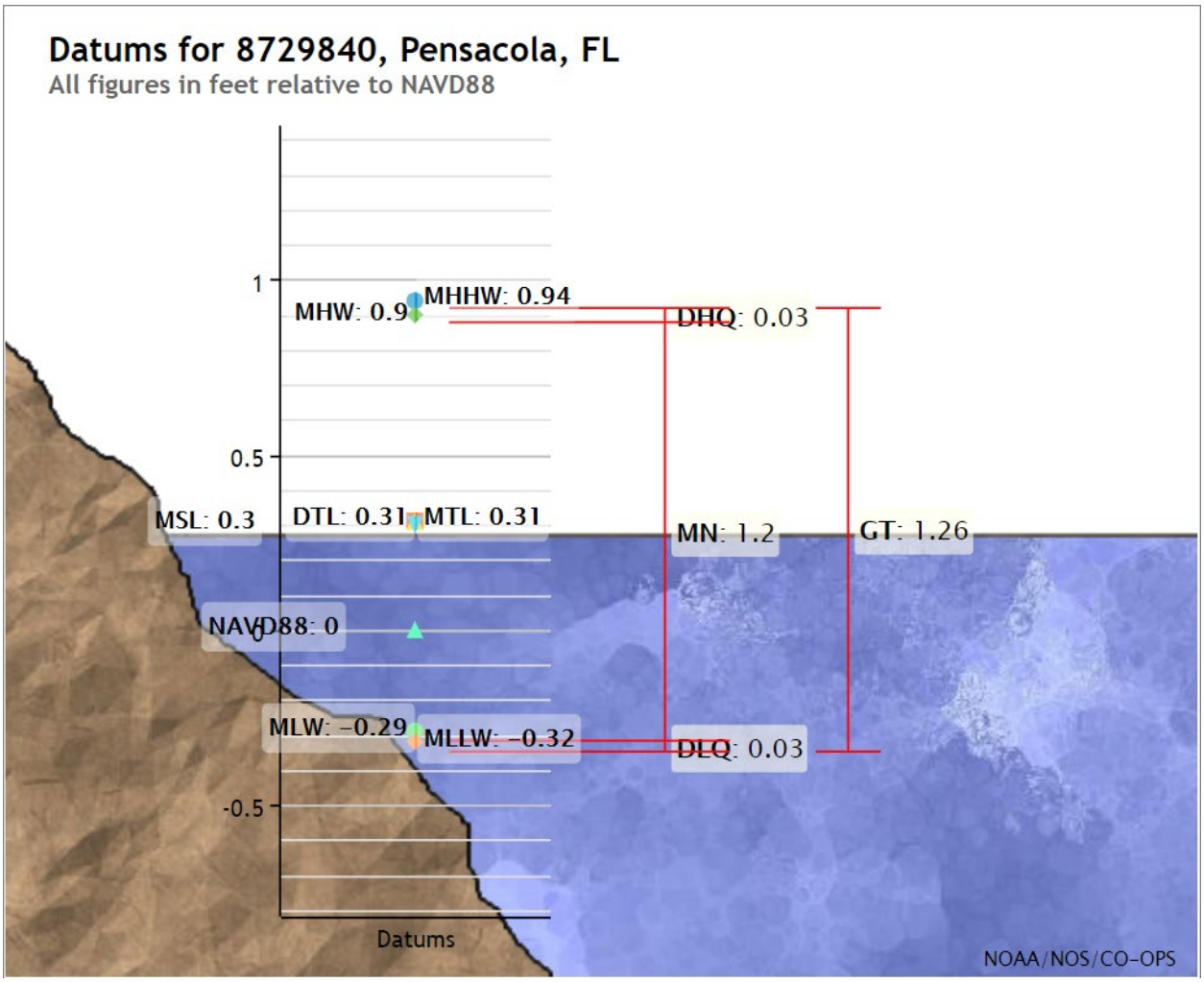


Figure 2-2. Tidal Datums relative to NAVD88, Station 8729840, Pensacola, FL

2.1.3 Topography*

The topography along the Okaloosa County shoreline varies from near sea level with exposed tidal flat at low tide, to about 25 to 30-foot high dunes on the undeveloped portion of Okaloosa Island. The terrain on the back bay area is mostly level with gently undulating topography in mostly urban developed landscape. General elevation is mapped between 10 to 20 feet above mean sea level (U.S. Geological Survey (USGS) topographic quadrangle). Occasional knolls of 50-foot height occur inland from the Choctawhatchee Bay shoreline. Further inland, on Eglin AFB reservation, bluffs of 70+ feet line stream banks and taper off into broad terraces.

2.1.4 Geology*

Okaloosa Island is composed of mostly Holocene sediments. This material consists of quartz sand with little organic matter and clay. It is mostly fine to medium-grained sand-sized quartz forming the beaches and dunes along the Gulf coastline. Along the Bay

shoreline, the material is undifferentiated quartz sands, consisting of fine to coarse grained material with varying percentages of silt and clay. The tributaries and streams that empty into the Bay along with adjacent lands are mapped as alluvial deposits. This material is restricted to river flood plains, and consists of quartz fine to coarse sand, silts and clays with higher percentage of organic material. The Citronelle Formation outcrops further inland, north of the Bay (Eglin AFB managed lands). It is composed of fine to coarse grained sands with gravel, silt and clay. It is often oxidized to reddish hues in exposures. (Florida Geological Survey, 1993, Open-file Series 16). Depth to competent rock is variable throughout the study area because bedding dips towards the southwest. Depth to top of rock along the coast is typically greater than 200 feet.

2.1.5 Soil Resources*

Soils mapped in the study area by the Natural Resource Conservation Service (NRCS) include numerous soil types and complexes. Within the area, two distinct land types may be distinguished – the beach fronting the Gulf of Mexico, and lands adjacent to the back bay of Choctawhatchee Bay.

Soils on Okaloosa Island, the beach front, are predominantly mapped as 3-Beaches, found on marine terrace beaches, and are frequently flooded and poorly drained due to tidal action, although it is unranked as a hydric soil. Lesser mapped soils are the 7-Duckston, frequently flooded sand found in marine depressions and floodplains; and the non-hydric Newhan-Corolla Complex excessively drained sandy soil typically found on ridges and dunes of xeric marine uplands.

In the back bay area, a multiple of mapped soil units occur that are predominantly non-hydric upland sands and sandy complexes. Of these, the more prevalent is the non-hydric 12-, 13-, and 14- Lakeland Sand, with slopes that vary between 0 – 30%, that is excessively well drained, and occurs on level to hilly marine terraces. The next dominant mapped soil unit, 27-Urban Lands, occurs on upland marine terrace and includes numerous minor components. In the study area, lands within this mapped area are mostly developed or disturbed. It is well-drained and rated as non-hydric. Smaller units occur in depressions and include the frequently flooded hydric 6-Dorovan Muck, the Rutledge hydric fine sand, and the 4-Chipely and Hurricane unit, a somewhat poorly drained non-hydric sandy soil found in mesic uplands (knolls and forested areas).

2.1.6 Native Beach Sediment*

Okaloosa County's engineering consultant, Taylor Engineering, Inc. collected samples of the native beach in the study area, as described in the *Eglin AFB/ Okaloosa County/ Destin Sand Source Investigation- Okaloosa County*, October 2009 report. The purpose of the sampling was to characterize the in situ sediments at representative locations. Shore-perpendicular transects were established along three reaches of the coastline: Eglin AFB beach (virtual monument V-501 through V-548), Okaloosa Island

(FDEP monument R-1 through R-16), and western Destin (FDEP monument R-17 through R-45). Samples were collected along each transect at the dune vegetation, dune toe, mid-berm, mean high water (MHW) shoreline, and mean low water (MLW) shoreline positions. These samples are considered representative of the majority of Okaloosa County beach and dune sand within the study area. Laboratory tests determined the grain size distributions, predominant Munsell color, percent fines, and carbonate content. Table 2-2 below contains a summary of the results.

Based on the Taylor Engineering studies, the sediments of the Gulf-fronting beaches are composed primarily of well-sorted (poorly graded) medium to fine grained, sand-sized quartz sediment. Samples were found to have a mean of 0.34 millimeters (mm). The Unified Soils Classification System (USCS) and Wentworth Classification System classify the Okaloosa County beach sand as fine and medium-to-fine sand, respectively, with less than 2% shell content. Taylor Engineering (2009) identified the color of the native beach samples in moist condition to be Munsell color 5Y 8/1 (white). See Chapter 7 of Appendix A, Engineering for a description of the sampling and testing conducted by Taylor Engineering on behalf of Okaloosa County.

2.1.7 Offshore Borrow Material Resources*

Okaloosa County's engineering consultant, Taylor Engineering, Inc., conducted reconnaissance and design-level offshore sand investigations to identify suitable beach-quality sand for use along the Okaloosa County coastline (October 2009). The investigations identified two potential borrow areas, OK-A and OK-B. The proposed borrow area for this project is OK-A, which is a nearshore relic ebb tidal delta located approximately 1.5 miles south of Okaloosa Island and west of East Pass. The supplemental borrow area, OK-B, is located approximately 7.1 miles south of Destin and is thought to be a transgressive sand shoal. See Figure 2-3 for locations. Both borrow areas are located in Florida state waters. The horizontal and vertical boundaries of both borrow areas were determined by analysis of geophysical surveys and sediment data obtained from vibracore sampling during the reconnaissance and design-level investigations. Grain size distribution, sediment composition (mineralogy, percent fines, and carbonate content), and Munsell color were compared to the native beach sand to determine suitability.

Borrow Area OK-A is approximately 700 acres in size. A narrow section of the northwest corner of the borrow area overlays the GINS boundary, and it is located within a designated Outstanding Florida Waters (OFW), which are waters designated worthy of special protection due to their natural attributes. This borrow area may require a special use permit from the National Park Service and/or a Joint Coastal Permit (JCP) from the State of Florida. Such permitting would be conducted during the Project Engineering and Design phase. Water depths range from -37 to -53 feet NAVD88. The borrow area has a FDEP-permitted dredge elevation of -49.4 feet

NAVD88 and it has been used for three previous nourishment projects, including Eglin AFB, Western Destin, and Holiday Isle. It is estimated to contain approximately 5.1 million cubic yards (mcy) of suitable non-dredged material remaining based on a 2020 hydrographic survey conducted by USACE. The FDEP has stated to USACE that OK-A may be re-permitted at a deeper cut elevation once the -49.4 ft NAVD88 cut elevation material has been exhausted (FDEP personal communication 2020). There is an estimated 9.3 mcy of suitable sand below the current cut elevation. Some of the thinner deposits might not be thick enough to dredge efficiently and the overall volume could be reduced. Of this quantity, 7.9 mcy is a minimum of 6 feet thick.

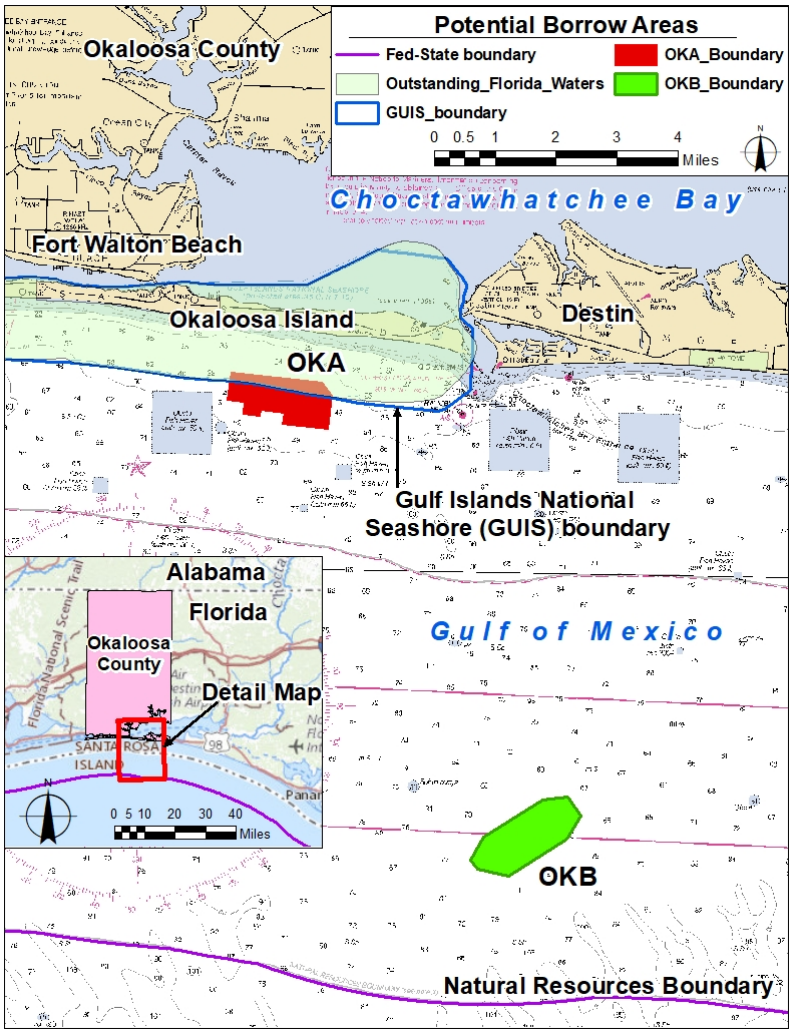


Figure 2-3. Okaloosa County Offshore Borrow Areas

Borrow area OK-A consists mostly of medium to fine grain sand-sized quartz with an average grain size of 0.31 mm (Table 2-2). Fines content is 1.3%, and carbonate percentage is 3.8%. The color of the borrow area is described as having a moist Munsell© color of 5Y 7/3 or lighter for most of the deposit which meets the compatibility criteria for this project (Florida Administrative Code 62B-41). Material from this borrow

site was used for beach placement along lands managed by the Eglin AFB. The sample testing determined the shell content to be within an acceptable 2% of total content. Mitigation techniques that could be used to reduce the shell content if needed could include screening larger material (i.e. shells >0.75 inches) during placement and rescreening material post-placement to removed smaller shell fragments.

Borrow Area OK-B is a potential source that was also identified by Taylor Engineering, Inc. during the sand search. This borrow area is located about 7.1 miles south of Destin and is approximately 806 acres in size; see Figure 2-3. Geotechnical data collected during the reconnaissance and detailed-level investigations determined that the material meets the FDEP-administered Florida Sand Rule (F.A.C. 62B-33.005(7)) for beach placement. OK-A was chosen to be permitted over OK-B because of the shorter haul distance to the placement sites (which reduces dredging costs) and because its composite Munsell© color is slightly lighter than the OK-B borrow site material. The OK-B borrow site could be used for supplemental material in the event that OK-A is completely exhausted in the future. Approximately 15.2 mcy of beach-compatible sand is estimated to be present within the boundaries of OK-B at a cut elevation of -74.5 feet NAVD88. The composite grain size is 0.30 mm. The material has a visible shell content of around 2%, a carbonate content at approximately 5.1%, and has greater than 72% of a Munsell© color of 5Y 7/3 or lighter. OK-B lies outside of the OFW. Based on calls with the FDEP, currently, no additional geotechnical investigation needs to be completed in OK-B to permit it (FDEP personal communication 2020). Updated bathymetric surveys would need to be conducted to design the dredge prisms and calculate quantities based on the existing seafloor conditions; however, the FDEP may require additional information for permitting.

Table 2-2. OK-A & OK-B Characteristics versus Native Shoreline reaches

Location	Mean grain size (phi)	Median grain size (phi)	Sorting (phi)	USCS	% Fines	Carbonate Content, %	Moist Munsell Value
Okaloosa Island Reach	1.51	1.56	0.51	SP	0.07	0.00	8
Destin Reach	1.68	1.65	0.44	SP	0.08	0.25	8
OK-A*	1.49	1.7	0.94	SP	1.16	3.8	7
OK-B	1.73	1.84	0.77	SP	2.6	5.1	7

*Stats are for volume above -49.4 ft-NAVD88.

2.1.8 Economic Characteristics*

Tourism is a critical component of Okaloosa County. It is home to a variety of activities and several notable attractions. Destin-Fort Walton Beach is considered one of the world's premier beach vacation destinations. Destin Harbor is the hub for almost all the commercial and recreations fishing businesses operating in the area. Choctawhatchee Bay waters are generally calm and suited for paddle boarding, kayaking and canoeing, but are also used for boating. The county has nature preserves and parks for recreation as well, some of which are included in the Gulf Islands National Seashore (GINS).

Other drivers of the economy are educational services and health care; professional, scientific, management and administrative services; retail, construction, public administration and manufacturing. Proximity of military bases also supports the economy of communities in Okaloosa County.

2.2 Future Without Project (FWOP)

Future coastal conditions in the study area are likely to be shaped as much by human intervention as by natural coastal processes. FWOP actions, such as emergency beach nourishment through the Federal Emergency Management Agency (FEMA) or other State emergency funded actions, are anticipated based on a review of the history of such actions. For these types of projects, unless specific plans or policies are identified which would alter future conditions, it is assumed that past actions are the most reliable indicator of the FWOP.

2.2.1 Climate Change

The FWOP anticipates a continuation of sea level rise. The formulation of alternatives is consistent with Engineering Pamphlet (EP) 1100-2-1 "Procedures to Evaluate Sea Level Change: Impacts, Responses, and Adaptation" (June 30, 2019). Screening of alternatives was undertaken based upon the USACE high-rate of Relative Sea Level Change (RSLC). The FWOP anticipates that although the consequence of storms will increase under higher rates of RSLC, the frequency and intensity of future storms will not change in the FWOP. For this study it was assumed that sediment transport and rates will be similar to historic rates, with some changes due to both the maturation and deterioration of existing coastal structures. Prominent hazards to environmental resources in the FWOP scenario are storm damage and sea level rise, both driven by climate change. Potential impacts to environmental conditions would most likely come from these sources.

2.2.1.1 Sea Level Rise

Coastal areas are particularly vulnerable to the effects of climate change. Coasts are sensitive to SLC, changes in the frequency and intensity of storms, increases in

precipitation and warmer ocean temperatures (USEPA, 2018). SLC and extreme storms can result in erosion or land subsidence, increasing the risk of flooding in cities, inhabited islands, and tidal wetlands. (NOAA, 2019). The impacts of climate change are likely to worsen problems that coastal areas already face. Confronting existing challenges that affect man-made infrastructure and coastal ecosystems, such as shoreline erosion, coastal flooding, and water pollution, is already a concern in many areas. Addressing the additional stress of climate change may require new approaches to managing land, water, waste, and ecosystems (USEPA, 2018).

Changes in Mean Sea Level (MSL) are a function of global and local response to astronomical, meteorological, climatological, geophysical, and oceanographic forcing mechanisms. Commonly used terms for describing SLC are Eustatic and Relative. Eustatic SLC is the change in water surface elevation attributed to global effects such as thermodynamic properties of water (expansion), Density (salinity), Volumetric (melting ice). Eustatic SLC over large time scales (400k years) has been observed through geologic records as being cyclic in nature as a result of interglacial cycles. RSLC is the change in water surface elevation with respect to the elevation of land at a specific location and spatially variable. RSLC is a function of eustatic SLC plus effects of vertical land motion, regional oceanographic patterns, hydrodynamics, and hydrologic cycles. RSLC trends are typically limited to small time scales using observed data and more applicable when describing effects to projects along coastlines such as the Okaloosa CSRM study.

The most widely accepted methodology for estimating RSLC is through interrogation of water level time series data at NOAA stations with 40-years of record or more. The time series record is filtered for extreme events and averaged monthly then a linear trend line is fitted to the data. The slope of this line is the relative sea level change rate (RSLR) expressed as length/time. The NOAA has completed this assessment at all stations with sufficient length of records and available on the website: http://tidesandcurrents.noaa.gov along with more in-depth explanation of the methodology. The RSLR obtained from the linear trend line is typically referred to as the “historical trend rate” and specifically referred to as the “low” curve in the USACE guidance. Additional curves projecting a change in the RSLR are developed by NRC and adopted by the USACE for the intermediate and high curves. These curves are intended to represent a change in the forcing mechanisms but not necessarily a prediction whereas it is assumed any projected RSLR is equally likely to occur. The intermediate and high curve are numerically described using the following polynomial equation for eustatic SLC using the global mean sea level change rate of 1.7 mm/yr presented by the International Panel on Climate Change (IPCC) (IPCC, 2007)

$$E(t) = 0.0017t + bt^2$$

Where *E(t)* is the SLC in meters, *t* is the number of years from the base year, and *b* is the constant coefficient specific to each curve. While this equation is for eustatic SLC it can be modified by replacing 0.0017 with the RSLR obtained from the NOAA for a particular location. The base year is the midpoint of the tidal epoch (NTDE (1983-2001)) used to determine MSL which currently is 1992. The intermediate and high curves used by the USACE are equivalent to the modified NRC Curve I and III, respectively. Coefficients for *b* are 2.71E-5 for modified NRC curve I and 1.13E-4 for modified NRC Curve III. This equation and coefficients are integrated into the USACE Sea Level curve calculator (Version 2019.21), described in EP 1100-2-1, a tool managed by USACE and used in this study. Utilizing the NOAA station 8729840 in Pensacola, Florida, the nearest site having a sufficient record and quality of water level data, gives a RSLR of 0.00689 ft/yr. The USACE low, intermediate, and high predictive curves based on this rate produced the results in Table 2-3 and graphically shown in Figure 2-4.

Table 2-3. USACE 2013 Sea Level Curve Data, Station 8729840, Pensacola, FL

Year	USACE Low	USACE Intermediate	USACE High
1992	0.30	0.30	0.30
1995	0.32	0.32	0.32
2000	0.36	0.36	0.38
2005	0.39	0.41	0.45
2010	0.42	0.45	0.54
2015	0.46	0.51	0.66
2020	0.49	0.56	0.78
2025	0.53	0.62	0.93
2030	0.56	0.69	1.10
2035	0.60	0.76	1.28
2040	0.63	0.84	1.49
2045	0.67	0.92	1.71
2050	0.70	1.00	1.95
2055	0.73	1.09	2.21
2060	0.77	1.18	2.48
2065	0.80	1.28	2.78
2070	0.84	1.38	3.09
2075	0.87	1.48	3.43
2080	0.91	1.60	3.78
2085	0.94	1.71	4.15
2090	0.98	1.83	4.54
2095	1.01	1.95	4.94
2100	1.04	2.08	5.37
2105	1.08	2.21	5.81
2110	1.11	2.35	6.28
2115	1.15	2.49	6.76
2120	1.18	2.64	7.26
2125	1.22	2.79	7.77
2130	1.25	2.94	8.31

All Values expressed in feet relative to NAVD88

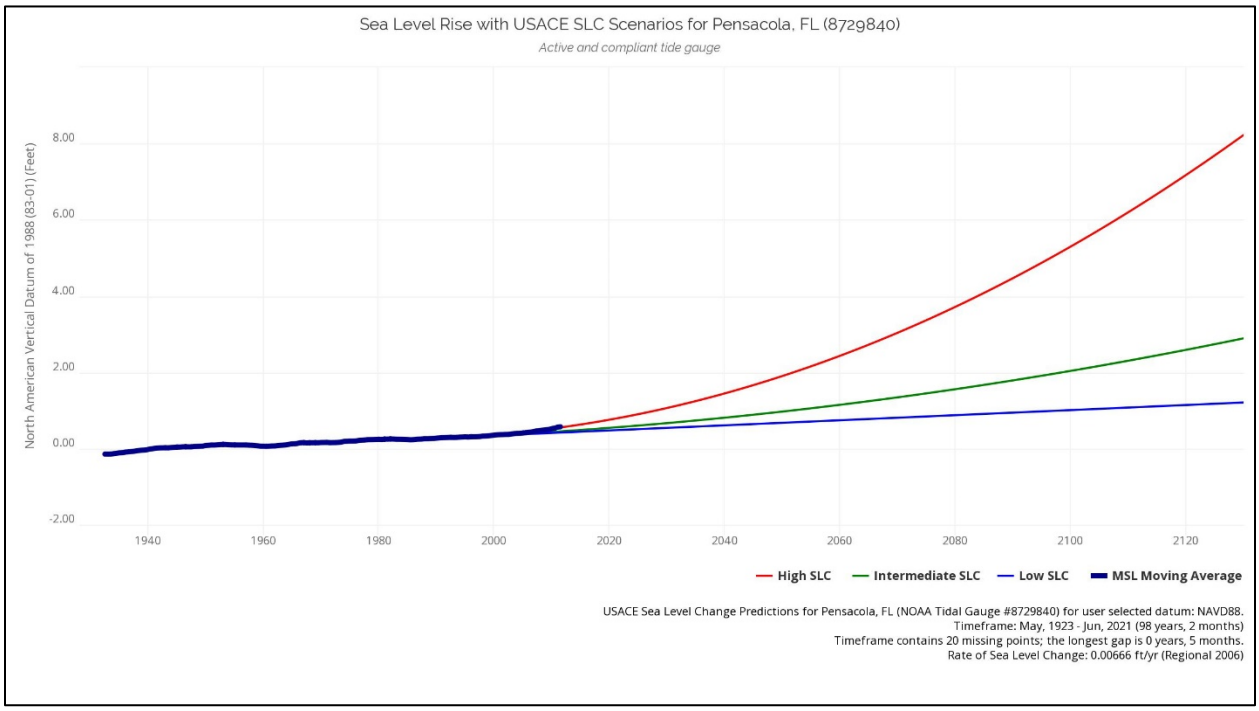


Figure 2-4. USACE Sea Level Curves, Station 8729840, Pensacola, FL

Plotting the MSL moving average recorded data over time (Figure 2-5) with the 3 predictive rates of SLR it is clear this project area is experiencing an increase in water level. The long-term trend of MSL is most representative of the low rate of SLC linear fit curve while the 2000 to present temporal range appears to follow the high curve. With uncertainty in how future water levels trend and recent increased rate of change this study is evaluating future project conditions using the high curve with consideration for realization of the low and intermediate curves. The projected RSLC over the planning horizon (2020 – 2075) is 0.38 ft for the low, 0.92 ft for the intermediate, and 2.65 ft for the high curve. The projected RSLC over the 50-year economic period of analysis (2025 – 2075) is 0.34 ft for the low, 0.86 ft for the intermediate, and 2.50 ft for the high curve. Further consideration of project performance and at-risk infrastructure over the 100-yr adaptation horizon (2025-2125) is also evaluated. RSLC over the adaptation horizon is 0.69 ft for the low, 2.17 ft for the intermediate, and 6.84 ft for the high curve. Changes in sea level over different project timelines is shown in Table 2-4. Effects of SLC on project performance and infrastructure over each project timeline is discussed within the respective sections of this report and in the main report.

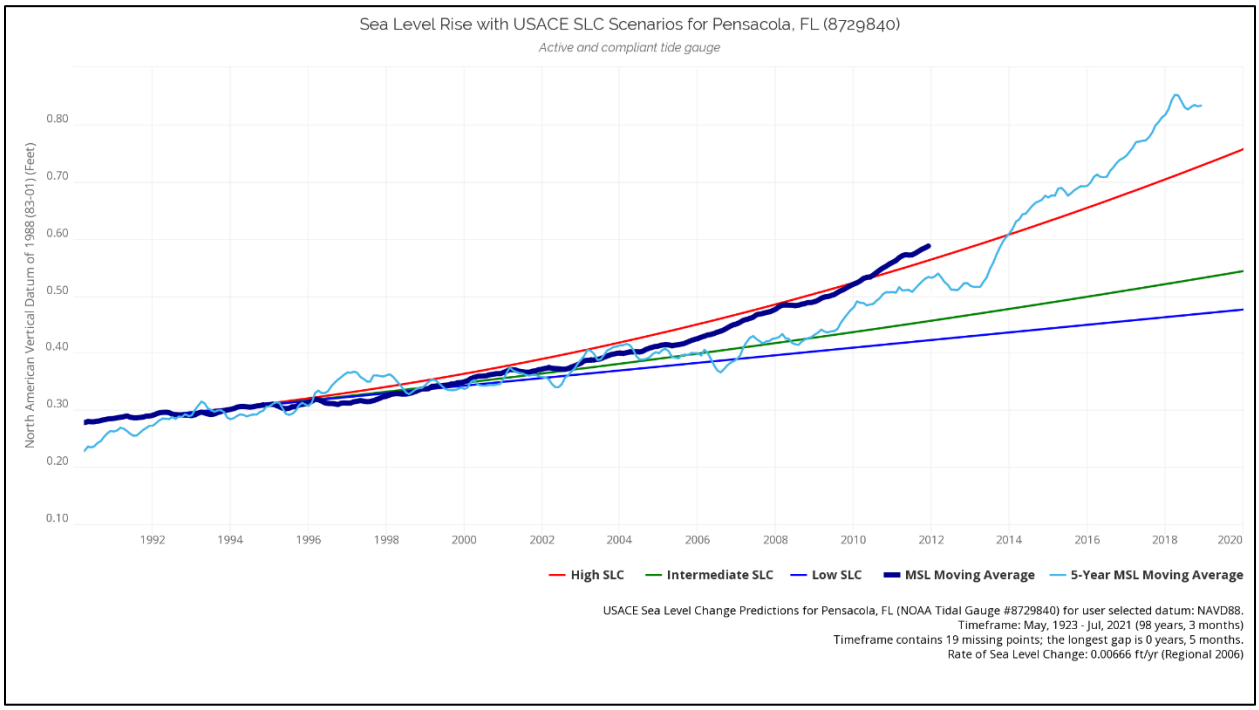


Figure 2-5. MSL Moving Average Recorded Data Over Time

Table 2-4: Summary of Project Timelines and SLC

USACE SLC Curve	Planning Horizon (2020-2075)	Economic Period of Analysis (2025-2075)	Adaptation Horizon (2025-2125)
Low	0.38	0.34	0.69
Intermediate	0.92	0.86	2.17
High	2.65	2.50	6.84

During screening, consideration was given to how the proposed measure or alternative would function through the 50-year period of analysis (POA) and through the 100-year adaptation horizon for the RSLC projection. While it is not the purpose of this study to determine what actions should be taken in the 50-year timeframe between the POA and the 100-year adaptation horizon, the possible impacts are noted for consideration of future impacts.

2.2.1.2 Future Vulnerability to Sea Level Change

To better understand the vulnerabilities associated with RSLC it is critically important to understand vulnerabilities not only to current conditions, but also to future conditions. This will allow for the determination of the appropriateness, or lack thereof, of the methods for addressing coastal storm risk through the lifecycle of the study area and beyond. The first step in this process is to characterize the risk now and in the future under several different plausible conditions. Vulnerability to RSLC is variable throughout the study area. For instance, a high dune and upland area in East Destin is less susceptible to coastal storm risk than some areas in the back bay of the study where only small bulkheads prevent erosion. Therefore, specific consideration was given to areas throughout the study area for appropriateness of consideration of coastal storm risk management measures. These areas are: (1) Fort Walton Beach, (2) Ocean City, (3) Shalimar, (4) Niceville, (5) Bluewater, (6) Okaloosa Island, and (7) Destin. Cross-sections of each locality were extracted to better understand the current and future storm risk to RSCL and coastal storm events. Figure 2-6 depicts the locations of the cross-section profiles. The following sections provide a more detailed image of the cross-section locations as well as the representative profile with regard to the 1% AEP water level superimposed on the high curve projected RSLC 50-years and 100-years

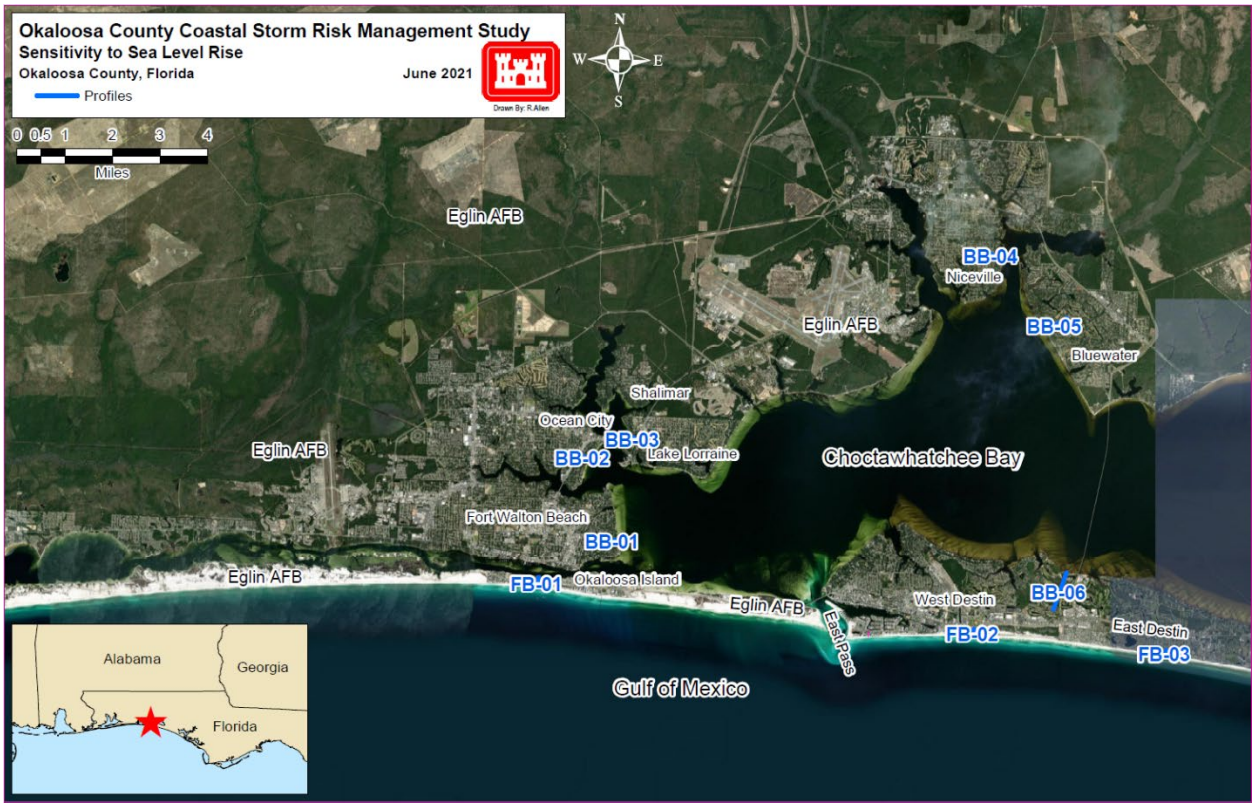


Figure 2-6. Okaloosa County Profile Locations

from now. It is also important within each of these areas to understand the exposure of critical infrastructure that may be inundated and damaged by coastal storms. Figure 2-7 shows and overall map of identified critical infrastructure within the 1% AEP event over the 100-year adaptation horizon and tracking the high SLC curve. Table 2-5 shows the elevation at which these structures may being to see inundation. These have been analyzed for their relative exposure and potential for measures to reduce flood risk.

Figure 2-7. Critical Infrastructure Locations within Study Extents

Table 2-5: Identified Critical Infrastructure Okaloosa Coastal Area

Location	Critical Infrastructure Category	Approx Elevation of Inundation (ft-NAVD88)
Shalimar	School	10.0
	Water and Wastewater	14.4
	Safety (Sheriffs Department)	11.2
	Safety (Police Department)	12.2
	Human Services/Safety (Church)	12.6
Ocean City	Medical (Pharmacy)	12.7
	Medical (Pharmacy)	14.2
	Water and Wastewater	13.3
	Water and Wastewater	13.6
	Human Services (Church)	13.7
	Electric	12.6
Okaloosa Island	Medical (EMS Station)	9.2
	Safety (Fire Department)	9.2
	Water and Wastewater	8.9
	Water and Wastewater	5.2
Destin	Water and Wastewater	12.0
	Information (Broadcast Tower)	17.3
	School	11.8
	Water and Wastewater	11.0
Fort Walton Beach	School	11.9
	Medical (Pharmacy)	16.3
	Water and Wastewater	11.4
	Medical (Pharmacy)	12.6
	Water and Wastewater	4.5
	School	8.6
	Safety (Fire Department)	17.5
	School	16.7
	Human Services (Church)	17.5
	School	15.8
	Human Services (Church)	17.5
	Human Services (Center)	16.5
	Trade (Airport Terminal)	13.9
	Medical (Pharmacy)	14.3
	School	13.3
	School	15.9
	Human Services (Church)	16.5
	School	8.6
	Information (Cell Tower)	14.0
	Information (Broadcast Tower)	15.8
	Medical (Urgent Care Facility)	16.2

2.2.1.2.1 Okaloosa Island

Okaloosa Island is a characteristic barrier island profile with a front beach consisting of a dune height averaging 13 feet NAVD88 then transitioning to a lower back beach with an elevation ranging from 8 to 10 feet NAVD88. The 1% AEP will cause inundation from the back bay well before inundation from the oceanfront is exposed. Based on the USACE high sea level curve in 50 years, front beach structures could be impacted by storm surge and waves. Figure 2-8 and Figure 2-9 present the profile location and profile, respectively for Okaloosa Island.

Figure 2-8. Okaloosa Island Representative Profile Location

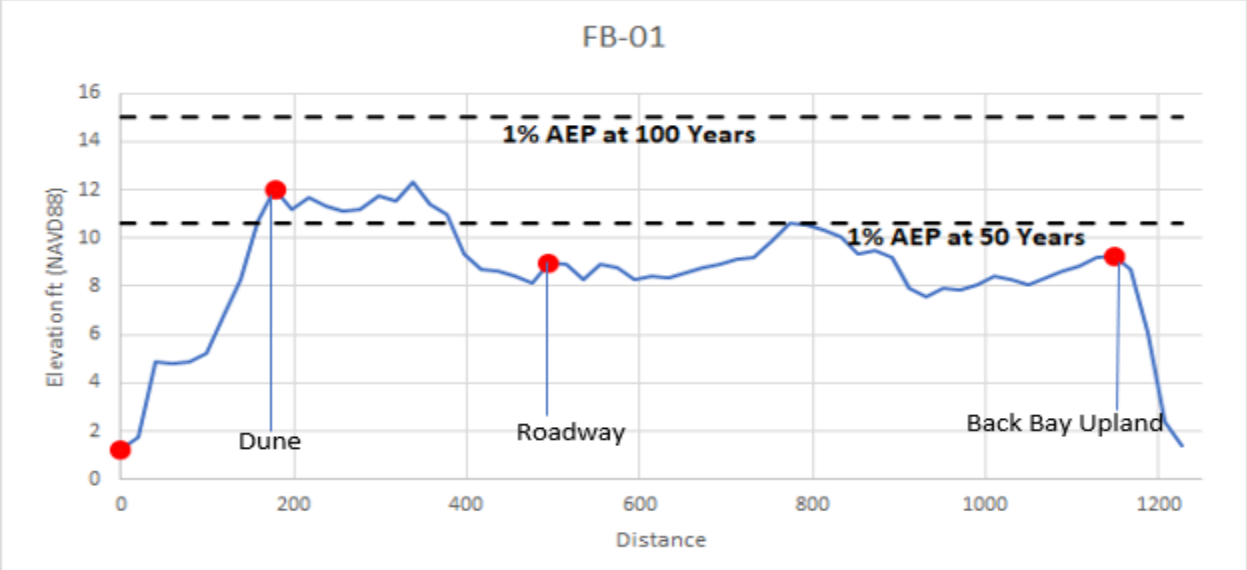


Figure 2-9. Okaloosa Island Representative Profile

Terrain along Okaloosa Island is characterized by a high front dune hand low back bay elevation. It is important to note that the protective dune height is variable in this reach, ranging from 12 – 16 feet in elevation. There is some existing exposure to structures and critical infrastructure from back bay flooding in the existing condition. The evacuation route along Okaloosa Island would already be exposed to flooding in the 100-year AEP event by 2060 if tracking the high SLC curve. This could locally restrict evacuations in a major storm. The front beach dune would not be overtopped until after 2100. Figure 2-10 shows the exposure through time for the existing condition.

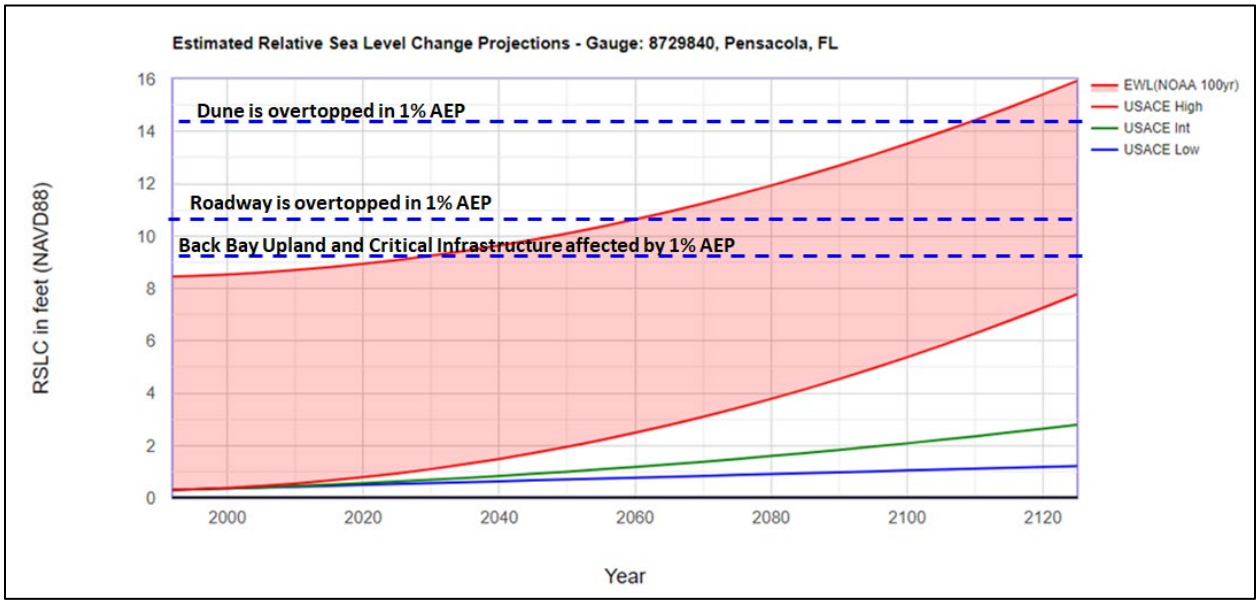


Figure 2-10. Exposure over time in the Okaloosa Island Area

2.2.1.2.2 West Destin

West Destin is characterized by a beach and dune with an average elevation of 14 feet NAVD88. This eventually ties into a high upland area that would limit back bay flooding of the front beach from an event. Exposure of the roadway, an important evacuation route, is protected from the front beach dune and high back bay upland area. A major concern in this area is erosion of the existing protective front beach berm and dune. Figure 2-11 and Figure 2-12 present the profile location and profile, respectively for West Destin.

Figure 2-11. West Destin Representative Profile Location

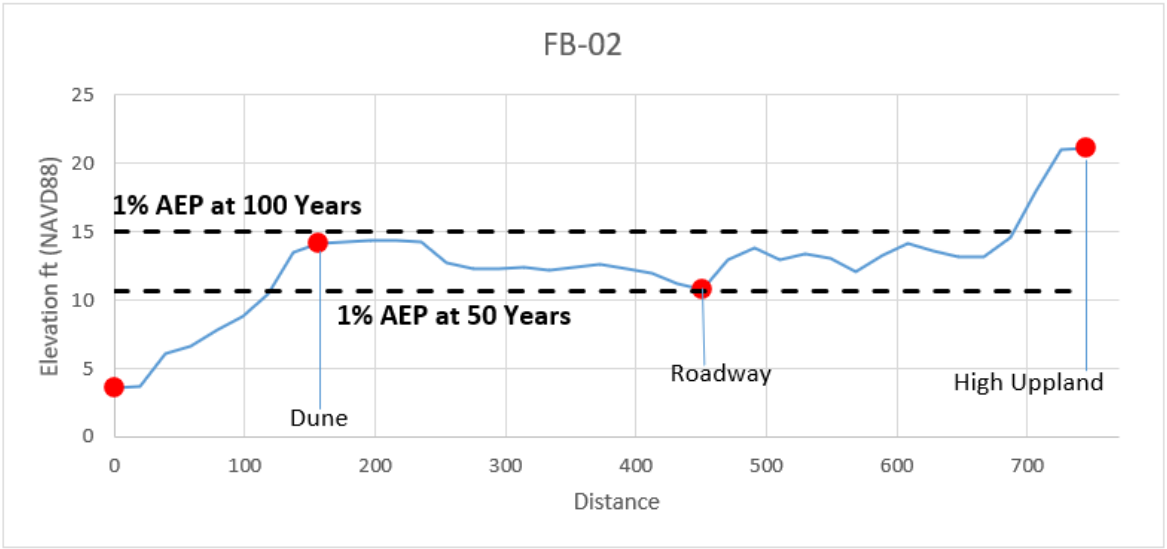


Figure 2-12. West Destin Representative Profile

Critical infrastructure in the area is located on fairly high ground with the exception of one water and wastewater location and two school locations. The remainder are well not affected by the 1% AEP until approximately 2063. Some consideration should be given to the low-lying infrastructure. Figure 2-13 shows the exposure through time for the existing condition.

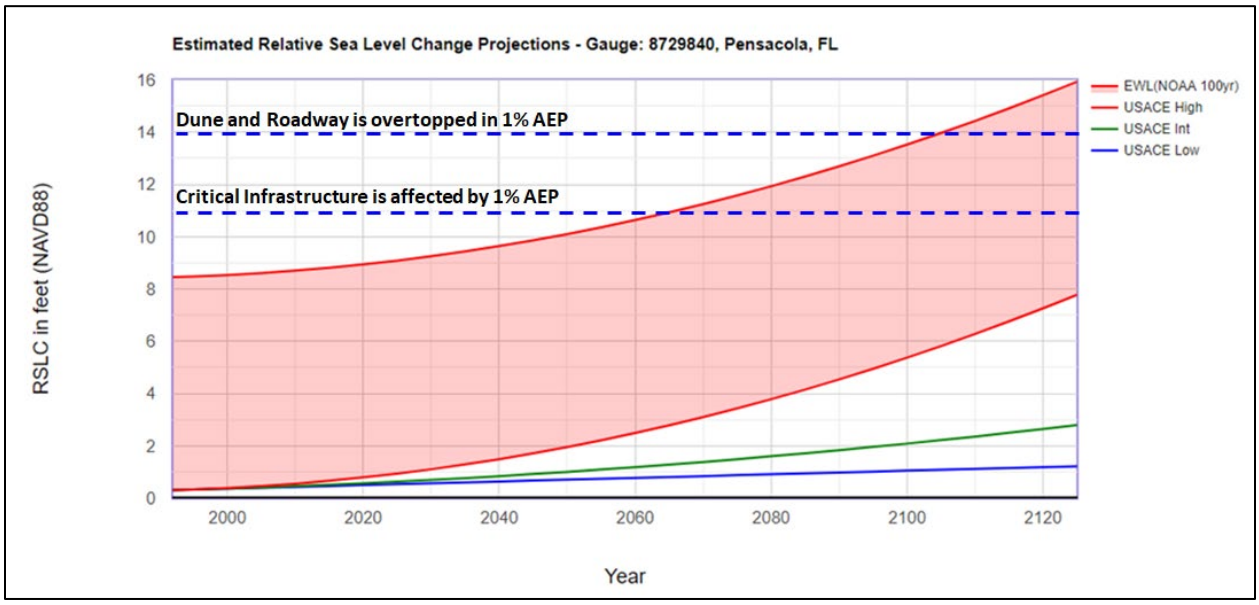


Figure 2-13. Exposure over time in the West Destin Area

2.2.1.2.3 East Destin

East Destin is characterized by a berm tying directly into an upland elevation of +20 feet NAVD88. Coastal storm risk is low in this area as infrastructure is surrounded by a high upland area. Infrastructure in this area would likely not see inundation from extreme storms on the front beach area over the 50-year or 100-year horizon. Figure 2-14 and Figure 2-15 present the profile location and profile, respectively for East Destin.

Figure 2-14. East Destin Representative Profile Location

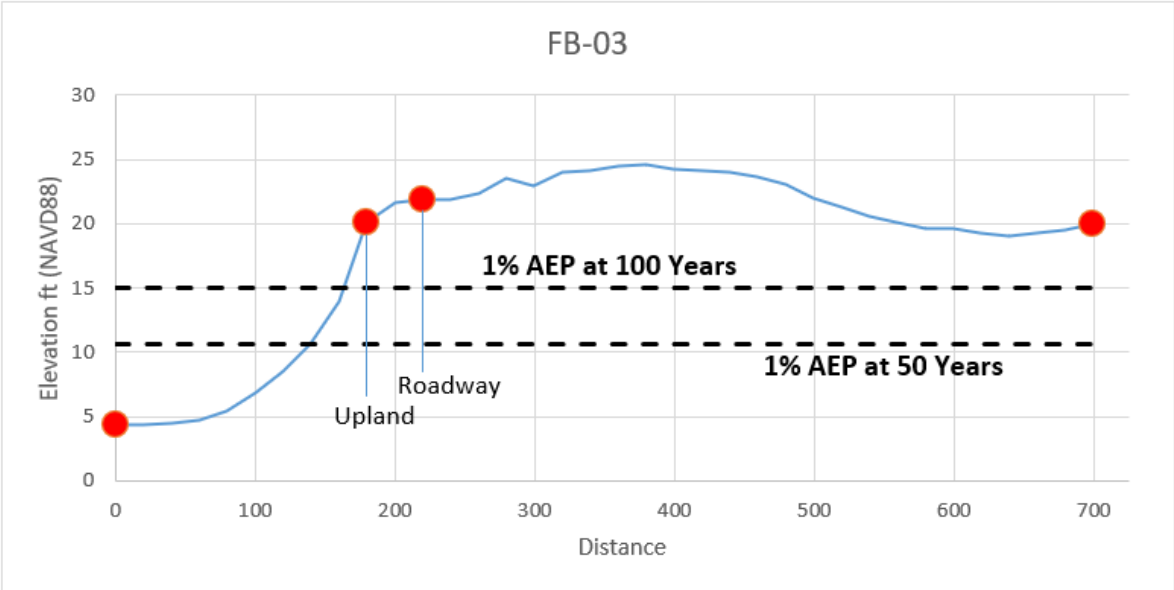


Figure 2-15. East Destin Representative Profile

2.2.1.2.4 Fort Walton Beach:

Fort Walton Beach shoreline is characterized by mostly bulkheaded bayfront properties. This removes exposure to erosion; however, there is vulnerability of these structures to increased inundation, wave loading and overtopping overtime associated with RSCL. Beyond the POA, there would be some inundation well inland, increasing with time. Figure 2-16 and Figure 2-17 present the profile location and profile, respectively for Fort Walton Beach.

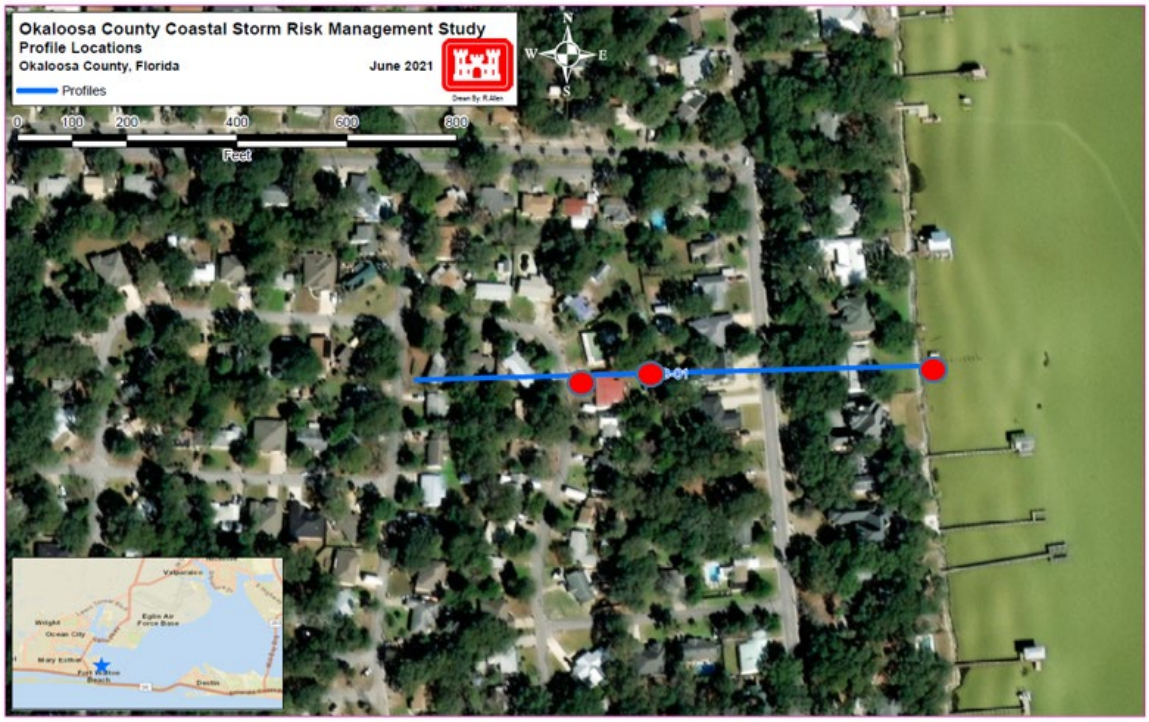


Figure 2-16. Fort Walton Beach Representative Profile Location

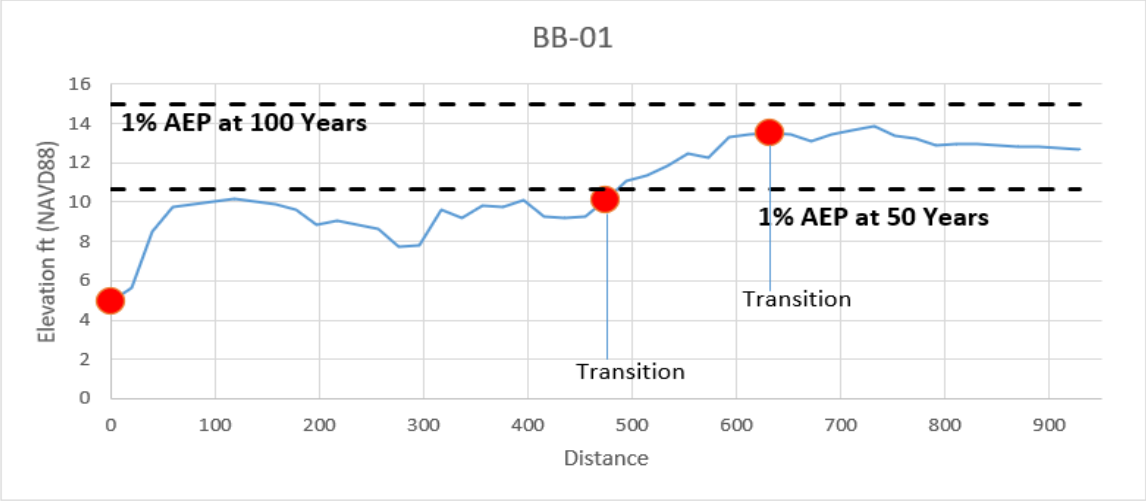


Figure 2-17. Fort Walton Beach Representative Profile

Fort Walton Beach has the highest exposure to critical infrastructure. Multiple locations could be exposed in the 1% AEP event. Consideration should be given to these locations with the NFS. Figure 2-18 shows the exposure through time for the existing condition.

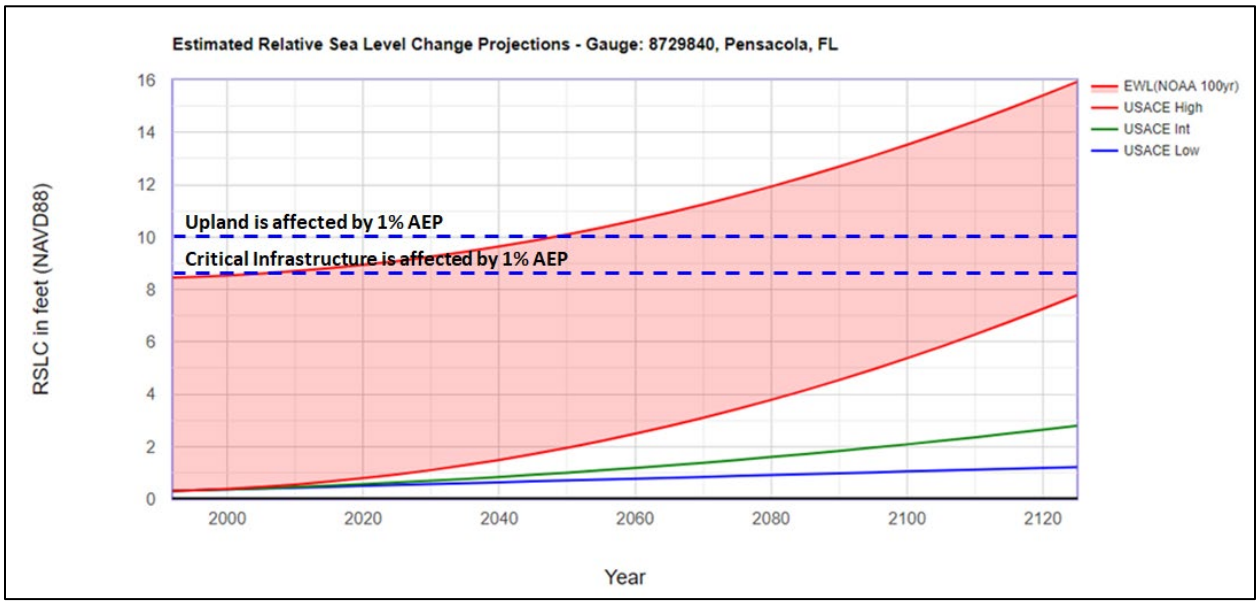


Figure 2-18. Exposure over time in the Fort Walton Beach Area

2.2.1.2.5 Ocean City

Ocean City shoreline is characterized by mostly bulkheaded bayfront properties. This removes the exposure to erosion; however, there is vulnerability of these structures to increased inundation, wave loading and overtopping overtime associated with RSCL. Over the-POA, there would be some inundation well inland, increasing over time. Over the 100-year adaptation horizon, critical evacuation routes may begin to be affected. Figure 2-19 and Figure 2-20 present the profile location and profile, respectively for Ocean City.

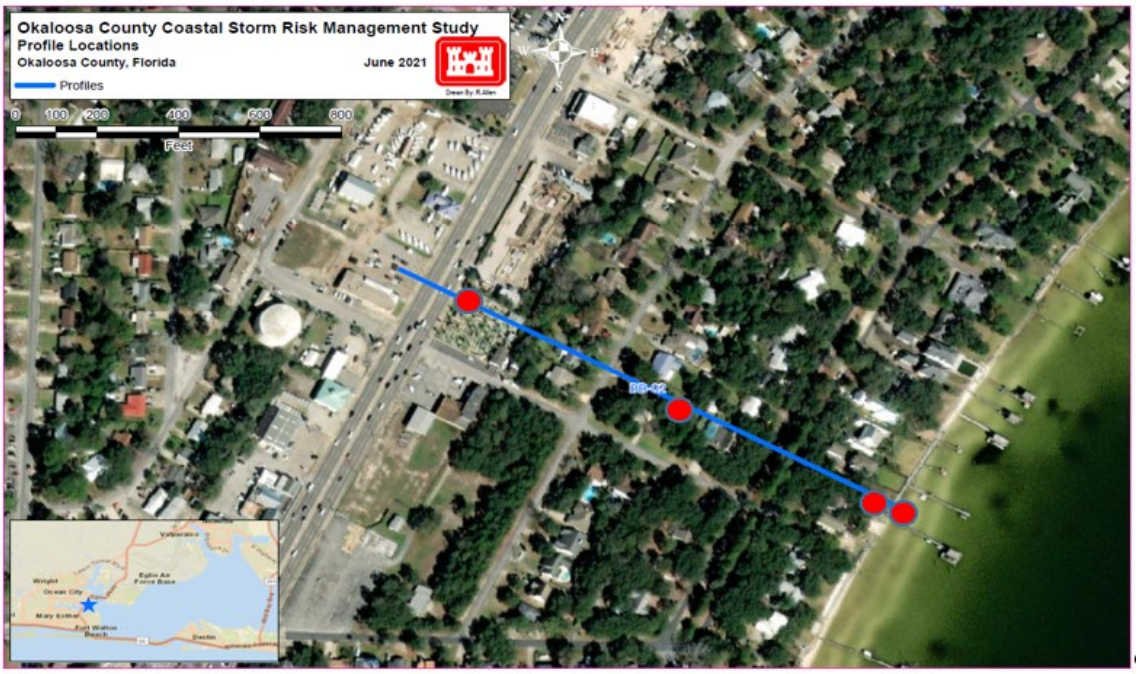


Figure 2-19. Ocean City Representative Profile Location

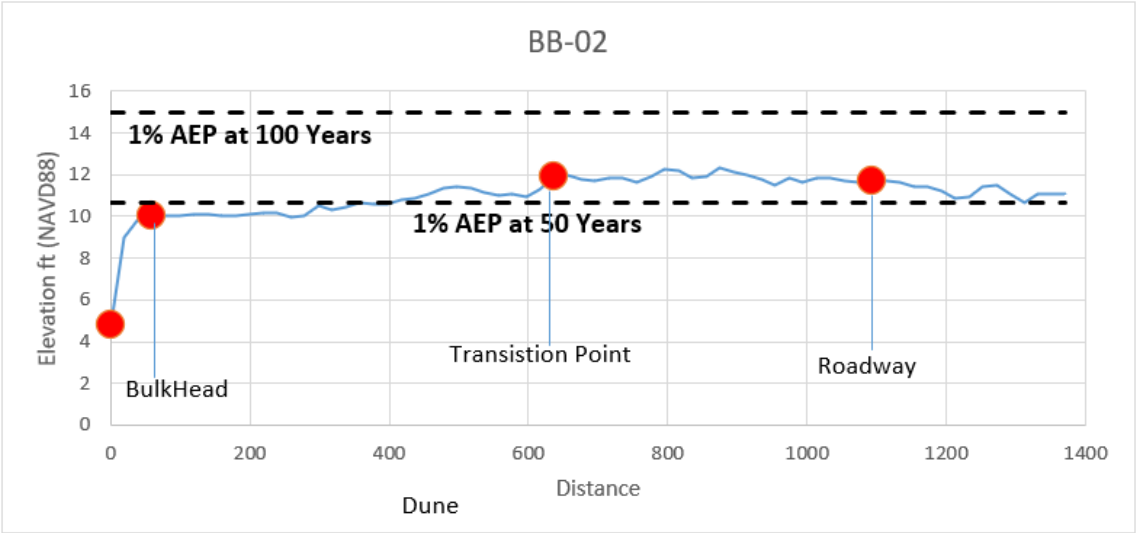


Figure 2-20. Ocean City Representative Profile

Critical infrastructure in the area is located on fairly high ground and would not be affected by the 1% AEP storm until 2085. The major roadway which acts as an evacuation route, would begin to be inundated by the 1% AEP event around 2080. Figure 2-21 shows the exposure through time for the existing condition.

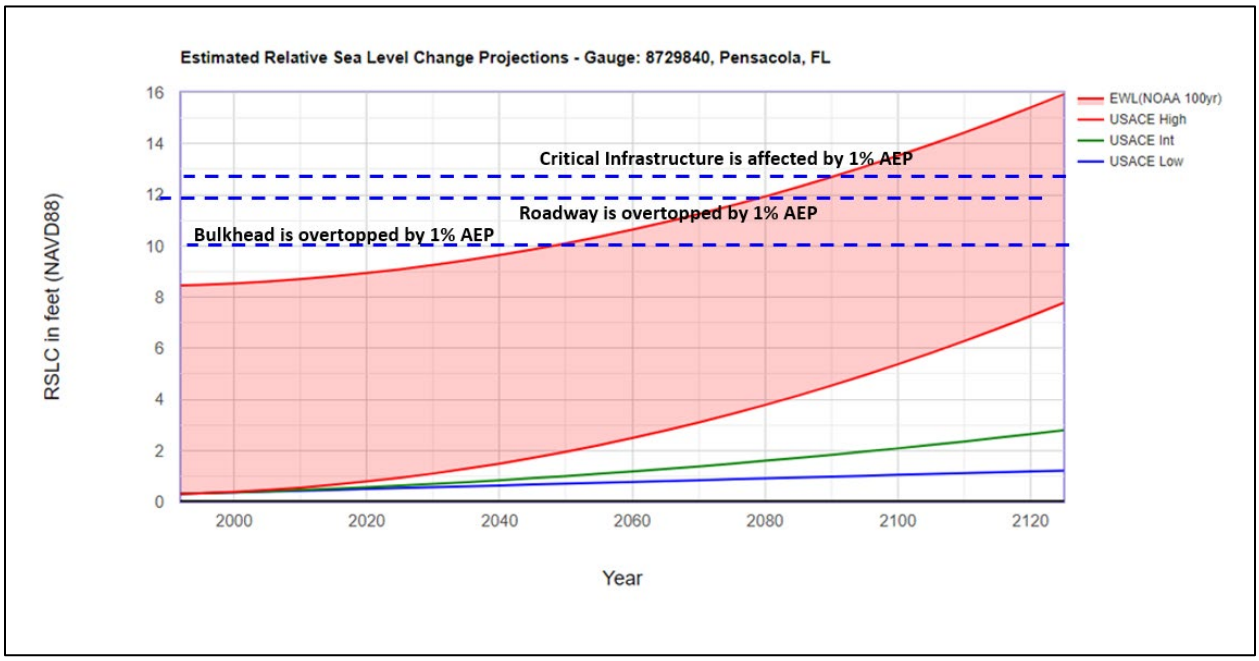


Figure 2-21. Exposure over time in the Ocean City Area

2.2.1.2.6 Shalimar

Similar to Ocean City, Shalimar is a heavily bulkheaded area. There is exposure to inundation in this area with evacuation routes for the area flooded within the POA. Figure 2-22 and 2-23 present the profile location and profile, respectively for Shalimar.

Figure 2-22. Shalimar Representative Profile Location

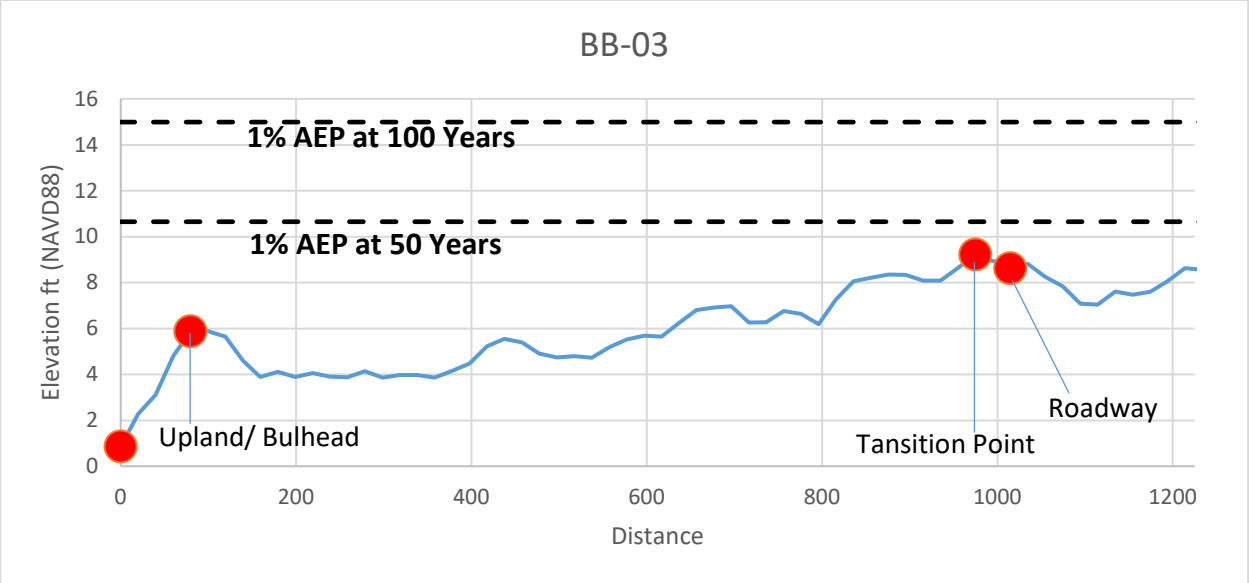


Figure 2-23. Shalimar Representative Profile

Some critical infrastructure would be exposed to flooding in the 1% AEP event around the year 2045. Evacuation routes in this area would currently be exposed for the 1% AEP event. Figure 2-24 shows the exposure through time for the existing condition.

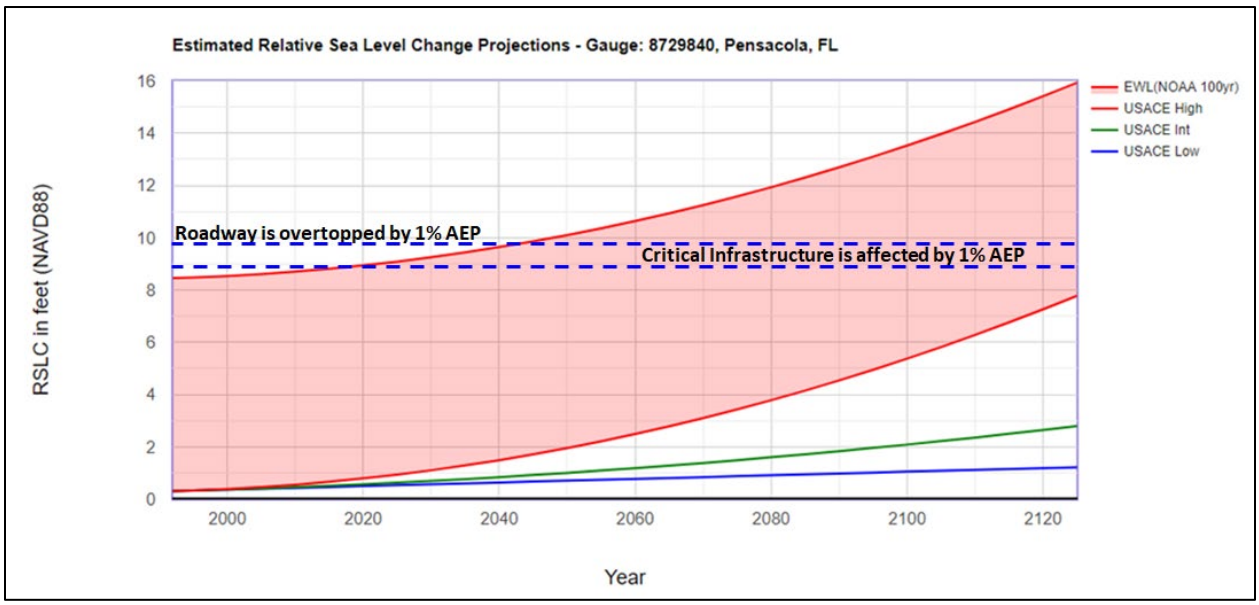


Figure 2-24. Exposure over time in the Shalimar Area

2.2.1.2.7 Niceville

Niceville has virtually no major transition points. The area is characterized by a gradual increase in the topography. Inundation would extend about 900 feet inland over the POA in a 1% AEP event and almost 1,400 feet over the 100-year horizon in a 1% AEP event. Consideration should be given in this area to protection from episodic events. Figure 2-25 and Figure 2-26 present the profile location and profile, respectively for Niceville.

Figure 2-25. Niceville Representative Profile Location

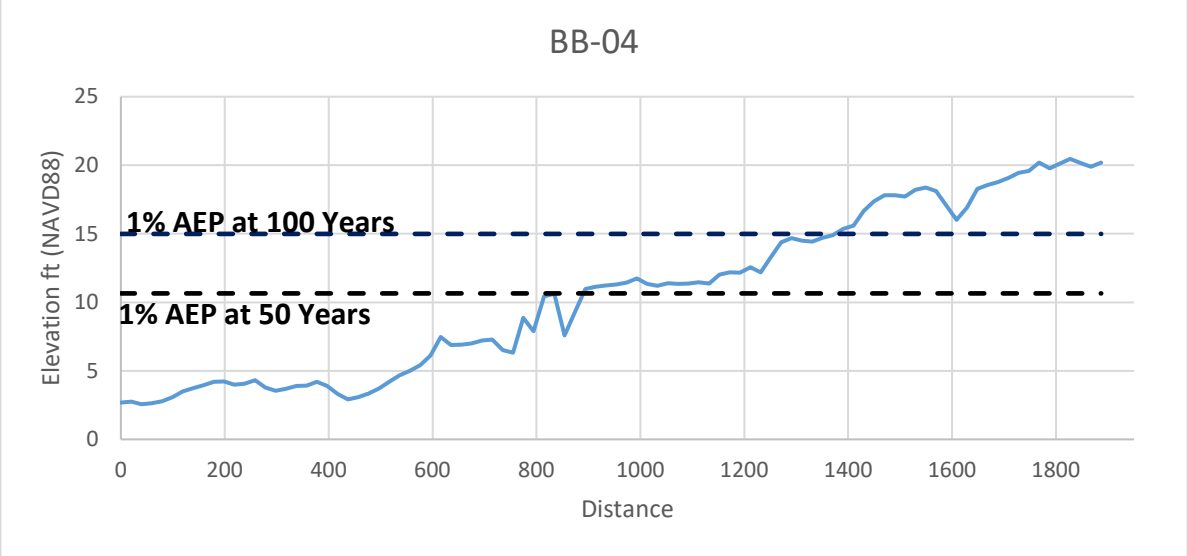


Figure 2-26. Niceville Representative Profile

2.2.1.2.8 Bluewater

Bluewater is characterized by a very high upland area in many places; however, there is inundation that can reach behind the high bulkheads in several locations. While the profile below shows a very high upland, this may not be consistently high over the whole coastline. Figure 2-27 and Figure 2-28 present the profile location and profile, respectively for Bluewater. Figure 2-29 shows the exposure through time for the existing condition.

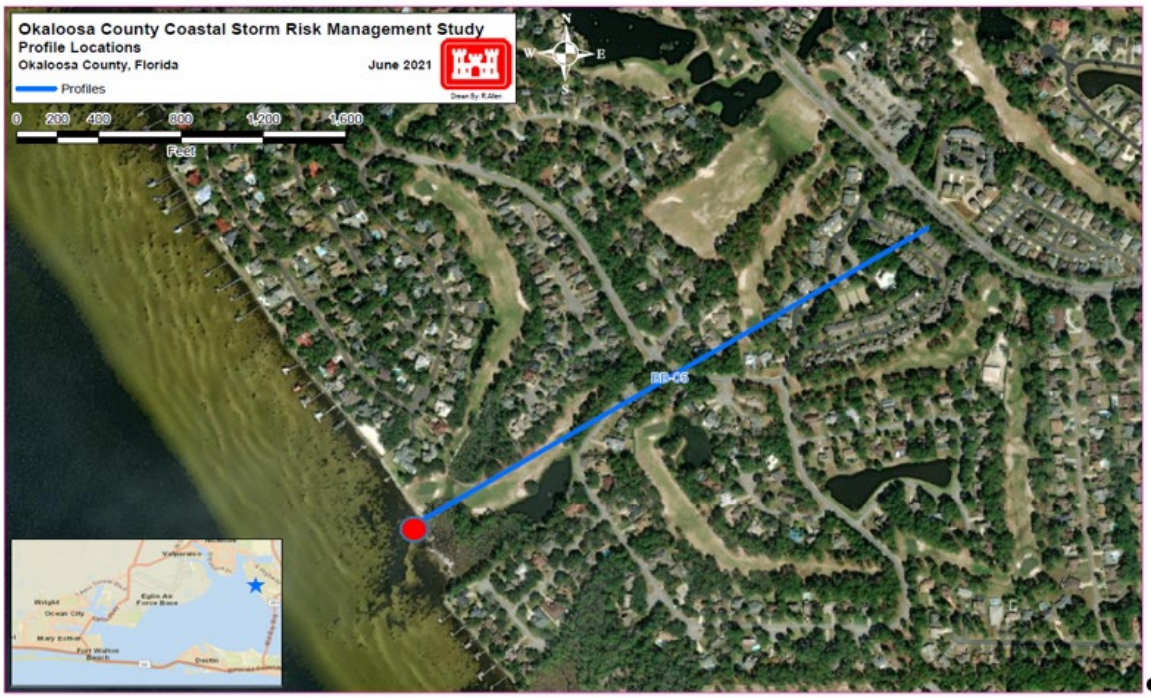


Figure 2-27. Bluewater Representative Profile Location

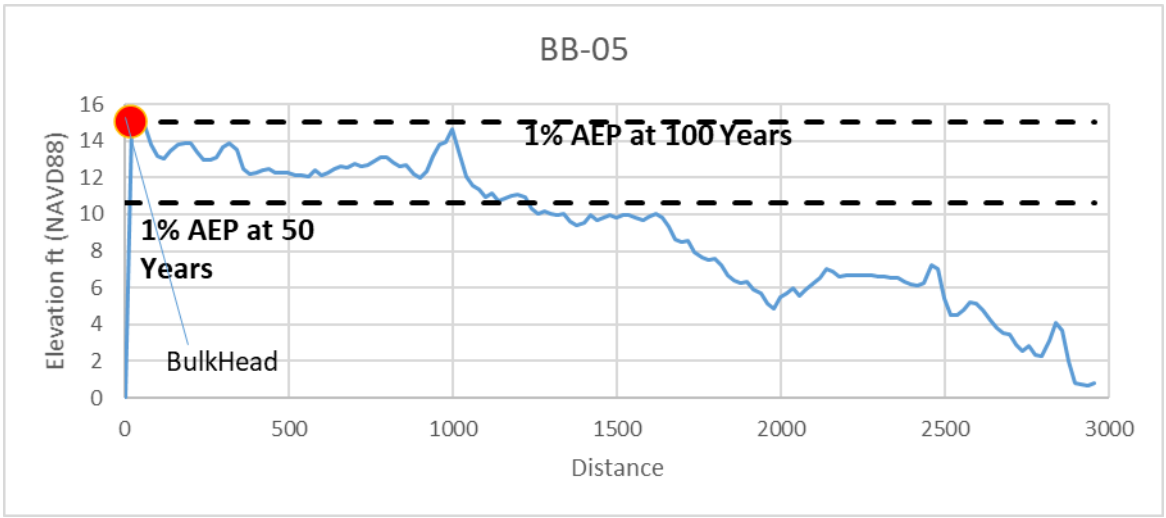


Figure 2-28. Bluewater Representative Profile

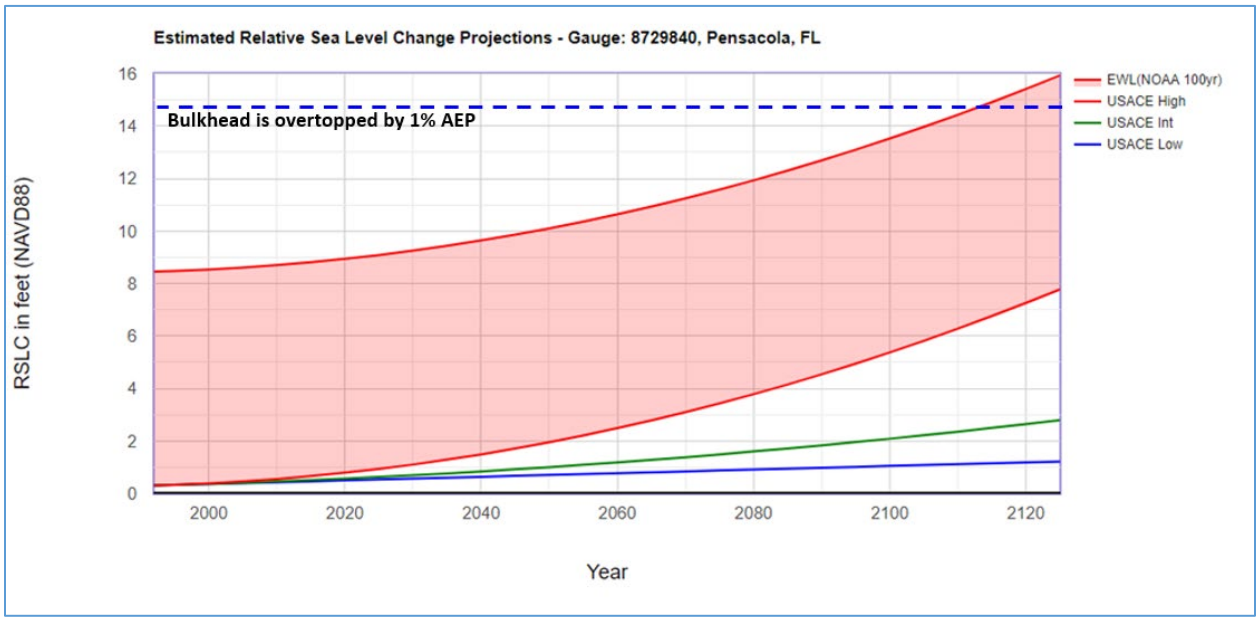


Figure 2-29. Exposure over time in the Bluewater Area

2.2.1.2.9 Back Bay Destin

The topography of back bay Destin is highly variable, with populated areas typically well protected by a high upland. Figure 2-30 and Figure 2-31 present the profile location and profile, respectively for back bay Destin. Figure 2-32 shows the exposure through time for the existing condition.

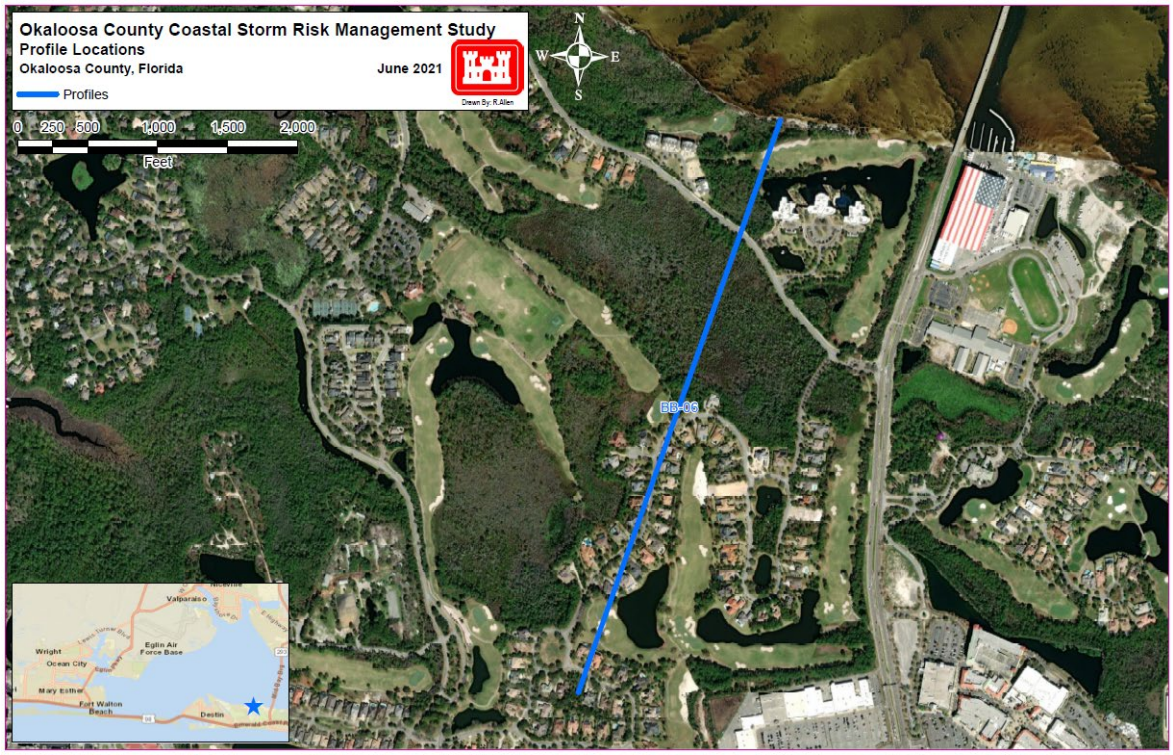


Figure 2-30. Back Bay Destin Representative Profile Location

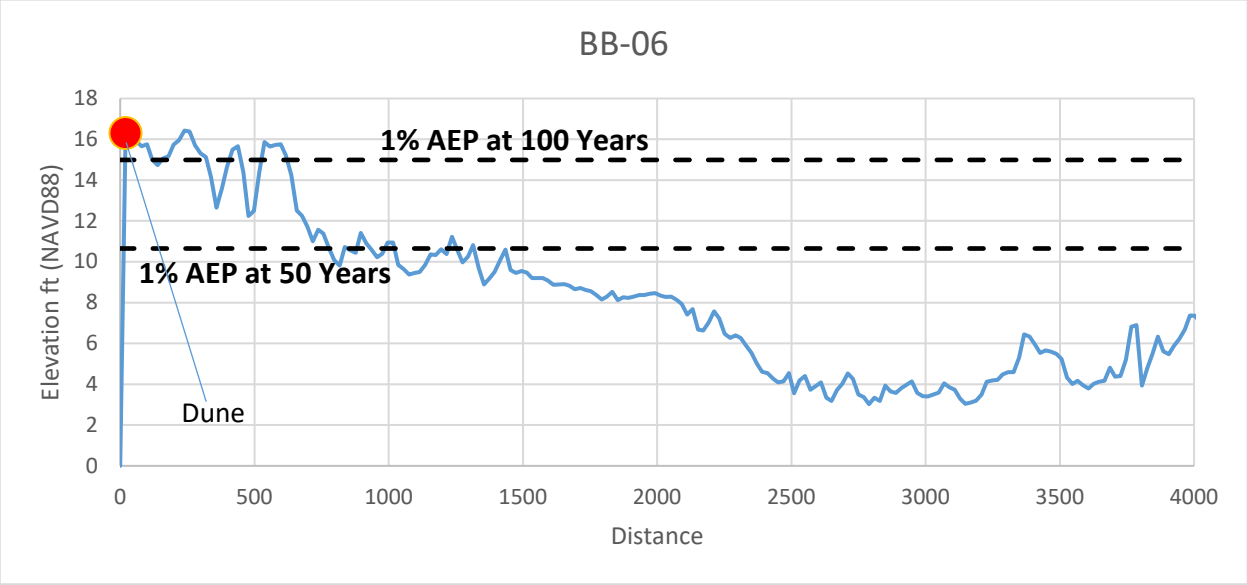


Figure 2-31. Back Bay Destin Representative Profile

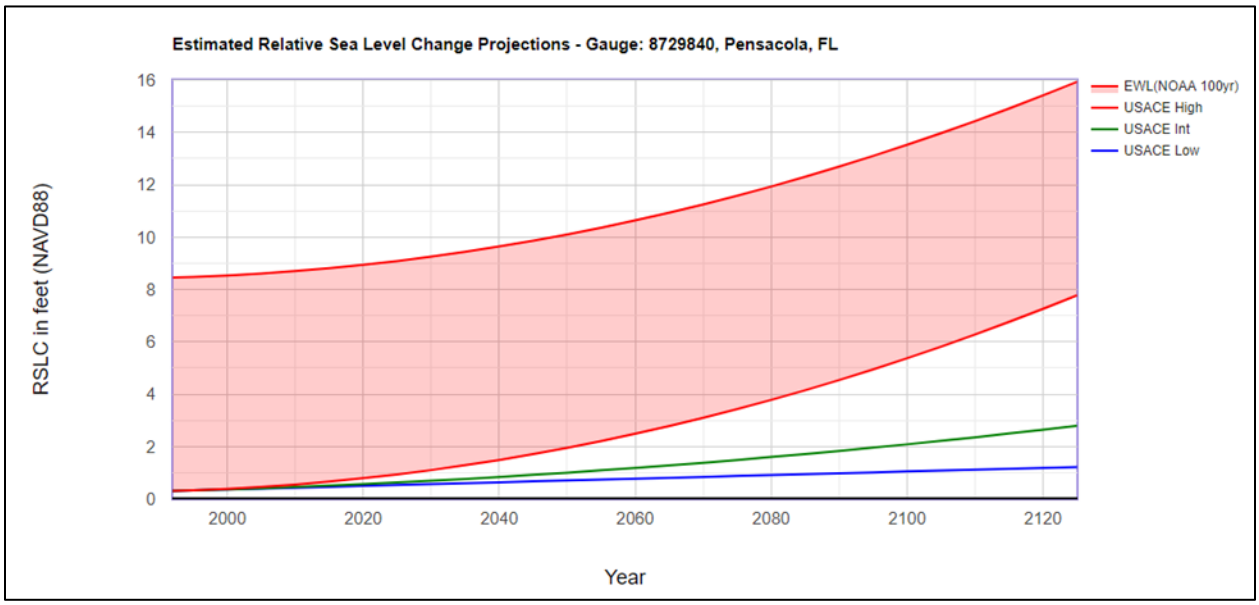


Figure 2-32. Exposure over time in the Back Bay Destin Area

2.3 Coastal Systems, Habitat and Processes: Gulf of Mexico Coastline*

The study area encompasses the entire Okaloosa County shoreline from the west to east county lines including the shoreline of Choctawhatchee Bay; see Figure 1-1 for the study limits. The coastline includes distinct land features typically associated with a shoreline environment.

2.3.1 Beach and Dune Areas*

A prominent feature characterizing portions of the Okaloosa County shoreline is the high dune elevations. This is partly attributed to the presence of Pleistocene bluffs formed as a result of an exposed submarine berm formed during inundation of the Florida Panhandle during that period; however, natural dunes occur in isolated pockets with some of the dunes occurring at beachfront development. In some developed areas, the dunes exhibit little relief and limited habitat value. In these areas, dune enhancements are common and typically contain planted vegetation such as sea oats (*Uniola paniculata*) to promote stabilization and growth. Some pioneer vegetation such as beach morning glory (*Ipomoea imperati*), railroad vine (*Ipomoea pes-caprae*), beach grass (*Ammophila breviligulata*) and sea rocket (*Cakile edentula*) have become established within the enhanced dune areas.

Eglin AFB controlled beachfront lands located on Okaloosa Island to the west of East Pass, and Henderson State Park, located a few miles east of East Pass, feature relatively unaltered beach and dune ecosystems. In some instances, the primary dune

crests reach over 30 feet in height. Vegetation consists of native pioneer species including sea oats, beach morning glory, railroad vine, sea rocket, beach elder (*Iva imbricata*), camphor weed (*Heterotheca subaxillaris*), and bitter panicum (*Panicum amarum*) which grow on the low primary dunes facing the ocean while Gulf bluestem (*Schizachyrium maritimum*), Cruise's golden aster (*Chrysopsis gossypina*), annual jointweed (*Polygonella articulata*), and the endangered Gulf coast lupine (*Lupinus westianus*) are found on the more stabilized dunes.

The existing dunes and associated vegetation provide optimal habitat for the Choctawhatchee beach mouse throughout the dune systems in the study area. This nocturnal species feeds primarily on the seeds and fruits of dune vegetation such as bitter panicum, sea oats, and evening primrose (*Oenothera humifusa*). The decline of the populations results from five key factors: habitat loss and fragmentation primarily due to beachfront development, disease, predation, competition from exotic species, and loss of genetic diversity (USFWS, 2019).

The beaches are typical of those found throughout the northern Gulf of Mexico. Beaches are a dynamic environment that change drastically as a function of weather and wave conditions. The direction of the net longshore transport along this region is from east to west. The constantly shifting sand does not allow vegetation to become established in the unconsolidated sandy substrate. The FDEP has designated critically eroded beach along Okaloosa County (R01 to R15) on Okaloosa Island, and along the Destin shoreline (R18 to R50) (FDEP 2020). This erosion affects beach front as well as dune habitats.

The wildlife inhabiting the beaches and dunes include sea turtles (for nesting), shorebirds (for foraging and resting), crustaceans such as ghost crabs (*Ocypode quadrata*), reptiles such as six-lined racerunners (*Cnemidophorus sexlineatus*), and various predators such as raccoons (*Procyon lotor*) and snakes. Beaches are important wintering areas for shorebirds such as sanderling (*Calidria alba*), dunlin (*Calidris alpine*), short and long-billed dowitchers (*Limnodromus griseus and Limnodromus scolopaceus)*), various plovers (*Charadrius spp*. and *Pluvialis spp*.), and willet (*Catoptrophorus semipalmatus*). Beaches and dunes are also important nesting sites for birds including plovers, terns (*Sterna spp.*), and black skimmer (*Rhynchops niger*).

2.3.2 Intertidal/Swash Zone*

The sandy substrate of the intertidal swash zone as defined by the Florida Natural Area Inventory (FNAI) (2010) defines the unconsolidated substrate community in this zone as expansive, relatively open areas of subtidal, intertidal, and supertidal zones which lack dense populations of sessile plant and animal species. Habitat within the intertidal swash zone is typically characterized by low benthic and infaunal species diversity. Saloman and Naughton (1978 and 1984) investigated benthic macroinvertebrate assemblages inhabiting the swash zone at Panama City Beach, Florida. Sampling data

showed four dominant species representing four families: *Donax texasianus*, a burrowing bivalve; *Scolelepis squamata*, a polychaete worm; *Haustorius sp*., an amphipod; and *Emerita talpoida*, an anomuran crab. The studies conducted by Saloman and Naughton (1984) concluded that benthic communities inhabiting the swash zone of Panama City Beach were typical of other sandy Gulf of Mexico beaches. Similar benthic communities in this zone should exist along the beaches of Okaloosa County. This portion of the beach also provides foraging and resting habitat for numerous seabirds and shorebirds such as terns, gulls (*Larus spp.*), sandpipers (*Tringa*, *Calidris*, and *Actitis spp*.), plovers, skimmers, and oystercatchers (*Haematopus spp.*). Fish and invertebrates within the intertidal zone are the staple diet for these avian species.

2.3.3 Nearshore*

As typical of the sandy panhandle coastline, the nearshore zone along Okaloosa County consists of two distinct longshore sandbars. For Florida Panhandle shorelines, the first and second sandbars are typically located approximately 50 to 80 feet and 425 to 460 feet offshore (Wolfe et al., 1988). These sandbars and associated troughs provide habitat for a diverse benthic community. Saloman (1976) investigated benthic faunal populations inhabiting the nearshore zone off Panama City Beach, Florida. A variety of crabs, marine worms, clams, crustaceans, and sand hoppers dominate the nearshore zone.

Donax texasianus, a burrowing bivalve, commonly occurred on both sandbars and in between troughs. Saloman and Naughton (1984) in a similar study found other dominant species found on the first offshore bar include *Haustorius sp*. (an amphipod), *Mancocuma sp*. (a hooded shrimp), and *Scolelepis squamata* (a polychaete worm). Additional dominant species found on the second sandbar and adjacent landward trough includes the haustoriid amphipods *Acanthohaustorius n*. *sp*., *Protohaustorius n. sp*., and *Pseudohaustorius n. sp*. Dial Cordy and Associates Inc. (2002) found that mollusks and annelids predominate the infaunal taxa up to 3.5 miles offshore of Pensacola Beach in the northern Gulf of Mexico. Overall, mollusca and annelida represented a majority of the taxa in this region. The assumption that similar benthic communities exist in the nearshore marine zone off Okaloosa County is reasonable.

A study conducted by Byrnes et al. (2004) evaluating the effects of borrow areas offshore of Alabama concluded that infaunal assemblages within the sand resource areas examined included common taxa expected for similar sedimentary environments and water depths in the northern Gulf of Mexico, which is also indicative of the selected Okaloosa County borrow areas.

Many commercially, recreationally, and ecologically important fish species are known to inhabit the nearshore and offshore areas of Florida's northern Gulf coast. Table 2-6

lists abundant fish species likely to occur in the nearshore marine waters of Okaloosa County.

Table 2-6. Common Nearshore Fish Species Found in Okaloosa County

Common and Scientific Name	Common and Scientific Name
Bull shark *Carcharhinus leucas*	Bonnethead *Sphyrna tiburo*
Bluntnose stingray *Dasyatis sayi*	Ladyfish *Elops saurus*
Speckled worm eel *Myrophis punctatus*	Scaled sardine *Harengula pensacolae*
Striped anchovy *Anchoa hepsetus*	Bay anchovy *Anchoa mitchilli*
Dusky anchovy *Anchoa lyolepis*	Silver anchovy *Engraulis eurystole*
Scaled sardine *Harengula jaguana*	Sea catfish *Arius felis*
Gulf toadfish *Opsanus beta*	Halfbeak *Hyporhamphus unifasciatus*
Atlantic needlefish *Strongylura marina*	Redfin needlefish *Strongylura notata*
Sheepshead minnow *Cyprinodon variegates*	Longnose killifish *Fundulus grandis*
Roush silverside *Membras martinica*	Tidewater silverside *Menidia beryllina*
Gulf pipefish *Syngnathus scovelli*	Bluefish *Pomatomus saltatrix*
Cobia *Rachycentron canadum*	Northern sennet *Sphyraena borealis*
Crevalle jack *Caranx hippos*	Yellow jack *Caranx bartholomaei*
Atlantic bumper *Chloroscombrus chrysurus*	Leatherjacket *Oligoplites saurus*
Florida pompano *Trachinotus carolinus*	Spotfin mojarra *Eucinostomus argenteus*
Silver jenny *Eucinostomus gula*	Pigfish *Orthopristis chrysoptera*
Sheepshead *Archosargus probatocephalus*	Pinfish *Lagodon rhomboides*
Silver perch *Bairdiella chrysura*	Spotted seatrout *Cynoscion nebulosus*
Sand seatrout *Cynoscion arenarius*	Silver seatrout *Cynoscion nothus*
Spot *Leiostomus xanthurus*	Atlantic croaker *Micropogon undulates*

Common and Scientific Name	Common and Scientific Name
Southern kingfish *Menticirrhus americanus*	Gulf kingfish *Menticirrhus littoralis*
Northern kingfish *Menticirrhus focaliger*	Black drum *Pogonius cromis*
Atlantic spadefish *Chaetodipterus faber*	Striped mullet *Mugil cephalus*
White mullet *Mugil curema*	Atlantic threadfin *Polydactylus octonemus*
Southern stargazer *Astroscopus y-graecum*	Leopard searobin *Prionotus scitulus*
Spotted whiff *Citharichthys macrops*	Gulf flounder *Paralichthys albigutta*
Planehead filefish *Monacanthus ciliatus*	Striped burrfish *Chilomycterus schoepfi*
Permit *Trachinotus falcatus*	Lizardfish *Synodus foetens*

2.3.4 Choctawhatchee Bay and Tributaries*

Choctawhatchee Bay encompasses 129 square miles in Okaloosa and Walton Counties, Florida. The main body of Choctawhatchee Bay is more than 27 miles long and follows an east-west orientation along the upper Gulf of Mexico coastline of Florida. The width of the bay varies from 1 to 6 miles, with depths ranging from 10 to 43 feet. Urban development along Choctawhatchee Bay ranges from medium to high density with several municipalities located on its shores. These cities include Fort Walton Beach, Mary Ester, Shalimar, Niceville, and Destin. Eglin AFB manages extensive shoreline in the northern portion of the bay. Small tributaries join the main body by finger bayous.

Okaloosa Island is a barrier island that fronts the Gulf of Mexico. Santa Rosa Sound is the water body that separates Okaloosa Island from the mainland. It also has sustained high urban dense development which is mostly located toward the southwest section of Okaloosa County. The eastern portion of the island is relatively undeveloped as it is under management by Eglin AFB. Beach and dune encompass the island at this location and provides water sport recreation along this corridor.

The GIWW is a maintained Federal authorized navigation channel that is routed through Choctawhatchee Bay and Santa Rosa Sound. East Pass is an inlet to the Bay that provides navigational access to the GIWW, bayous and tributaries. Other usage of water resources within the study area include fish production and management, shore and wading bird habitat for nesting and foraging, as well as general wildlife usage for foraging, nesting, and reproduction. The city of Destin is located on the east side of

East Pass. This highly developed urban area faces onto the Gulf of Mexico and extends to the eastern study limit at the Walton County line.

The western portion of Choctawhatchee Bay is within the OCCSRM study limits. The bay extends along the inner waterbody, bounded on the south by Okaloosa County Island, with egress provided by East Pass to the southeast and Santa Rosa Sound to the west. The eastern portion of the bay is outside of the OCCSRM study limits east of the Okaloosa County line; see Figure 1-1.

2.3.5 Air Quality*

The US Environmental Protection Agency (USEPA) sets National Ambient Air Quality Standards (NAAQS) in accordance with the Clean Air Act (CAA) "for pollutants considered harmful to public health and the environment." The Clean Air Act identifies two types of NAAQS: primary and secondary. Primary standards provide public health protection and secondary standards provide public welfare protection. The USEPA has set NAAQS for six principal pollutants, which are called criteria air pollutants: carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead, and particulate matter (PM10 and PM25).

The *General Conformity Rule* published by the USEPA on November 30, 1993 (rev. 2010) designates and implements Section 176(c) of the CAA for geographic areas in CAA non-attainment areas for criteria pollutants and in those attainment areas subject to maintenance plans required by CAA Section 175(a). The CAA General Conformity Rule applies to Federal actions. The study area is not located in any designated nonattainment areas for any criteria air pollutants.

2.3.6 Surface Water Resources*

The FDEP classifies the coastal water in the study area as Class II, defined as waters suitable for shellfish production, and Class III, waters suitable for recreation and propagation of fish and wildlife. The FDEP sets water quality standards and requires monitoring of water quality during sand excavation and beach placement operations. A water quality certification (WQC) must be obtained for the activities with the borrow area(s) and beach placement areas associated with this project.

Karenia brevis, commonly referred to as red tide, is a marine organism found in bays and estuaries. Large population of this organism creates a harmful algal bloom known as red tide. Typically, red tide occurs in late summer to early fall, but it can persist through winter to early spring. The organism releases a neurotoxin that can cause mortality to fish, shellfish, and infrequently, marine mammals such as West Indian manatee. Respiratory irritation has been reported in humans while engaged in recreation along the shoreline during red tide outbreaks (NOAA, 2019). The Florida Fish and Wildlife Conservation Commission (FWC) conducts routine monitoring

throughout the year, with permanent monitoring stations established in adjacent Walton County in Choctawhatchee Bay. The most recent outbreak of red tide in Okaloosa County was in October 2018 (FWC, 2020).

See Table 2-7 below for listed waterways not supporting designated uses within the study area obtained from the USEPA 2016 303(d) listed waters for classified waterbodies within the study area.

Table 2-7. USEPA 2016 303(d) Listed Waters

Planning Unit/OSG Case #	Water Segment name/Type	WTB Class	Priority/Parameter	Comment
Yellow River/17-0418	Shoal River/Estuary	3M	Med/Fecal & Escherichia Coliform	Verified impaired by threshold exceedances
Choctawhatchee – St Andrew/ 16-0494	Turkey Creek/Stream	3F	Med/Iron	Verified impaired by threshold exceedances for sample size
Choctawhatchee – St Andrew / 16-0499 & 16-5000	Boggy Bayou/Tributary to bay	3M	Med/Nutrients (Total Nitrogen)	Exceedance of criterion more than once in 3-year period
Choctawhatchee – St Andrew/ 16-0456	Lincoln Park	3M	Med/Bacteria (Beach Advisory)	> 21 days of beach advisories from 2002 – 2007, info: DOH
Choctawhatchee – St Andrew/ 10-0438 & 05-1132	Rocky Bayou / Rocky Bayou State Park	2/3M	Low-Med/Fecal Coliform/Bacteria (Beach Advisory)	Parameter exceeded threshold; State Park beach advisories .21 days 2002 - 2003
Choctawhatchee – St Andrew/ 10-0457	Poquito Park	3M	Bacteria (beach Advisory)	<21 days of advisories from 2002 – 2008, info: DOH
Choctawhatchee – St Andrew/ 05-1133	Choctawhatchee Bay Middle segment 1 Estuary	2	Med/Bacteria (Shellfish)	Coliform bacteria downgrade shellfish harvesting classification for some portion Class II waterbody.

Planning Unit/OSG Case #	Water Segment name/Type	WTB Class	Priority/Parameter	Comment
Choctawhatchee – St Andrew/ 16-0504, 16-0505	Choctawhatchee Bay Middle segment 1 Estuary	2	Med/Nutrients (Nitrogen/ Phosphorus)	Exceedance of criterion more than once in 3-year period
Choctawhatchee – St Andrew/ 10-0459	East Pass Beach	2	High/Bacteria (Beach Advisory)	<21 days of beach advisories 2004 and 2007, info: DOH
Choctawhatchee – St Andrew/ 05-1131	Gulf Island Nat Seashore Beach	3M	Med/Bacteria (Beach Advisory)	< 21 days of beach advisories 2003, info: DOH
Choctawhatchee – St Andrew/ 05-0506	Clement Taylor Park Beach	3M	High/Bacteria (Beach Advisory)	< 21 days of beach advisories 2012 - 2015, info: DOH
Choctawhatchee – St Andrew/ 13-1333	Choctawhatchee Bay Middle segment 1	2	Coliform Bacteria (Shellfish Harvest)	Verified impaired 2012; SEAS reassessed areas of WTB
Choctawhatchee – St Andrew/ 16-0504, 16-0505	Choctawhatchee Bay Lower segment	2	Med/Nutrients (Nitrogen/ Phosphorus)	Exceedance of criterion more than once in 3-year period
Choctawhatchee – St Andrew/ 16-0508, 16-0507	Choctawhatchee Bay Middle segment 1	2	Med/Nutrients (Nitrogen, Chlorophyll-a)	Exceedance of criterion more than once in 3-year period
Choctawhatchee – St Andrew/ 16-0509	Choctawhatchee Bay Middle segment 2 Estuary	2	Low/Fecal Coliform	Verified impaired by threshold exceedances for sample size
Choctawhatchee – St Andrew/ 16-0510	Choctawhatchee Bay Middle segment 1 Estuary	2	Med/Nutrients (Total Nitrogen)	Exceedance of criterion more than once in 3-year period
Choctawhatchee – St Andrew/ 16-0510	Camp Timpoochee Beach	2	Med/Bacteria (Beach Advisory)	> 21 days of beach advisories 2006, info: DOH
Pensacola Bay/ 17-0425	Emerald Promenade (Santa Rosa Is Beach)	3M	High Bacteria (Beach Advisories)	> 21 days of beach advisories 2012 - 2015, info: DOH

Planning Unit/OSG Case #	Water Segment name/Type	WTB Class	Priority/Parameter	Comment
Choctawhatchee – St Andrew/ 16-0519	Henderson St Park Beach	3M	High Bacteria (Beach Advisories)	> 21 days of beach advisories 2008 - 2015, info: DOH
Choctawhatchee – St Andrew/ 10-0462	James Lee Park Beach	3M	High Bacteria (Beach Advisories)	> 21 days of beach advisories 2002 - 2008, info: DOH
Choctawhatchee – St Andrew/ 10-0463	Wayside Park Beach	3M	High Bacteria (Beach Advisories)	> 21 days of beach advisories 2002 - 2008, info: DOH
Choctawhatchee – St Andrew/ 10-0463	Garnier Park Beach	3M	Med Bacteria (Beach Advisories)	> 21 days of beach advisories 2002 - 2003, info: DOH
Pensacola Bay 10-3079	Santa Rosa Sound Estuary	2	Low/Fecal Coliform Bacteria	Does not meet Class II water quality; median value exceeded
Pensacola Bay 06-0616	Liza Jackson Park	3M	Med Bacteria (Beach Advisories)	> 21 days of beach advisories 2003 - 2004, info: DOH
Pensacola Bay 06-0617	Marler Park	3M	Med Bacteria (Beach Advisories)	> 21 days of beach advisories 2003 - 2004, info: DOH
Choctawhatchee – St Andrew/ 10-0464	Destin Harbor Estuary	2	Low Fecal Coliform Bacteria	Parameter exceeds listing threshold

2.3.7 Fisheries Resources*

The western portion of Choctawhatchee Bay is within the OCCSRM study limits. The bay extends along the inner waterbody, bounded on the south by Okaloosa County Island, with egress provided by East Pass to the southeast and Santa Rosa Sound to the west. The eastern portion of the bay is outside of the OCCSRM study limits east of the Okaloosa County line. Table 2-6 in Section 2.3.3 provides a listing of fish species that occur within the study area.

2.3.8 Essential Fish Habitat*

Essential Fish Habitat (EFH) is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity and include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include aquatic areas historically used by fish where appropriate (NMFS 2019 website). The near and offshore areas of the Okaloosa County study area support a variety of fish species, primarily small species and juveniles of larger fish species. EFH for many of these species occurs within the study area and include such species managed under the purview of the National Marine Fisheries Service (NMFS)-Habitat Conservation Division (HCD) and identified in Table 2-8.

The Magnuson-Stevens Fishery Conservation and Management Act of 1973 (MSFCMA) require that Federal agencies assess potential impacts to EFH for the NMFS-HCD managed commercial fisheries. In accordance with the MSFCMA, any Federal action that has the potential to adversely affect EFH requires consultation with the NMFS-HCD. As defined by the MSFCMA, fish includes finfish, mollusks, crustaceans, and all other forms of marine animal and plant life. EFH communities range from naturally occurring hard-bottom areas and artificial reefs to floating mats of *Sargassum sp.* (brown algae). Fish habitat utilized by a species can change with life history stage, abundance of the species and competition from other species, and environmental variability in time and space. The type of habitat available, its attributes, and its functions are important to species productivity and societal benefits. Some potential threats to habitat include certain fishing practices, marina construction, navigation projects, dredging, alteration of freshwater input into estuaries, and stormwater runoff.

Table 2-8. Essential Fish Habitat for Managed Species within the Study Area

Species	Life Stage	Habitat
Brown Shrimp	Adult	Soft bottom; estuarine dependent
Cobia	Adult, juveniles/subadults, larvae, eggs	Pelagic; drifting or stationary floating objects
Dolphin (Mahi)	Adult, juveniles/subadults, larvae, eggs	Pelagic; floating objects
Greater Amberjack	Adult, juveniles/subadults, larvae, eggs	Pelagic and epibenthic; reefs and wrecks; to 400m
Gray Snapper	Adult	All bottom types; 0 to 130m
King Mackerel	Adult	Pelagic
Lesser Amberjack	Adult, juveniles/subadults, larvae, eggs	Pelagic
Lane Snapper	Adult, juveniles/subadults, larvae, eggs	Soft and hard bottom; 0 to 130m
Little Tunny	Adult, juveniles/subadults, larvae, eggs	Pelagic
Pink Shrimp	Adult	Soft, hard bottom; inshore to 65m
Brown Shrimp	Adults (year-round)	Year-round in water depth >14 m; soft bottom
Red Drum	Adult	Soft bottom, oyster reefs, estuarine to 40 m
Stone Crab	Adult	Soft, hard, or vegetated bottom
Spanish Mackerel	Adult, juveniles/subadults, larvae, eggs	Pelagic; inshore to 200 m
Tilefish	Adult	Soft bottom, steep slopes; 80 to 540m
White Shrimp	Adult juveniles/subadults, larvae, eggs	Soft bottom; inshore to 40m

NOAA NMFS EFH Website 2020

2.4 Endangered Species Act (ESA) Threatened and Endangered Species*

This section addresses listed species known to inhabit the project areas (USFWS IPAC, 2019). The presence of these species necessitates coordination with appropriate agencies as required by the ESA. Table 2-9 contains a more comprehensive list of Federal Protected Species in the Okaloosa County area.

Table 2-9. List of Protected Species in the Okaloosa County Area

Common Name	Scientific Name	Status
Fish/Chondrichthyes		
Gulf Sturgeon	*Acipenser oxyrinchus desotoi*	T
Okaloosa County Darter	*Etheostoma Okaloosa Countye*	E
Giant manta ray	*Manta birostris*	E
Reptiles		
Eastern indigo snake	*Drymarchon corais couperi*	T
Atlantic loggerhead turtle	*Caretta caretta*	T
Leatherback turtle	*Dermochelys coriacea*	E
Kemp's ridley	*Lepidochelys kempi*	E
Green sea turtle	*Chelonia mydas mydas*	E
Hawksbill turtle	*Eretmochelys imbricata imbricata*	E

Common Name	Scientific Name	Status
Birds		
Bald eagle	*Haliaeetus leucocephalus*	**
Least tern	*Sterna antillarum*	T
Southeastern American kestrel	*Falco sparverius paulus*	T
Piping plover	*Charadrius melodus*	T
Red knot	*Calidris canutus rufus*	T
Wood stork	*Mycteria americana*	E
Mammals		
West Indian manatee	*Trichechus manatus floridanus*	E
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	E
Santa Rosa beach mouse	*Peromyscus polionotus leucocephalus*	E
Bryde's whale (Gulf of Mexico subspecies)	*Balaenoptera edeni*	E
Plants		
Gulf coast lupine	*Lupinus westianus*	T

Common Name	Scientific Name	Status
Cruise's goldenaster	*Chrysopsis gossypina cruseana*	E
Lichen		
Perforate reindeer lichen	*Cladonia perforata*	E
Insect		
Gulf Coast Solitary Bee	*Hesperapsis oracria*	UR

E = Endangered. T = Threatened. T (s/a) = Threatened due to similarity in appearance. UR = Under review. n/a = information not available or no designation listed. USFWS PCFO website

2.4.1 Sea Turtles*

Florida's Panhandle beaches provide nesting grounds for Federally listed (threatened and endangered) sea turtles. Sea turtle nesting season in this area spans from May 1 through October 31. The threatened Atlantic loggerhead turtle (*Caretta caretta*) and the endangered green turtle (*Chelonia mydas mydas*) frequently nest on the beaches of Okaloosa County including Santa Rosa (Okaloosa) Island and Destin. The endangered leatherback (*Dermochelys coriacea*), Kemp's ridley (*Lepidochelys kempi*), and hawksbill (*Eretmochelys imbricata*) sea turtles may also occasionally nest on northwest Florida's beaches. Infrequent occurrences of Kemp's ridley and leatherback sea turtles have been reported on Okaloosa Island in the past decade (FWC website, 2020). Of these sea turtle species, only the loggerhead turtle has designated critical habitat, discussed in Section 2.5.1.

2.4.2 Gulf Sturgeon*

The swash and nearshore zone is host to the Federally endangered Gulf sturgeon (*Acipenser oxyrinchus*), a sub-species of the Atlantic sturgeon. During early spring (March to May), Gulf sturgeon move from the Gulf of Mexico into coastal rivers for spawning. After hatching, the juveniles generally disperse upstream or downstream of the spawning sites, and often move into associated estuarine feeding areas for the winter months. During certain times of the year, Choctawhatchee Bay estuarine provides wintering feeding ground for Gulf sturgeon adults and juveniles. Discussion of Gulf Sturgeon designated critical habitat is in Section 2.5.2.

2.4.3 Choctawhatchee Beach Mouse*

The Choctawhatchee beach mouse (*Peromyscus polionotus allophrys*), a Federally listed endangered species, inhabits the coastal dune communities along portions of the northern Gulf Coast, more specifically with proximity to Choctawhatchee Bay. This endemic subspecies once had a historic range from East Pass in Okaloosa County to Shell Island in Bay County. Today, only one population is found within Okaloosa County, at Henderson State Park, Unit CBM-1. The population at Henderson Beach State Park exists only as a result of a translocation program in cooperation with the FWC and the FDEP, that manages this area. Discussion of Choctawhatchee beach mouse designated critical habitat is in Section 2.5.3.

2.4.4 Protected Shorebirds*

Several state and Federal protected bird species use beach habitat for foraging, resting, or nesting. The black skimmer, least tern (*Sterna antillarum*), and southeastern snowy plover (*Charadrius alexandrinus tenuirostris*) have all used portions of the beach within Okaloosa County. In Florida, migratory bird nesting season spans from April 1 through August 31. The State of Florida designates the black skimmer as a species of special concern, and the southeastern snowy plover and least tern as threatened species.

Both Federal and State agencies (USFWS and FWC, respectively) consider the piping plover (*Charadrius melodus*) a threatened species. Piping plover nests well to the north, but winters in different areas of Florida including the Gulf coast. Although piping plover has been sighted on Okaloosa Island, no USFWS designated critical habitat exists along the shoreline in the County.

2.4.5 Gulf Coast Lupine and Cruise's Golden-Aster *

The Gulf coast lupine *(Lupinus westianus)* is Federally listed as a Species of Special Concern (SSC) but state listed as threatened. Cruise's golden-aster (*Chrysopsis gossypina cruiseana)* is Federally listed as a SSC but state listed as endangered. Both plants are specific to eastern and northern Gulf of Mexico and inhabit the coastal strands and dunes of Okaloosa County (ISB, 2020). Coastal development and storm-induced dune erosion have a direct impact towards sustaining suitable habitat for these species.

2.4.6 Florida Perfoliate Reindeer Lichen*

The Federally endangered Florida perforate reindeer lichen (*Cladonia perforata*) is known to occur on about 27 sites throughout Florida but is only known to occur on one site in northern Florida, the Okaloosa County shoreline. Significant loss of xeric, white-sand scrub habitat is the leading cause of the species' imperilment. The species

presence has been vouchered in dune habitat of Okaloosa County Island within Eglin AFB reservation.

2.4.7 Gulf Coast Solitary Bee*

In the past decade, an increasingly rare native Gulf Coast solitary bee has been documented at only six locations along the coastal dunes and barrier islands of Florida's northern Gulf Coast. This fuzzy, yellow-and-black-striped bee is a member of the oldest family of bees on Earth and the only known species of its subfamily in the eastern United States (USFWS, 2020). It has been pushed towards extinction by loss of habitat from urbanization, pesticides and climate change-induced sea-level rise and storm. The species relies on pollinating one host plant, the coastal plain honeycombhead (*Balduina angustifolia)* commonly found on secondary dunes within about 1,500 feet of the shore (USFWS, 2020). This scenario makes its habitat extremely vulnerable to rising sea levels and increased frequency of storm surges. The occurrence of the Gulf coast solitary bee within the study area is not vouchered at this time; however, suitable habitat along Okaloosa Island is present that could support its existence.

2.4.8 Okaloosa Darter*

The Federally endangered Okaloosa darter (*Etheostoma okaloosae)* occurs in only six streams located in Okaloosa and Walton counties in northern Florida. This small fish was listed in 1973 due to its restricted range and sensitive habitat requirements (USFWS, 1981). Habitat modification and subsequent population increase of the brown darter has further restricted this species range. Habitat requirements for the Okaloosa darter include small streams where they inhabit the margins of clean sandy substrate streams that are protected by overhanging vegetation and woody debris. Root mats provide spawning substrate. The darter tends to avoid midstream channel and open stretches. The species is in competition with the commonly found brown darter for similar habitat requirements. The most significant threat to the Okaloosa darter is habitat quality degradation from storm damage to streamside vegetation, and water quality disturbance from erosion and siltation. Discussion of Okaloosa darter designated critical habitat is in Section 2.5.4.

2.4.9 Giant Manta Ray*

The NMFS-Protected Resource Division (PRD) listed the giant manta ray (*Manta birostris*) as threatened under the ESA (83 FR 2916, Publication Date January 22, 2018). The species is found in all ocean basins including nearshore waters of the northern Gulf of Mexico; around 95 unique individuals have been recorded between 1982 and 2017. The giant manta ray faces threats of fisheries interactions, environmental contaminants (microplastics, marine debris, petroleum products, etc.), vessel strikes, entanglement, and global climate change. Overall, the predictable nature of their appearances, combined with slow swimming speed, large size, and lack

of fear towards humans, may increase their vulnerability to threats. Although the giant manta ray tends to be solitary, they aggregate to feed on planktonic organisms or to mate, and commonly frequent shallow reefs inshore and offshore. Giant manta rays may occur in deeper waters within their habitat along with sandy bottom areas and seagrass beds in estuarine waters near oceanic inlets, using these waters as potential nursery grounds. Incidental capture of giant manta rarely occurs in the Gulf of Mexico; with the majority released alive.

2.5 Critical Habitat Resources*

Critical habitat designation under the ESA is administered by the USFWS and the NOAA NMFS. Within the study area, critical habitat for several designated species includes the frontage shoreline along the Gulf of Mexico as well as Choctawhatchee Bay and some contributing tributaries.

2.5.1 Loggerhead Sea Turtle Critical Habitat*

The USFWS and the NMFS designated loggerhead turtle critical habitat in 2015 that encompasses some 1531 miles of coastline and over 88 nesting beaches in coastal counties from North Carolina to Mississippi. According to the Northwest Florida USFWS Field Office website, no loggerhead turtle critical habitat has been designated in the study area that covers the entire Okaloosa County coastline.

2.5.2 Gulf Sturgeon Critical Habitat*

Gulf sturgeon are managed under the ESA by NFMS and the USFWS, who have designated critical habitat for this species. The critical habitat range extends along the nearshore of the northern Gulf of Mexico and extends inland up several major rivers, tributaries and bays including the entire Choctawhatchee Bay, including the western section within the study area. Additionally, the beach front of the study area from the MHW line of the Okaloosa Island and mainland shoreline extending seaward one nautical mile, and half of borrow area OK-A are designated as within the Gulf sturgeon critical habitat.

2.5.3 Choctawhatchee Beach Mouse Critical Habitat*

The USFWS designated 1.25 mile of beach front and dune areas as critical habitat for the Choctawhatchee beach mouse. The critical habitat occurs in the Henderson Beach State Park coastal dunes on the ocean frontage, a protected and managed habitat to support this species. Consultation with the USFWS regarding the effects of the selected plan on Choctawhatchee beach mouse critical habitat has been completed and covered under the Statewide Programmatic Biological Opinion *(*SPBO) (USFWS, 2015) for Shoreline Protection Measures along the State of Florida.

2.5.4 Okaloosa Darter Critical Habitat*

More than 98.7% of this species habitat falls within tributary streams on the Eglin AFB reservation (USFWS, website). The population of darters on Eglin AFB is increasing in accordance with the USFWS Recovery Plan for this species. As a result, the species was downlisted to threatened in 2010, although recovery actions are still ongoing. The critical habitat designated boundary ends at the confluence of several tributaries and bayous in Choctawhatchee Bay just within the study limits.

2.6 Raptors and Migratory Birds*

2.6.1 Bald Eagle*

According to the Bald Eagle Management Plan for nesting season during 2016, bald eagles primarily nest near aquatic habitat in mature or dead trees. Man-made structures such as power-poles and communication towers also serve as nesting sites for some bald eagles. Nests are typically large at up to six feet in diameter and three feet deep weighing more than 1,000 pounds. The FWC Geographic Data Portal for the FWC inventories and maintains a database of known eagle nests throughout the Florida on an annual basis. According to the FWC database, four active nests are known to occur throughout the study area, all of which are located near the back bay.

2.7 Migratory Birds*

Okaloosa County, located in the panhandle of northern Florida, is within the Atlantic Flyway Zone. Along the panhandle protected coastline, multiple shorebird species utilize these resources; however migratory birds, such as the snowy plover (*Charadrius nivosus*) take advantage of small dunes and flattened vegetated beach berm which give nesting birds a clearer view to scan for predators like raptors, snakes, raccoons, and coyotes (Audubon website, 2019). American oystercatcher (*Haematopus palliates*), least tern (*Sternula antillarum*), mottled duck (*Anas fulvigula*), swallow-tailed kite (*Elanoides forficatus*), and the American avocet (*Recurvirostra americana*) occasionally utilize the study area as a stop-over resource during migratory periods.

2.8 Seagrass Resources*

Seagrass data collected from Choctawhatchee Bay between 1992 and 2003 indicated a 38% loss of this resource (FWC, 2018), with most of the viable colonies located in the western portion of the bay within the study area of Okaloosa County. Of the seagrass mapped in Choctawhatchee Bay, 83% were found in the western portion in Okaloosa County, see Figure 2-32. Loss within the eastern portion is due to water quality degradation whereas in the western portion of the bay, loss is attributed to hurricane and storm overwash as well as high wave energy (SIMM Report No. 1, 2011). Seagrass is an important component to habitat for species such as sea urchins, fish,

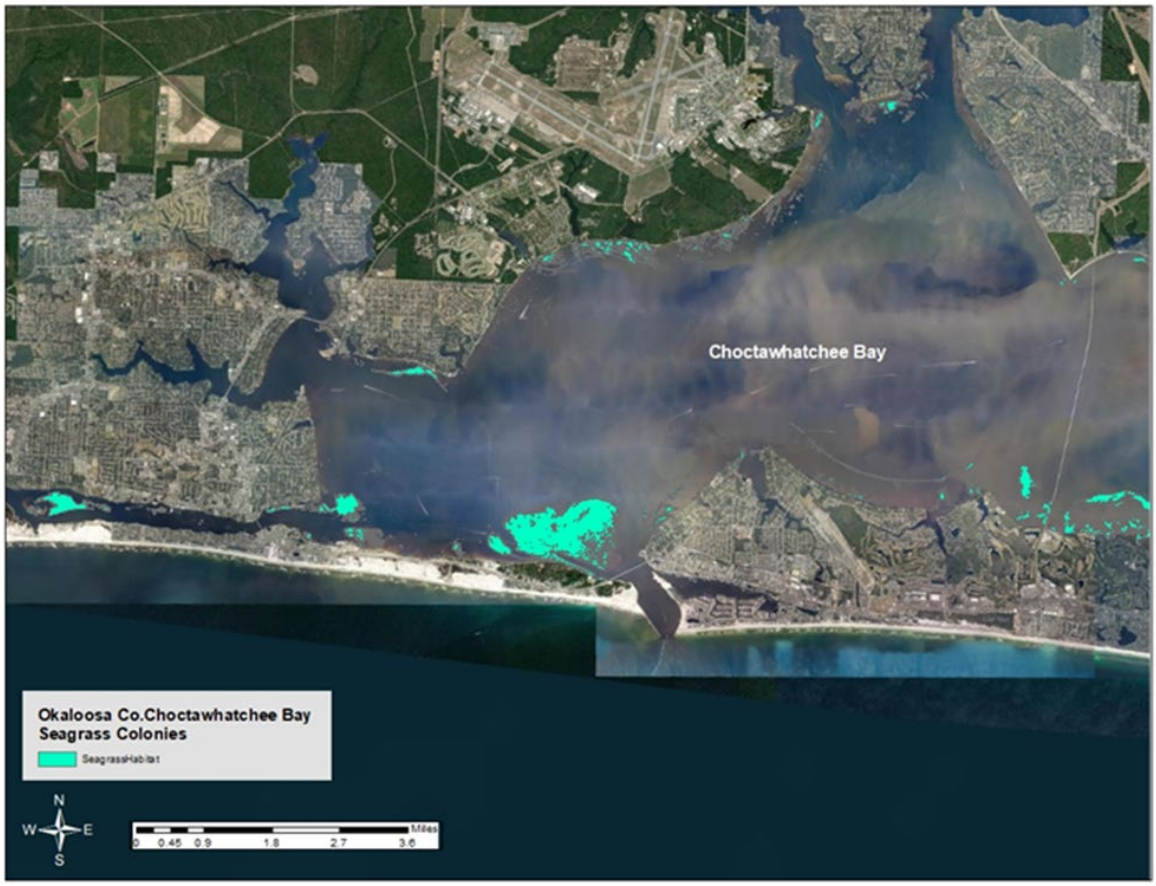


Figure 2-33. Sea grass beds in Choctawhatchee Bay in Study Area

waterfowl, and protected species West Indian Manatee and green sea turtle (Hemminga and Duarte, 2008). It is considered an integral component to EFH (NMFS website 2019).

2.9 Demographics, Socioeconomics, and Human Resources*

2.9.1 Demographics*

Okaloosa County incorporates 1,058 square miles and includes the municipalities of Fort Walton Beach, Mary Esther, Cinco Bayou, Shalimar, Valparaiso, Niceville, and Destin. The 2019 estimated census population of Okaloosa County is 214,439 inhabitants, compared to 180,824 in 2010, an increase of 18.7%. Okaloosa County ranked 16th in annual average population growth of all counties in Florida from 2010 through 2019. These communities help support adjacent Eglin AFB by providing civilian labor force, government contractors and associated amenities.

In 2019 the per capita income in Okaloosa County was $31,901, compared to $30,197 (in 2018 dollars) for the state. In 2019, the median household income in Okaloosa

County was $62,048, compared to $53,267 for the rest of Florida. About 11.5% of Okaloosa County's population was living below the poverty level.

The rate of home ownership is 63.3%. The number of housing units in Okaloosa County increased from 92,407 units in 2010 to 98,619 in 2019, an increase of 6.7%. The median value of homes in Okaloosa County increased from $181,800 in 2010 to $207,600 in 2019, an increase of 14.2%. The median value of owner-occupied housing was $198,700. The makeup of the county in 2019 was estimated at 74.5% white, 9.5% African American and 8.66% of Hispanic or Latino origin. Other minorities residing in Okaloosa County of two or more races make up 3.4%, and 2.84% Asian residents; collectively, about 0.1% of the population are comprised of American Indian/Alaska Native, and Native Hawaiian (Okaloosa County, 2019).

2.9.2 Environmental Justice*

Because the USACE is a part of the Federal government, it must comply with Title VI of the Civil Rights Act, 42 U.S.C., Sec. 2000 et seq. This law states that "No person in the United States shall, on the ground of race, color or national origin be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance." EO 12898 requires that "…each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations…."[Subsection 1-101].

One potential residential/commercial site meeting the Environmental Justice criteria was evaluated in the study area. The site is located in an urbanized, low income and high density residential/commercial area in Fort Walton Beach along a tributary to Santa Rosa Sound. The tributary, which is a FEMA-designated floodplain (AE 8-ft flood base elevation, FIRM 12091C0461H, 2002), starts upstream of a US Housing and Urban Development (HUD) funded housing development managed by the Fort Walton Beach Housing Authority. The facility consists of multiple family structures built in the mid 1970's on a filled wetland. The stream is diverted underground beneath the housing authority development and re-surfaces to become an exposed, poor water quality channel with high turbidity, trash, and obstructed outfall into Santa Rosa Sound.

Further investigation of land use discovered that a City of Fort Walton Beach designated brownfield site is immediately adjacent to the Fort Walton Beach Housing Authority (City of Fort Walton Beach, 21 December 2010, Appendix C, Environmental). A portion of the drainage channel and riparian area are within the designated boundary from Bass Avenue to the St. Mary's School. A project for ecological restoration at this site would be outside the scope of the study authorization for the OCCSRM study. The USACE evaluated census tract data to confirm that no isolated Environmental Justice

communities exist within the study area. Data related to the analysis of this site is contained in Appendix C, Environmental.

2.10 Archeological and Cultural Resources*

Archaeological and cultural resources are broad terms generally used to discuss the tangible, and often intangible, aspects of the past including Native American and post-European contact histories. The present discussion, however, is focused specifically upon historic properties. While all historic properties can be categorized as archaeological or cultural resources, historic properties represent a specific class of resource deemed to be particularly significant and have been listed or are eligible for listing on the National Register of Historic Places (NHRP). To be determined eligible, a historic property must meet at least one of 4 criteria for significance and at least 1 of 7 aspects of integrity established by the National Park Service (NPS).

The National Historic Preservation Act (NHPA) has defined historic properties as pre-Contact and historic archaeological sites, structures, buildings, districts, objects or any other physical evidence of human activity considered important to a culture, a subculture, or a community for scientific, traditional, religious, or any other reason. Several Federal laws and regulations protect these resources including the NHPA of 1966, the Archaeological and Historic Preservation Act of 1974, the American Indian Religious Freedom Act of 1978, the Archaeological Resources Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990.

Section 106 of the NHPA and its implementing regulations, 36 CFR Part 800, require an assessment of the potential impacts of an undertaking on historic properties that are within the proposed project's Area of Potential Effect (APE), which is defined as the geographic area(s) "within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." The APE for the current study is discontinuous and includes two areas where shoreline protection measures would occur. These include the shorelines of Choctawhatchee Bay and the Gulf of Mexico in Okaloosa County and two offshore borrow sites where dredging activities would occur.

The documentation of historic properties is important for this project because Choctawhatchee Bay and the Gulf of Mexico coastline along the Florida Panhandle contains a rich and varied array of archaeological sites. The historical sequence of the region, like the rest of the North and South American continents, is generally divided into two major periods, the pre-European Contact and post-Contact, or historic periods. The first begins with the Paleoindian Period, during which initial human settlement occurs some time before 10,000 years ago and ends with the arrival early European explorers. In the Gulf of Mexico, the post-Contact begins with the arrival of the Spanish in the sixteenth century. Much of the pre-Contact period is defined by materials recovered from archaeological sites. Through analyses of these materials a sequence

of numerous sub-periods has been proposed based upon changes in the archaeological record through time. These changes have been attributed to technological innovations, changes in resource exploitation strategies, shifts in settlement patterns, and ideological developments that occurred through time as past Native American populations adjusted to changing climatic conditions and as populations increased. The post-Contact period is also divided into different sub-periods also based on shifts in technologies, resources exploitation, and settlement. Common sub-periods used to describe the history of the region are often based on historic events such as Spanish exploration, colonization, the Revolutionary War, Industrialization, the Antebellum Period and Civil War, World War I and World War II, and the Cold War Period.

Background research conducted on the study area indicated that 295 known terrestrial and submerged archaeological sites and 254 historic structures have been previously recorded in the proposed project area. The current NRHP eligibility status of the resources is summarized in Table 2-10. Of the 295 archaeological sites, 32 have been determined eligible and 9 have been determined potentially eligible for NRHP listing by the State Historic Preservation Officer (SHPO) and 134 have not been formally evaluated by the SHPO. A total of 18 historic structures within the study area have been determined eligible by the SHPO, 95 have been determined eligible, and 140 structure have not yet been formally evaluated.

Table 2-10. Status of NRHP Eligibility

Florida SHPO Determination (Sites)	#	Survey Determination (Sites)	#	Florida SHPO Determination (Structures)	#	Survey Determination (Structures)	#
Eligible	32			Eligible	18		
Potentially eligible	9			Potentially eligible			
Ineligible	110			Ineligible	95	Ineligible/ Insufficient Information	132
Insufficient information	10	Insufficient information	1	Insufficient information	1		
Not evaluated	134	Ineligible or no further work recommend-ed	17	Not evaluated	140		
Total sites	295					Total structures	254

Known pre-Contact sites types within the study area include small to large surface scatters of artifacts, deep subsurface cultural deposits, mounds, and ancient submerged landforms that were well suited for human occupation during lower sea levels of the mid-Holocene before 4,000 years ago. European exploration and settlement, and subsequent colonial and American period activities have resulted in a rich and varied historic archaeological record spanning more than 500 years. Historic sites types found in the region include surface scatters of historic refuse and a multitude of features and structures. The particularly rich marine resources of the region have always been a focal point of human occupation along the gulf coast. This is evident from the study of dry-land archaeological sites as well as numerous submerged archaeological sites and shipwreck within Choctawhatchee Bay and the Gulf of Mexico. Some of the more widely known NRHP listed sites in the area include the Fort Walton Mound (8OK6), a large Mississippian platform mound in Fort Walton Beach and the Camp Pinchot and Eglin Field historic districts within Eglin AFB. These two districts comprise numerous buildings related this base's important effort's during World War II**.**

2.11 Aesthetics (Visual Resources)*

The signature white sandy beaches and the relatively low wave energy of the Gulf of Mexico provide a visually pleasing environment along the beaches of Okaloosa County. Choctawhatchee Bay is a large open body of water that has mostly developed shoreline with bay-facing structures, landscaped lawns, gardens and public parks that provide extensive view of the coastal features. Some undeveloped lands associated with Eglin AFB, shoreline along Santa Rosa Sound, and other publicly accessible lands provide uninhibited, aesthetic views of this region.

2.12 Recreation Resources*

The Okaloosa County beaches draw tourists from far and wide, in part because of its sugar white crystalline sands. Fishing and boating enthusiasts can choose either fresh water rivers, the saltwater Gulf of Mexico or the brackish Santa Rosa Sound and Choctawhatchee Bay and have quick access to them by the free boat ramps scattered throughout the County. Birdwatchers thrill to the variety of shore and inland species that call the County home or that pass through along the Great Florida Birding Trail, a network of premier wildlife viewing sites across the state.

The County Parks Department seeks to improve park services that provide a better quality of life for the residents of and visitors to Okaloosa County. The Parks Department maintains a variety of park facilities including small neighborhood parks, playground facilities, beach accessways, boat ramps and multipurpose sports fields. Two state parks in the study area, Fred Gannon Rocky Bayou State Park and Henderson Beach State Park, are managed by the FDEP. The GINS, managed by the

NPS, stretches from the Mississippi coastline and encompasses Okaloosa Island and nearshore waters within the study area.

Four museums are located in Fort Walton Beach and Destin. These museums are tourist destinations and key historical repositories for the immediate area. The exhibits present the history of the Okaloosa County that tell the journey from a small fishing village to a major tourist attraction, covering prehistoric conditions to modern weaponry technology.

2.13 Oil, Gas, and Mineral Resources*

No oil, natural gas, or other mineral resources are within the OCCSRM study area, or immediately adjacent to the study area limits.

2.14 Hazardous, Toxic, and Radioactive Waste*

The project area lies primarily in residential and recreational areas. USACE, Mobile District knows of no recently reported incidents of hazardous, toxic and radioactive waste (HTRW) in the study area. However, on April 20, 2010, the floating semi-submersible mobile offshore drilling unit Deepwater Horizon experienced an explosion and fire. The spill site is over 150 miles offshore from the Okaloosa County coastline and is not anticipated to have adversely affected the shoreline within the study limits.

2.15 Noise*

Noise is sound that interferes with normal activities or that otherwise diminishes the quality of the environment. It may be intermittent or continuous, steady or impulsive, stationary or transient. Stationary sources are normally related to specific land uses (for example, a factory). Transient noise sources move through the environment, either along relatively established paths such as highways and railroads, or randomly. There is wide diversity in responses to noise that not only vary according to the type of noise and the characteristics of the sound source, but also according to the sensitivity of the receptor (a person or animal), the time of day, and the distance between the noise source and the receptor.

Ambient noise levels in the study area are low to moderate and are typical for this type of land use. As a result of the urbanization near the beaches and the popularity of the beach environment, elevated noise levels, primarily from vehicles, may occur during weekends and summer months. The major noise producing source of the area year-round is breaking surf adjacent to residential and resort areas.

SECTION 3.0 PROBLEMS, OPPORTUNITIES, OBJECTIVES, CONSTRAINTS, PUBLIC CONCERN

3.1 Formulation Process.

This section discusses the first steps in the Plan Formulation process. Plan formulation supports the USACE water resources development mission. A systematic and repeatable planning approach, once the problems have been identified, is used to ensure that sound decisions are made. The Principles and Guidelines describe the process for Federal water resource studies. It requires formulating alternative plans that contribute to Federal objectives. The Plan Formulation process consists of six steps to result in a plan for recommendation and implementation. These steps consist of (1) Specify Problems and Opportunities, (2) Inventory and Forecast Conditions, (3) Formulate Alternative Plans, (4) Evaluate Effects of Alternative Plans, (5) Compare Alternative Plans, and, (6) Select a Recommended Plan. The information presented in this and subsequent sections is to inform the reader of the planning process as it had been conducted. After the release of the Draft Report, the team refined the design of the Tentatively Selected Plan (TSP) with additional engineering and environmental investigations. Based on feasibility level of design and comments received following publication of the Draft Report, portions of the TSP were modified.

3.2 Study Problems

The condition of a shoreline (stable, erosional, or accretional) depends on various complex interrelated processes. The primary problem in the study area is the loss of beach and vulnerability of oceanfront development to damage during storm events. Storm events, including Hurricanes Erin and Opal (1995), Danny (1997), Earl and Georges (1998), Isidore (2002), Ivan (2004), Katrina and Dennis (2005), Ike and Gustav (2008), Irma (2017), Michael (2018), and Sally (2020) have contributed to beach and dune erosion in most Okaloosa County, Florida coastal areas.

Although the hurricane eyes did not come ashore on the Okaloosa County, Florida shoreline, the lack of adequate beach width and dune height resulted in hurricane damage to beachfront condominiums, hotel, and restaurant properties through the developed Gulf-front areas. The combined effect of wind, waves, and tides amplified during storm conditions resulted in erosion and lowering of the beach profiles of Okaloosa County, Florida as well as recession of the shoreline and dunes. These problems can be summarized by the following statements which will be used by the PDT in developing the planning objectives:

- Erosion, wave and flood damages from coastal storms to critical infrastructure, residential and commercial properties, along the shoreline of Okaloosa County, Florida
- Reduced public use due to decreased beach/dune footprint

3.3 Study Opportunities

Because of the damaging effects of coastal storms to properties, infrastructure, and human life along the coast, there is an opportunity for a CSRM project for Okaloosa County, Florida. Such a project can reduce damage caused by wind- and tide-generated waves and currents by stabilizing or restoring the eroded shoreline. Restoring a beach-dune system allows greater stability and sustainability of the coastal environment once it has become re-established. The beach and dune system and back bay area provide habitats for a variety of associated flora and fauna including several threatened or endangered species. Restoration opportunities include increasing both the beach berm and dune widths to stabilize and/or restore the shoreline to provide coastal storm damage reduction to properties, infrastructure, and human life, enhance sea turtle nesting habitat and the habitat for a variety of shorebirds, beach mice, and natural vegetation as well as other inhabitants of the coastal environment.

These opportunities can be summarized by the following statements which, in addition to the problem statements, were used by the PDT to develop the planning objectives:

- Increase coastal resilience
- Reduce the threat of storm related damages to properties
- Reduce the threat to life safety
- Enhance regional sediment management practices
- Enhance existing coastal environment habitat
- Consider usage of Natural and Nature Based Features (NNBF) along with other CSRM measures

3.4 Planning Objectives

The primary goal of this study is to investigate, analyze and recommend solutions to reduce coastal storm risk to residents, coastal shoreline, infrastructure, development, and native flora and fauna. Identifying and considering the problems, needs and opportunities of the study area in the context of Federal objectives resulted in the development of the following study specific objectives:

1. Reduce the potential for damages caused by coastal storm waves, flooding and erosion to residential and commercial development and critical infrastructure (i.e. roads, emergency facilities, etc.) along the shoreline and back bay areas of Okaloosa County, Florida for the 50-year POA
2. Reduce life safety risk from coastal storms along the shoreline and back bay areas of Okaloosa County, Florida for the 50-year POA
3. Promote adaptive capacity of shoreline and back bay areas of Okaloosa County, Florida for the 50-year POA
4. Maintain recreational opportunities along the shoreline and back bay areas of Okaloosa County, Florida for the 50-year POA

3.5 Planning Constraints

A constraint is a restriction that limits the extent of the planning process. Constraints are designed to avoid undesirable changes between without- and with-plan conditions. These can be divided into universal constraints and study-specific constraints. Universal constraints, such as those related to legal and policy, are to be included in every study. Study-specific planning constraints are statements of actions unique to a specific study that alternative plans should avoid. The study-specific constraints for this study overlaps those of the universal constraints and include:

- Avoid Coastal Barrier Resources Act zones
- Avoid adverse impacts to Federally Threatened and Endangered Species such as the piping plover, red knot, Choctawhatchee beach mouse or their critical habitat, and sea turtle nesting grounds along the beach
- Avoid impacts to Federal projects (GIWW/East Pass/Air Force Lands)
- Avoid impacts to sediment input into the littoral drift
- Avoid hydrologic connectivity impacts to back bay and sound areas
- Avoid adverse impacts to Cultural Resources (surface/sub-surface/submerged)
- Avoid negative impacts to other Federal/State/Local projects

3.6 Planning Strategy

Plan formulation is the process of building alternative plans that meet planning objectives and avoid planning constraints. The plan formulation process includes a number of detailed evaluations of potential scales and combinations of measures, and an iterative refinement process for alternative development.

Per the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G)*, four criteria are considered during the screening process: completeness, effectiveness, efficiency, and acceptability. Specific technical criteria related to the environment, economics, and engineering are also considered for further screening and include:

Environmental Criteria:

- The plan would fully comply with all relevant environmental laws, regulations, policies, and EOs

- The plan would represent an appropriate balance between environmental sustainability and economic benefits and must contribute to NED benefits

- The plan would be developed in a manner that is consistent with the USACE Environmental Operating Principles (EOPs)

Economic Criteria:

- Tangible benefits of a plan must exceed economic costs
- Each separable unit of improvement must provide benefits at least equal to costs

Engineering Criteria:

- The plan must represent sound, acceptable, and safe engineering solutions

When appropriate, plan formulation also considers assumptions, professional judgment, and/or estimates instead of acquiring new data to support the decision-making process after considering the relative likelihood, nature, and magnitude of the impacts to the overall decision and the associated environmental, social, and economic consequences. With this in mind, the PDT determined the study would identify the potential alternatives, develop an initial array, and narrow that array into a focused array of alternatives. As the focused array of alternatives was analyzed, the PDT screened the alternatives until a RP, based on the NED benefits, was identified.

3.7 Alternative Development

3.7.1 Management Measures

Alternative plans are a set of one or more management measures functioning together to address one or more planning objectives. A management measure is a feature or activity that can be implemented at a specific geographic site to address one or more planning objectives.

CSRM measures can be classified into two groups: non-structural and structural. Non-structural alternatives can consist of those measures that: (1) control or regulate the use of land and buildings such that damages to property are reduced or eliminated; (2) acquire threatened or damageable property; or, (3) retreat, which is the relocation of threatened property.

To develop a comprehensive list of measures that addressed the study objectives the PDT worked closely with the NFS's technical consultant, Taylor Engineering, to identify issues and to develop an array of measures to address study problems and meet study objectives. Alternative plans were also developed using an economic and environmental focused strategy that addresses the specific problems in the study area and were preliminarily evaluated by applying numerous, specific criteria to achieve maximum storm risk reduction and restoration benefits.

Per the USACE, Engineering Research and Development Center (ERDC), Summary Report (SR), SR-15-1 dated January 2015, resiliency is the ability of a system to prepare for, resist, recover, and adapt to achieve function performance under the stress of both natural hazards and human-related disturbances through time. For the purpose

of this study, the team used adaptive capacity as the assessment of a measure's ability to adjust through natural processes, operation and maintenance activities, or adaptive management, to preserve the measure's function.

The management measures (Table 3-1) for this project include structural and non-structural.

3.7.1.1 Structural Measures

Structural measures serve to reduce land loss or damage to the shoreline, dunes, and coastal development shorelines. These measures include the construction of hard structures and/or beach fill.

3.7.1.1.1 Beach Restoration (Beach fill, dune creation)*

Beach restoration generally involves the placement of compatible sand from an offshore source (borrow area) on an eroding shoreline to restore its form and to provide an adequate geometry to provide coastal storm damage risk reduction. Selection of the desired configuration depends on site conditions and must consider whether fill placement is intended to combat shore erosion, flood inundation, or both. A beach fill typically includes a berm backed by a dune and both elements combine to prevent inundation damages to leeward areas. Periodic renourishment is normally required to offset long-term and storm-induced erosion.

Table 3-1. Management Measures

Structural Measures:	Non-Structural Measures:
• Beach Restoration (Beach fill, dune creation)*	• Improvements to Storm Warning Systems
• Revetments	• Acquisitions (buyouts)
• Seawalls and Bulkheads	• Change Construction Requirements
• Groins	• Elevating Structures
• Jetties	• Modify Land Use Regulations
• Wave Attenuation Structures (Breakwaters, rubble mound)	• Improvement to Individual Emergency Plans
• Geotubes	• Relocation
• Storm Surge Barrier	• Flood Proofing
• Clearing and snagging*	
• Tidal flats*	
• Emergent/Submerged aquatic vegetation*	
• Marsh Creation*	

* Natural and Nature Based Features (NNBF)

3.7.1.1.2 Revetments

A revetment armors the existing slope face of a dune or, embankment to absorb the energy of crashing waves where otherwise, the coastline would be eroded. It is usually composed of one or more layers of precast concrete armor units, stone or riprap comprised of granite or other locally available material.

3.7.1.1.3 Seawalls and Bulkheads

Seawalls and Bulkheads are similar in design with slightly differing purposes. Seawalls are principally structures designed to resist wave attack but also may retain some soil to assist in resisting wave forces. The land behind seawalls is usually a recent fill area. Seawalls normally require extensive toe protection to reduce the risk and magnitude of scour. Vertical seawalls are generally high and are often judged to be socially and aesthetically unacceptable. Moreover, vertical seawalls are vulnerable to catastrophic failures that may be attended by accelerated upland erosion. Bulkheads are primarily soil-retaining structures which are designed to also resist low to moderate wave attack. Seawalls and bulkheads may be built of many materials including steel, timber, or concrete piling, gabions, or rubble-mound structures.

3.7.1.1.4 Groins

Groins are coastal structures, normally constructed perpendicular to the shoreline, which act to interrupt longshore sediment transport. Groins generally extend from the dune/beach interface to water depths on the order of 10 to 12 feet and are designed to impound sand. At a single groin, the updrift impoundment of sand is generally offset by an equivalent amount of erosion downdrift of the structure. Groins are often constructed in series or fields to provide coastal storm damage risk reduction for continuous shoreline segments.

3.7.1.1.5 Jetties

Jetties are structures used at inlets to stabilize the position of the inlet channel, to shield vessels from wave forces, and to control the movement of sand along the adjacent beaches to minimize the movement of sand into the channel. Because of the longshore transport reversals common at many sites, jetties are often required on both sides of the inlet to achieve complete channel protection. Jetties are built from a variety of materials, e.g., timber, steel, concrete, and quarrystone. Most of the larger structures are of rubble-mound construction.

3.7.1.1.6 Wave Attenuation Structures (Breakwaters, rubble mound)

Breakwaters are typically rubble-mound structures built seaward of the shoreline, and act to reduce wave energy reaching the shoreline. Offshore breakwaters may be built as a long continuous structure or as a series of shorter, segmented structures. The advantages of segmented breakwaters include cost-effectiveness and design flexibility. The effect of breakwaters is to cause gradients in wave energy in the lee of the structures that promote sediment deposition behind the breakwaters.

3.7.1.1.7 Geotubes

A geotube is a geotextile tube filled with beach sand placed along a shoreline to reduce erosion by providing sand dune armoring to protect upland areas from storm surge, wave action, and flooding.

3.7.1.1.8 Storm Surge Barrier

A storm surge barrier can consist of levees, floodwalls, and floodgates to provide protection for development behind the barrier from storm surges, flooding, and waves.

3.7.1.1.9 Clearing and snagging*

Clearing and snagging is an action that can be undertaken to assure that stream channels are not obstructed with debris and freely allow for streamflow preventing a buildup of storm runoff leading to flooding.

3.7.1.1.10 Tidal flats*

Tidal flats are low-gradient tidally inundated coastal surfaces that require extensive nearly horizontal, marshy or exposed substrate consisting of unconsolidated sediment that span a range of composition from mud to sandy flats. They are found in sheltered bays, estuaries and coasts that are protected by barrier islands. In northern Gulf of Mexico, tidal flats support salt marsh, seagrass, algal mats and oyster beds or reefs and are influenced by tidal level, substrate composition, and salinity. In Okaloosa County, tidal flats occur on the northern edge of Okaloosa Island in a low energy aquatic environment along the Santa Rosa Sound. As a NNBF measure, tidal flats can provide temporary flood attenuation, and can stabilize substrate from effects of erosion. During storm conditions, elevated storm tides and high waves may erode beaches and dunes, and the eroded sand can be carried landward by surging water (Fagherazzi, S. et al, 2007). The sand and water may wash over or break through the dunes, spilling out onto the landward side of peninsulas and barrier islands. This deposit is usually fan-shaped and therefore is known as an overwash (or washover) fan (Delaware Sea Grant, 2009).

3.7.1.1.11 Emergent/Submerged aquatic vegetation*

Submerged aquatic vegetation (SAV) are grasses that grow to the surface of shallow water, but do not emerge from the water surface. In marine or estuarine environment, seagrasses grow in colonies, forming dense beds or meadows that attach to the ocean bottom by thick roots and rhizomes which are horizontal stems attached to the substrate with shoots pointing upward and roots pointing downward (Fonseca and Kenworthy 1998). SAV typically occur in protected bays and lagoons as well as along the continental shelf (NOAA 2021). In the study area, extensive seagrass beds are restricted to waters within Choctawhatchee Bay and Santa Rosa Sound providing food source for Federally protected West Indian Manatee and foraging green sea turtle. Disturbance to seagrass beds in the study area could adversely impact these species (NOAA 2021, Seagrass). Seagrass can attenuate wave energy (Fonseca and Cahalan 1992) and stabilize substrate with its extensive rhizome system by holding sediment in place. However, it is vulnerable to suspended sediment that can prohibit light penetration for photosynthesis, as well as fluctuating salinity (Shafer, D.J. et al. 2002).

3.7.1.1.12 Marsh Creation*

Saltmarsh occur along the intertidal zone of marine, estuarine, or riverine systems. Specifically, these wetlands occur in Choctawhatchee Bay along the fringe of drowned river valleys, lagoons, and the Santa Rosa Sound coastal waterway, in primarily marine or estuarine systems. The dense vegetation and shallow waters within saltmarsh can slow the advance of storm surge somewhat and slightly reduce the surge landward of the wetland, reducing its arrival time. Controlled study results confirm lateral erosion significantly decreases when estuarine vegetation colonizes the marsh margins, and that different erosion rates are associated with various marsh species on the fringe edges (Finotello et al). Saltmarsh is also affected by astronomical tidal action (Tiner, R. 2018). A typical restoration project for this study would require a fairly expansive area of shallowly inundated tidal fringe to incorporate a nearshore region for wave breaking and energy reduction even if significant erosion of portions of the wetland should occur during a storm event (Fagherazzi, S. et al 2007).

3.7.1.2 Non-Structural Measures

While non-structural measures serve to reduce damages to the development or structures that have developed along the beach, they do not reduce land loss or damage to the shoreline and dunes.

3.7.1.2.1 Modify Land Use Regulations

Land use regulations can be used to establish oceanfront setback limits and restrict construction below a certain elevation. These actions can help reduce unwise development in areas susceptible to coastal storm damage.

3.7.1.2.2 Acquisitions (buyouts)

Acquisition would involve the purchase of damageable property that is threatened by extra-tropical and tropical storms and relocating displaced persons in accordance with the provisions of the Uniform Relocation Act, Public Law 91-646.

3.7.1.2.3 Change Construction Requirements

Changing construction requirements consists of revising building codes to make structures more resistant to coastal storms. Code changes could include changes in allowable materials and construction techniques.

3.7.1.2.4 Elevating Structures

Elevating structures would consist of raising an existing structure to an elevation that is at least equal to or greater than the design flood elevation. Elevation can be performed using fill material, on extended foundation walls, on piers, posts, piles, and columns.

3.7.1.2.5 Improvements to Storm Warning Systems

Improvements to storm warning systems would include analyzing existing warning systems to determine if there are improvements to the system that could be implemented and whether those improvements will result in improved warning time for residents/visitors of the area.

3.7.1.2.6 Improvement to Individual Emergency Plans

Individual emergency plans are those personal plans that an individual family unit has developed to prepare for and respond to coastal storms. Improvement would consist of analyzing what can typically be included in an individual plan and make recommendations of components that could be added to enhance individual plans.

3.7.1.2.7 Relocation

Relocation, also referred to as retreat, is moving an affected structure inland away from the shoreline to reduce its damage potential.

3.7.1.2.8 Flood Proofing

This technique consists of waterproofing the structure. This can be done to residential homes as well as commercial and industrial structures. A “conventional” built structure can generally only be flood proofed up to 3-feet in elevation.

3.7.2 Screening of Management Measures

Management measures were screened based on an appraisal of how well they met the planning objectives and avoided planning constraints. Those that satisfied or minimally satisfied any the objectives would be considered for incorporation into the initial array of alternatives. Those that did not satisfy any of the objectives would be eliminated from consideration.

The team developed a list of measures (Table 3-2) using the two primary areas of concern: the Gulf coastal shoreline and the back bay shoreline. Similar measures were aggregated together for this assessment. Three measures were considered to have commonality for both areas of concern. The measures were then assessed on how well each of the measure groupings would address the study objectives and constraints. The three measures were assigned the following rankings:

- High (green - meets objective/avoid constraint to varying degrees)
- Medium (yellow - minimally meets objective/barely avoids constraint)
- Low (red - does not meet objective/avoid constraint)

Only one aggregate measure (Improve Emergency/Storm Warning Systems) was assessed as not meeting any of the study objectives. Additionally, with consideration of RSLC, this measure offers no additional benefit for the POA. Beyond the POA, consideration may need to be given to additional lead times for warnings due to increased sea level. Furthermore, warnings systems for the coastal area already exist and are outlined in the Okaloosa County Emergency Management Plan.

The Okaloosa County Emergency Management Plan also identifies the serious risk to low-lying evacuation routes. It lays out a goal to have evacuations completed before the storm arrives. This is supported by software that updates evacuation times based on changes in population density of an area. While there is still risk that remains, the plan outlines the warning system and process in place to reduce life safety risk to the maximum extent practical.

Critical infrastructure that was identified in the FWOP was also eliminated from further consideration for protection from coastal storm risk in this study. Through communicating with the NFS it was identified that state, county, and municipalities already have a processes and programs for identifying and addressing coastal storm risk to critical infrastructure or critical facilities and will continue to use these avenues in the future. The State Hazard Mitigation Plan for the state of Florida lays out the processes for addressing risk to critical infrastructure. Regional Planning Councils work with Local Emergency Planning Communities to identify threats to critical infrastructure in the county and develop Local Mitigation Strategies (LMS) and post disaster redevelopment plans. The LMS are reviewed every 5 years and include updates or major changes to critical infrastructure. The LMS for Okaloosa County identifies critical

facilities in great detail, identifies hazards, and provides recommendations for hazard mitigation.

Vulnerabilities to critical infrastructure can be addressed through the Pre-Disaster Mitigation Grand Program. This program can fund structural and non-structural measures to reduce risk to critical facilities. Florida continues to utilize this federal program to address vulnerabilities to critical infrastructure. Several other programs including the Hurricane Loss Mitigation Program can also provide funding to address risk to critical infrastructure. As there are other avenues that exist that the NFS prefers to utilize to address critical infrastructure, the assessment of these facilities in the FWOP section of the report will act only to identify vulnerably and potential help the NFS with prioritizing needs.

There are three aggregated measures that minimally meet all the study objectives. They were considered further during the development of the initial alternative array. The other aggregated measures satisfied one or more of the objectives and were considered further during the development of the initial alternative array. Most of the aggregated measures satisfied one or more of the constraints.

Once the aggregated measures had been assessed as to how well they satisfied the objectives and avoided the constraints, the PDT further combined them to develop a list of measures that would be used to develop the initial array of alternatives. These were grouped based on their function for the defined areas. The four groups included beach restoration measures in the shoreline area, dune restoration in the shoreline area, flooding in the back bay area, and shoreline in the back bay area. At the time of this grouping the PDT also further considered the results of the measure screening and eliminated those measures felt to not have significant promise to meet two or more of the study objectives. The result of this combination of measures is shown in Table 3-3.

Table 3-2. Management Measures Meet Objectives and Avoids Constraints

Focused Areas	Aggregated Measures	Meets Objectives (High, Medium, Low)			Avoids Constraints (High, Medium, Low)		
		Obj. 1 – Reduce Damages from Coastal Storms-surge, waves, erosion	Obj. 2 – Develop Resilient Coastal Shoreline	Obj. 3 – Improve Recreational Opportunities	Const. 1 – CBRA/T&E Species/EFH	Const. 2 – Existing Fed Projects (GIWW/Air Force Lands)	Const. 3 – Impacts to Hydro/Sediment Flow Connections
Shoreline Stabilization (Beach/Dune)	Beach Nourishment (sediment)						
	Dune Nourishment/stabilization						
	NNBF						
	Groins/Breakwaters/Geotube/bulkheads/ Seawalls, revetments						
Back Bay Flooding and Shoreline Stabilization	Modify Regulations (Land Use/Construction/Etc)						
	Elevate Structures						
	Acquisition/Buy-Out/Relocation						
	Improve Emergency/Storm Warning Systems						
	US Highway 98 Elevation						
	Storm surge barrier						

3.7.3 Initial Array of Alternatives

The PDT developed likely combinations of measures, Table 3-3, and determined that there were potentially 76 alternatives that would result. The team then screened those possibilities based on meeting the objectives, avoiding the constraints, meeting the four P&G criteria, meeting technical feasibility, and being environmentally acceptable. This resulted in an initial array of 20 alternatives, including no-action, that could be screened further to produce a focused array of alternatives. The list of the initial array of alternatives, with their component measures, is shown in Table 3-4.

Table 3-3. Combining Management Measures

Shoreline Measures Combined	Back Bay Measures Combined
Shoreline measures that address beach restoration - Abbreviated using S: ○ S-1 Beach nourishment only ○ S-2 Beach nourishment, with NNBF ○ S-3 Beach nourishment with NNBF and hardened structure ○ S-4 Beach nourishment with hardened structure	Back Bay Flooding measures – Abbreviated using F: ○ F-1 Storm surge barrier ○ F-2 Acquisition/buyout ○ F-3 Structure elevation ○ F-4 Clearing and snagging
Shoreline measures that address dune restoration - Abbreviated using D: ○ D-1 Raise/widen dune only ○ D-2 Raise/widen dune, with NNBF ○ D-3 Raise/widen dune, with NNBF and hardened structure	Back Bay Shoreline – Abbreviated using B: ○ B-1 Hardened structure (Groins/breakwaters/ geotubes/bulkheads/seawalls, revetments) ○ B-2 NNBF ○ B-3 Hardened structure with NNBF

3.7.4 Screening the Initial Array of Alternatives

The team screened the initial array of alternative plans into a focused array of alternatives. They were compared based on the following considerations:

Table 3-4. Initial Array of Alternative Plans and Description

Initial Array of Alternatives	Plan Description
No Action Alternative	No Action Alternative
Alternative 1 (S-1)	Beach nourishment only
Alternative 2 (S-1 + D1)	Beach nourishment, raise/widen dune
Alternative 3 (S-4)	Beach nourishment with hardened structure
Alternative 4 (B-2)	NNBF only
Alternative 5 (S-1 + B-2)	Beach nourishment, NNBF
Alternative 6 (S-1 + D-1 +B-2)	Beach nourishment, Raise/widen dune, NNBF
Alternative 7 (S-4 + B-2)	Beach nourishment with hardened structure, with NNBF
Alternative 8 (F-2)	Storm surge barrier
Alternative 9 (S-1 + F-2)	Beach nourishment, storm surge barrier
Alternative 10 (S-1 + D1 + F-2)	Beach nourishment, raise/widen dune, storm surge barrier
Alternative 11 (S-4 +F-2)	Beach nourishment with hardened structure with hardened structure
Alternative 12 (B-3)	Hardened structure with NNBF
Alternative 13 (S-1 + B-3)	Beach nourishment, hardened structure with NNBF
Alternative 14 (S-1 + D1 + B-3)	Beach nourishment, raise/widen dune, hardened structure with NNBF
Alternative 15 (S-4 + B-3)	Beach nourishment with hardened structure with NNBF
Alternative 16 (F-3)	Structure elevation
Alternative 17 (S-1 + F-3)	Beach nourishment, structure elevation
Alternative 18 (S-1 + D1 + F-3)	Beach nourishment, raise/widen dune, structure elevation
Alternative 19 (S-4 + F-3)	Beach nourishment with hardened structure, structure elevation

- No Action was retained as a baseline condition during comparison/evaluation of focused alternatives
- Alternatives that addressed problems on the coastal shoreline and included back bay risk reduction solutions were retained
- Alternatives that minimally met the coastal shoreline objective were retained for comparison with other focused alternatives
- Alternatives that did not address problems on the coastal shoreline or back bay shorelines were screened out
- Alternatives that did not address coastal shoreline and minimally addressed back bay were screened out

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

It is likely that the use of hard structures would have a negative impact on listed species inhabiting the area. Studies have demonstrated that a loss of nesting habitat related to placement of coastal structures has had adverse impact on nesting sea turtles in Florida (Sea Turtle Conservancy, 2020). Structures not only cause the loss of suitable nesting habitat but can result in the disruption of coastal processes accelerating erosion and interrupting the natural shoreline migration. Because of adverse effects on sea turtle nesting habitat caused by coastal structures, the continued vulnerability of remaining nesting habitat to frequent or successive severe weather events, may impact ability of sea turtle populations to survive and recover (Sea Turtle Conservancy, 2020). In response to periodic storms, the beach itself moves landward, construction or persistence of structures at their pre-storm locations can result in a major loss of nesting habitat. In addition, the presence of hard coastal structures may interfere with nesting turtle access to the beach, result in a change in beach profile and width (downdrift erosion, loss of sandy berms, and escarpment formation), trap hatchlings, and concentrate predatory fishes, resulting in higher probabilities of hatchling predation. The combination of habitat loss and nesting opportunities resulting from beachfront development and subsequent use of coastal structures such as seawalls, bulkheads, and groins is believed to be a threat to sea turtle survival and recovery and should be avoided were possible (Sea Turtle Conservancy, 2020).

Coastal structures are known to have a similar effect on beach mouse habitat and various shorebirds known to exist along the project area. The use of seawalls, bulkheads, and groins disrupt the natural dune and beach building processes that are critical to the survival of endangered beach mouse populations and shorebirds. Because of the limited remaining habitat such structures could compromise the ability of certain populations to survive and recover (USFWS, 2019). As with sea turtles, the combination of habitat loss to beachfront development and subsequent use of persistent coastal structures to stabilize the shorelines at their pre-storm locations would result in an increased threat to species survival and recovery. To preserve the survival and recovery of these species, the use of coastal structures should be avoided.

Additionally, the effects of RSLC on the project area during the POA would not warrant an increased need for hard structures where other, more adaptable measures area available. Beyond the POA, the effects of RSLC may warrant further consideration of hard structures for coastal storm damage reduction. This may prompt a change in rules and attitudes regarding the use of hard structures along the shoreline in this area. This will be discussed in more detail when addressing adaptation measures for the study area.

Regarding modifying regulation of land use, such an action may establish oceanfront setback limits or restrict building below a certain elevation; however, the study area is nearly fully developed and implementation of additional land use regulations will not serve to reduce the threat of damage to the existing structures during the POA. Additionally, there are already regulations in place for building and development along the shoreline of Okaloosa County to minimize the threat of damage to shoreline structures. Beyond the POA, the effects of RSLC may warrant further local regulations to reduce the possible impacts. This may prompt changes in usage of the structures to minimize damages from coastal storms that could occur.

While beach and dune fill can also be considered as a NNBF, the NNBFs that were combined with other measures consisted of tidal flats, emergent/submerged aquatic vegetation, and marsh creation.

Table 3-5 was developed to assist to demonstrate the screening of the initial array. Alternatives retained are shown in green. Alternatives screened out are shown in red. Yellow designates alternatives retained that minimally addresses objectives.

Table 3-5. Screening Initial Array of Alternatives

			Gulf Shoreline Alternatives			
			No Action	**Beach**	**Beach and Dune**	**Structure**
Back Bay Alternatives		**#**				
	No Action		0	1	2	3
	Natural and nature-based features (NNBF)	*B-2*	4	5	6	7
	Acquisition	*F-2*	8	9	10	11
	NNBF and hard structure	*B-3*	12	13	14	15
	Structure Elevation	*F-3*	16	17	18	19

SECTION 4.0 EVALUATION OF ALTERNATIVES

4.1.1 Focused Array of Alternatives

The screening of the alternatives in the initial array (Section 3.7.4) resulted in the development of a focused array of alternatives consisting of eleven alternatives including no action. These alternatives included both coastal shoreline and back bay alternatives as shown in Table 4-1.

Table 4-1. Focused Array of Alternatives

Alternatives	Description
No Action Alternative	No Action or Future Without Project (FWOP)
Alternative 1	Beach nourishment only
Alternative 2	Beach nourishment, raise/widen dune
Alternative 5	Beach nourishment, NNBF
Alternative 6	Beach nourishment, raise/widen dune, NNBF
Alternative 8	Acquisition/buyout
Alternative 9	Beach nourishment, acquisition/buyout
Alternative 10	Beach nourishment, raise/widen dune, acquisition/buyout
Alternative 16	Structure elevation
Alternative 17	Beach nourishment, structure elevation
Alternative 18	Beach nourishment, raise/widen dune, structure elevation

4.1.2 Screening the Focused Array

To screen the Focused Array, the PDT concentrated on those alternatives that contained non-structural and NNBF measures. With available data and limited field work the team concluded that these alternatives could be assessed adequately to determine the viability of these alternatives.

4.1.2.1 Front Beach Non-Structural Screening

There are a number of nonstructural measures that can be considered to protect structures along the front shoreline. Initially the PDT considered the available measures and the applicability to the Okaloosa shoreline. Considering the current state of development, any regulatory changes were considered as ineffective and dropped from consideration. Likewise, the type of construction of the structures along the shoreline was judged to preclude the option of elevating the structures due to substantial cost and was dropped from consideration. Adding floodproofing to structures was considered but this measure would only be effective against flooding from the larger storms but not effective due to any wave action from those storms and was dropped from consideration. Retreat of the affected structure on the existing property is not practicable. Because of the small size of the existing lots, the structures could not be relocated further from the shoreline nor is there available property to relocate the structures upon. Therefore, retreat was not considered a viable option and was dropped from further consideration.

Property acquisition was also considered as a CSRM measure. Property acquisition would involve the purchase of the at risk property that is threatened by extra-tropical and tropical storms and relocating the displaced persons per the Uniform Relocation Act, Public Law 91-646. Implementation of this non-structural measure would likely exceed the cost of any structural measure; therefore it will not be analyzed further. A land acquisition project on the beachfront would be prohibitively expensive, since the condominium complexes and commercial establishments on the beachfront are multi-million-dollar investments. Therefore, given that Implementation of this non-structural measure would likely exceed the cost of any structural measure, it will not be analyzed further.

An additional consideration of screening both retreat and buyouts would be the economic impact they would incur. The front beach communities of Okaloosa Island and Destin rely heavily on the housing and development along the coastline. Recreation is the major economic driver of these municipalities. The removal of structures including homes, condominiums and recreation industry along the Gulf front beach would have a devastating impact on the economic drivers these communities rely on

and would ultimately not benefit the NFS. At the current time, it is anticipated that significant landowner opposition would arise from acquisition of the front beach.

While this analysis has screened the application of nonstructural measures at this time, it does not preclude future consideration of nonstructural measures. Some consideration must be given to retreat and relocation once future conditions become so severe that remaining in the area becomes intolerable. For example, once sea level change effects the area in a way that these locations are uninhabitable, the appetite for relocation or retreat may become more tolerable. The use of other nonstructural measures can also be considered at that time. Adaptation strategies are discussed in more detail in Section 6.2.3.

4.1.2.2 Back Bay Non-Structural Screening

For the alternatives with non-structural measures in the back bay a process was developed to identify structures at risk of inundation from various storms with consideration of sea level change as described below. The economic feasibility of non-structural measures for the structures at risk was then assessed. The process is graphically illustrated in Figure 4-1, with a more detailed discussion provided in Appendix B, Economics, Attachment 1. The non-structural assessment found that there is development in the back bay area of Okaloosa County that can be affected by inundation from coastal storms, but frequency and severity are not significant enough to support an economically feasible measure.

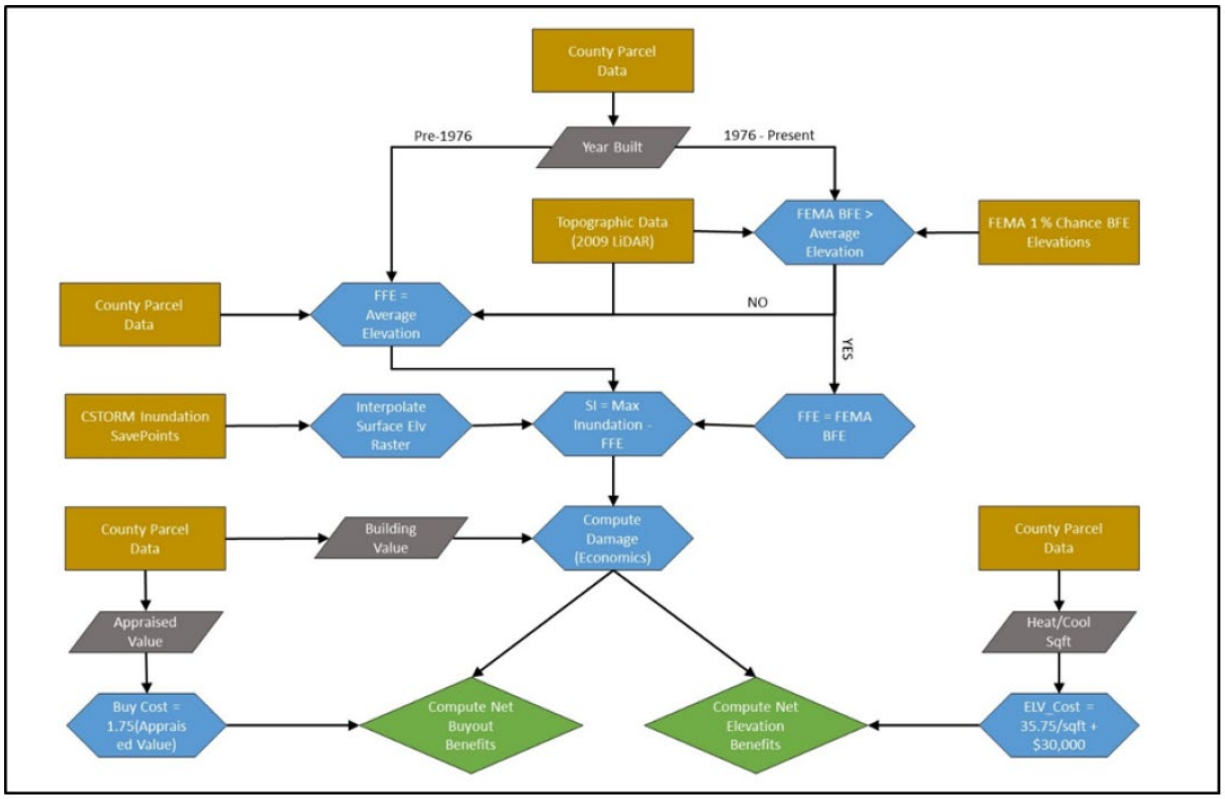


Figure 4-1. Process Flow Chart for Structure Risk and Feasibility Assessment

This analysis considered risk associated with the 50-year planning horizon and the USACE intermediate sea level rise curve over a range of AEP events. The analysis used very conservative estimates to ensure that no area with a potential Federal interest was excluded. These assumptions include:

- Low first floor elevations, 1 to 2 feet from the base terrain elevation
- Very low cost of elevation
- All structures where sound enough to be elevated
- All structures where eligible for buyout and relocation

Initial results showed that there was limited Federal interest; however, two census blocks in the back bay showed some areas with composite positive net benefits. As a result, a site visit to several locations was performed. It was discovered during these site visits that the most important assumption, low first floor elevations, was far too conservative. All structures canvassed were, at a minimum, elevated 5 feet higher than the original assumption (generally 1-2 feet above the terrain) with an average difference of 8 feet. This was in agreement with other areas in the study area based on a windshield inspection (Google Earth). In summary, areas exposed to coastal storm risk

were often elevated well above the level of which damages would occur and there was no Federal interest in retreat or elevation of structures in the back bay area.

While the analysis used for this screening considered the intermediate sea level rise curve, consideration was also given to the sensitivity of the analysis to the high sea level rise curve as the project area is closely tracking this curve and this defines the extent of the study area. Figure 4-2 shows the RSLC in the area over the planning, economic and adaptation horizons. Table 4-2 provides the RSLC elevation changes that can be anticipated in the project area through the 100-year adaptation horizon. Based on this information, there would be only an additional 1.64 feet of sea level rise considering the high sea level rise curve compared to the intermediate over the POA. Most structures in the study area were elevated at least 5 feet above the levels considered in the analysis, there is no Federal interest in the POA with consideration to high sea level rise.

Much like the preceding section on front beach nonstructural screening, the screening of this area for nonstructural measures does not preclude future consideration of nonstructural measures. Should sea level change begin to affect this area additional studies including the use of nonstructural measures can be considered.

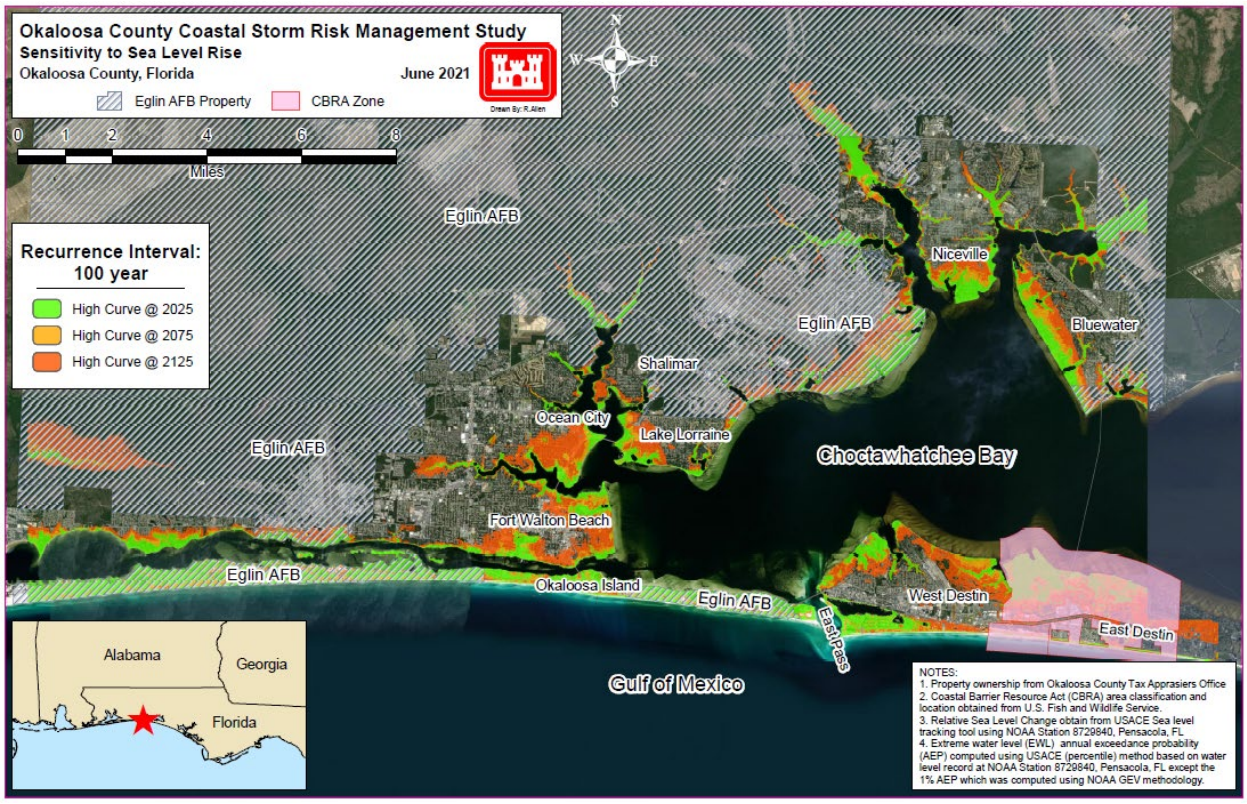


Figure 4-2. Sensitivity to Sea Level Rise

Table 4-2. RSLC Over Different Horizons

USACE SLC Curve	Planning Horizon (2020-2075)	Economic Period of Analysis (2025-2075)	Adaptation Horizon (2025-2125)
Low	0.38	0.34	0.69
Intermediate	0.92	0.86	2.17
High	2.65	2.50	6.84

Considerations for the 100-year adaptation horizon does show a relative sea level change of 6.84 feet. Therefore, some consideration should be given to nonstructural measures in the distant future. This is discussed in more detail in Section 6.2.3.

4.1.2.3 Beach and Berm Screening

The "Beach Nourishment Only" measure, also referred to as a "Berm Only" measure, was only carried forward on the far eastern side of beachfront area in Destin, Florida. A berm only solution, which would include only enhancing the berm and excluding any existing dune from the potential Federal project, was deemed not a holistic solution to addressing coastal storm risk and therefore impractical for the western portion of Destin and Okaloosa Island. Per conversations with the CSRM Planning Center of Expertise, there was agreement that the berm only options are often not considered holistic measures to address coastal storm risk, especially inundation from tropical systems. Excluding an existing dune from any of the beach nourishment alternatives considered would allow the existing dune to erode without repair, drastically decreasing benefits though the lifecycle of an alternative and would demonstrate poor resiliency with respect to coastal storm risk, biodiversity, and habitat for threatened and endangered species. Therefore, Berm Only measures were not carried forward on Okaloosa Island and the western portion of Destin.

In the eastern portion of the beachfront in Destin the Beach Nourishment Only alternative was considered as it was the only possible beach measure to address Coastal Storm Risk in that area. Much of existing East Destin consists of a berm that ties directly into a high upland area of approximately 18 feet NAVD88. Construction of an 18 foot or greater dune where no dune exists was considered not feasible and extremely unlikely to produce benefits in front of a high upland area that already protects the existing infrastructure. Therefore, while Beach Nourishment Only was still considered unlikely to produce positive net benefits, it was carried forward for this area of the coast as the only viable option for a structural measure in this reach of the beachfront.

4.1.2.4 NNBF Screening

For the alternatives with NNBF measures, a process was developed to identify sites for NNBF measures to reduce the potential for damages caused by coastal storms, promote adaptive capacity of the shoreline and back-bay areas and maintain recreational opportunities along the study area. Using aerial mapping available on the internet, 24 potential sites were initially identified to consider for NNBF features. Of those sites, 14 were eliminated based on not satisfying study objectives. A field survey was conducted on the remaining sites that also determined that those 10 sites did not satisfy the study objectives. It was concluded that alternatives using NNBF were not warranted as the sites did not exhibit significant storm damage that would prohibit function of storm surge and wave attenuation or inhibit resiliency to existing resources. These areas include natural shorelines consisting of forested or marsh wetlands that will continue to retain wave attenuation capacity in future storm surge events, although the character of the existing systems will likely adapt to additional impoundment. Marsh migration of herbaceous dominated systems will most likely replace forested shorelines. However, these systems will still retain their function to address inundation from storm events. The extent of armored shoreline in the back bay prohibits the acceptance of NNBF features in these privately owned areas. Furthermore, placement of marsh in front of these structures is infeasible due to the extent of seagrass beds that provide habitat for sensitive and listed species, as well as anticipated objection from shoreline landowners. Details of the NNBF assessment is included in Appendix C, Environmental. The results of the screening of the focused array are presented in Table 4-3.

The screening of the alternatives in the focused array resulted in the development of the Final Array of Alternatives. This array consists of two structural measures consisting of beach nourishment and dune raising or widening, as well as the no action alternative. The resulting Final Array of alternatives is shown in Table 4-4.

It should be noted that the NFS developed and obtained a FDEP permit for a similar alternative type to Alternative 2 prior to execution of this study. This plan proposes for Okaloosa Island an approximately 40-foot wide dune crest at 14-foot NAVD88, a 60-foot wide back berm at 8.5 feet NAVD88, and a 140-foot wide berm at 5.5-feet NAVD88. For West Destin the alternative cross sections show 30-ft dune crest widths at 14-ft elevation with slopes (1 vertical (V):4 horizontal (H)) to 30-ft beach berm width that extend to the nearshore. Currently, the NFS has no plans to implement the permitted project but is willing to participate in the implementation of a Federal project.

Table 4-3. Screening Results of Focused Array of Alternatives

Alternative	Description	Result
No Action Alternative	No Action or Future Without Project (FWOP)	Carried forward to final array
Alternative 1	Beach nourishment only	Carried forward to final array
Alternative 2	Beach nourishment, raise/widen dune	Carried forward to final array
Alternative 5	Beach nourishment, NNBF	Eliminated from further consideration
Alternative 6	Beach nourishment, raise/widen dune, NNBF	Eliminated from further consideration
Alternative 8	Acquisition/buyout	Eliminated from further consideration
Alternative 9	Beach nourishment, acquisition/buyout	Eliminated from further consideration
Alternative 10	Beach nourishment, raise/widen dune, acquisition/buyout	Eliminated from further consideration
Alternative 16	Structure elevation	Eliminated from further consideration
Alternative 17	Beach nourishment, structure elevation	Eliminated from further consideration
Alternative 18	Beach nourishment, raise/widen dune, structure elevation	Eliminated from further consideration

Table 4-4. Final Array of Alternatives

Alternative	Description
No Action Alternative	No Action or Future Without Project (FWOP)
Alternative 1	Beach nourishment only (East Destin only)
Alternative 2	Beach nourishment, raise/widen dune

The discussion below describes the modeling and evaluation process for the economic and engineering analyses conducted for this study.

4.2 Economic Analysis

Detailed evaluation of alternatives was conducted utilizing Beach-*fx,* the USACE approved planning model for analyzing the physical performance and economic benefits and costs of CSRM projects. Beach-*fx* relies on user-populated databases that describe the coastal area under study: environmental forcing in the form of a suite of historically-based plausible storm events that can impact the area; an inventory of infrastructure that can be damaged; and estimates of morphology response of the anticipated range of beach profile configurations to each storm in the plausible storm suite together with damage driving parameters for erosion, inundation, and wave impact damages. The model is data driven in that all site-specific information is contained within the input databases, which generalizes the model and makes it easily transportable between study areas. Beach-*fx* integrates the engineering and economic analyses and incorporates uncertainty in both physical parameters and environmental forcing, which enables quantification of risk with respect to project evolution and economic costs and benefits of project implementation.

4.2.1 Areas Analyzed

The total Gulf-front shoreline in the study area is approximately 26 miles with a variety of property ownerships to include government, county and private. There are areas that the probability of project implementation is low, including Eglin AFB property, due to the lack of development and property that is subject to the environmental constraints of the CBRA. See Figure 4-3 for the Gulf-front study area.

The study area was initially divided into two areas for analysis, the back bay and coastal shoreline. The back bay area was evaluated by performing an assessment of coastal storm hazards associated with inundation and screening for potential feasibility of

implementing nonstructural measures. Further discussion regarding the back bay area can be found in Section 4, Appendix A, Engineering and Appendix B, Economics. The coastal shoreline consists of approximately eight miles of front beach for evaluation. For detailed alternatives analysis, the coastal shoreline was divided into two developed reaches, Okaloosa Island and Destin. The Destin area was further divided into two study reaches, West Destin and East Destin based on beach morphology, environmental considerations and land use. All study reaches, including Okaloosa Island, were divided into model reaches of about 1,000 feet based on FDEP monuments. The Okaloosa Island reach consisted of FDEP monuments R01 through R15. The West Destin reach consisted of FDEP monuments R18 through R32 and the East Destin reach consisted of FDEP monuments R33 through R50.

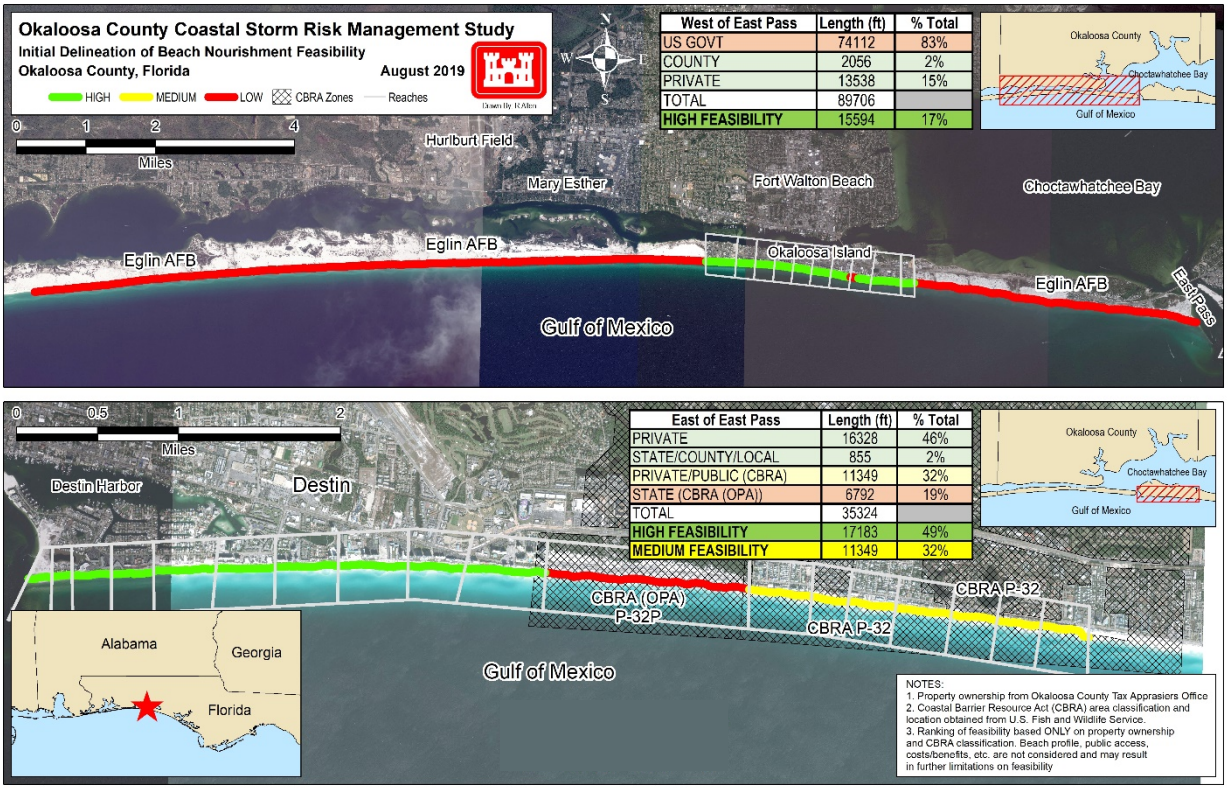


Figure 4-3. Gulf-Front Study Area

4.2.2 Data Collection

Attribute information for 739 separate damage elements (DE) was populated for economic modeling. The attributes of the structures included geographic location, structure type, foundation type, construction type, width, length, number of floors, depreciated replacement cost and year built. The proximity of these structures to the shoreline makes them potentially vulnerable to erosion, wave attack and inundation. The DE include:

- 20 Commercial buildings
- 50 Gazebos
- 172 Multi-family Residents
- 134 Pools
- 169 Single Family Residents
- 194 Dune walks

Okaloosa Island and Destin consist of 6 representative beach profiles, 48 Beach-*fx* model reaches and 271 lots for economic modeling and reporting purposes. The hierarchical structure is depicted as follows:

Beach Profiles: Coastal beach profile surveys were analyzed by USACE, Mobile District Coastal Engineering personnel and the USACE, ERDC to develop representative beach profiles that include the dune, berm and submerged portions of the beach. The representative profiles are used for shore response modeling in the Storm Induced Beach Change (SBEACH) engineering numerical model and only referred to in this section for informational purposes.

Beach-*fx* Model Reaches: Quadrilaterals with a seaward boundary that is parallel with the shoreline that contain the Lots and DE, and that are used to incorporate coastal morphology changes for transfer to the lot level. All study reaches were divided into Beach-*fx* model reaches (1,000 feet in length based on FDEP monuments). The Okaloosa Island Reach consisted of FDEP monuments R01 through R15. The West Destin Reach consisted of FDEP monuments R18 through R32 and the East Destin Reach consisted of FDEP monuments R33 through R50. Figure 4-4 shows an aerial view of the Beach-*fx* model reaches.

Lots: Quadrilaterals encapsulated within model reaches used to transfer the effect of coastal morphology changes to the DE.

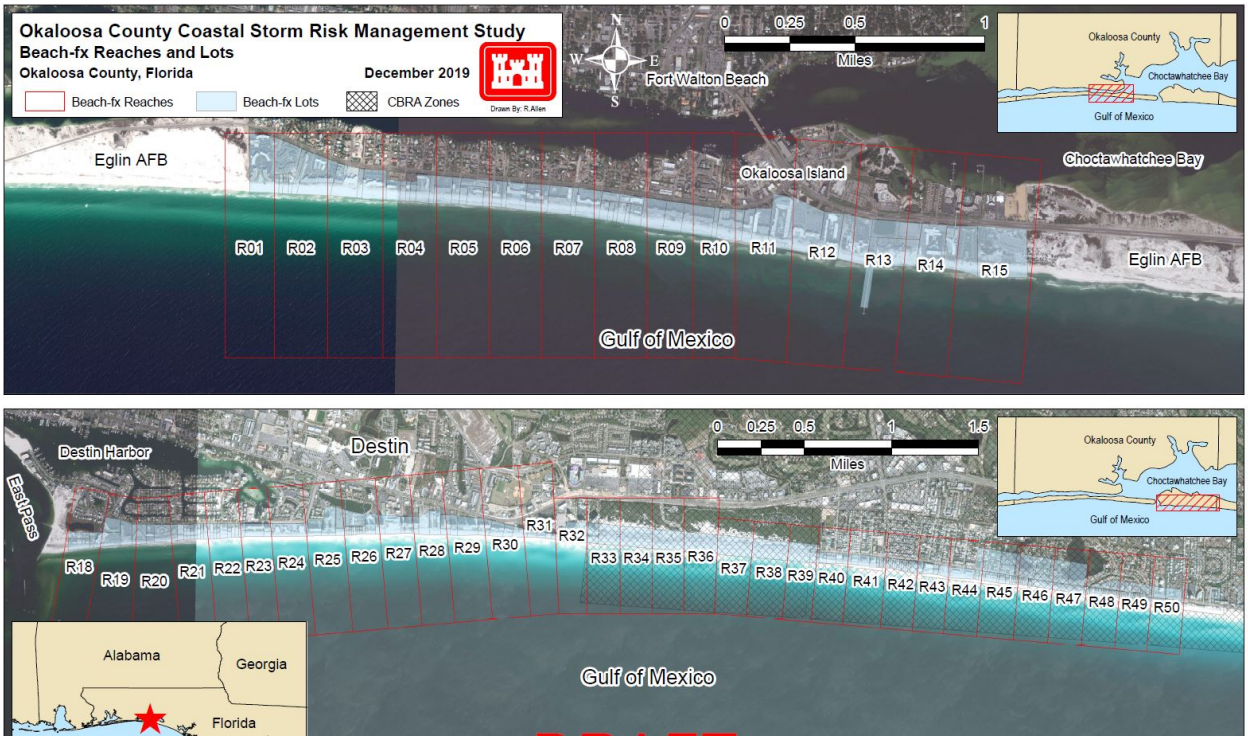


Figure 4-4. Beach-*fx* Modeling Reaches

Damage Elements (DE): Represent a unit of coastal inventory in the existing condition and a store of economic value subject to losses from wave-attack, inundation and erosion damages. Beach-fx handles economic considerations at the DE level. These considerations include extent of damage, cost to rebuild and time to rebuild. Beach-fx uses pre-defined damage functions to calculate the extent of damage. For each DE, the following information is input into Beach-fx:

- Geographical reference (northing and easting of center point)
- Alongshore length and cross-shore width
- Usage (e.g. single family, multi-family, commercial, walkover, pool, gazebo)
- Number of floors
- Construction type
- Foundation type
- Armor type
- First floor elevation
- Value of structure (replacement cost less depreciation)
- Value of contents

4.2.3 Existing Condition Coastal Structure Inventory

Information on the existing economic conditions along Okaloosa County coastline was collected for economic modeling purposes. The information on the coastal assets detailed in this section was mainly collected from Okaloosa County. The depreciated replacement cost was estimated using the RS Means Square Foot Costs Data Catalog (henceforth, RS Means), Doheny (2019).

4.2.3.1 Structure and Content Value

The structure value, as an input for Beach-fx, was represented by the depreciated replacement cost. The depreciated replacement cost for both residential and non-residential structures was determined using the 2018 RS Means. To determine the depreciated replacement cost, the square footage and occupancy type of each structure were identified. Then, for each occupancy type, the average square footage was determined to represent that occupancy category for the purpose of RS Means.

The geospatial location and footprint of the DE was verified using aerial photography in ArcMap® and Google Maps®. The construction and foundation type of each DE was gathered from Okaloosa County information and visual observations by the USACE, Mobile District staff. First floor elevations of all DE in the study area were surveyed using Terrestrial based light detection and ranging (LiDAR). RS Means was used to estimate depreciated replacements costs and an uncertainty of +/- 10% was assigned to these costs. The value of contents was assumed to be 50% of the structure value for all habitable structures. Non-habitable structures (dune walkovers, pools and gazebos) had zero contents value.

The economic value of the existing structure inventory represents the depreciated replacement costs of damageable structures and their associated contents within the study area along the coastline. The DE inventory includes 739 damageable structures with an overall estimated value of $2.3 billion and $1.2 billion in contents.

Figure 4-5 shows the structure and content values by reach and the DE distribution. The distribution is relatively uniform, however the values aggregated by reach show significant variation. The variation is due to differentiation between the types of development within the reach.

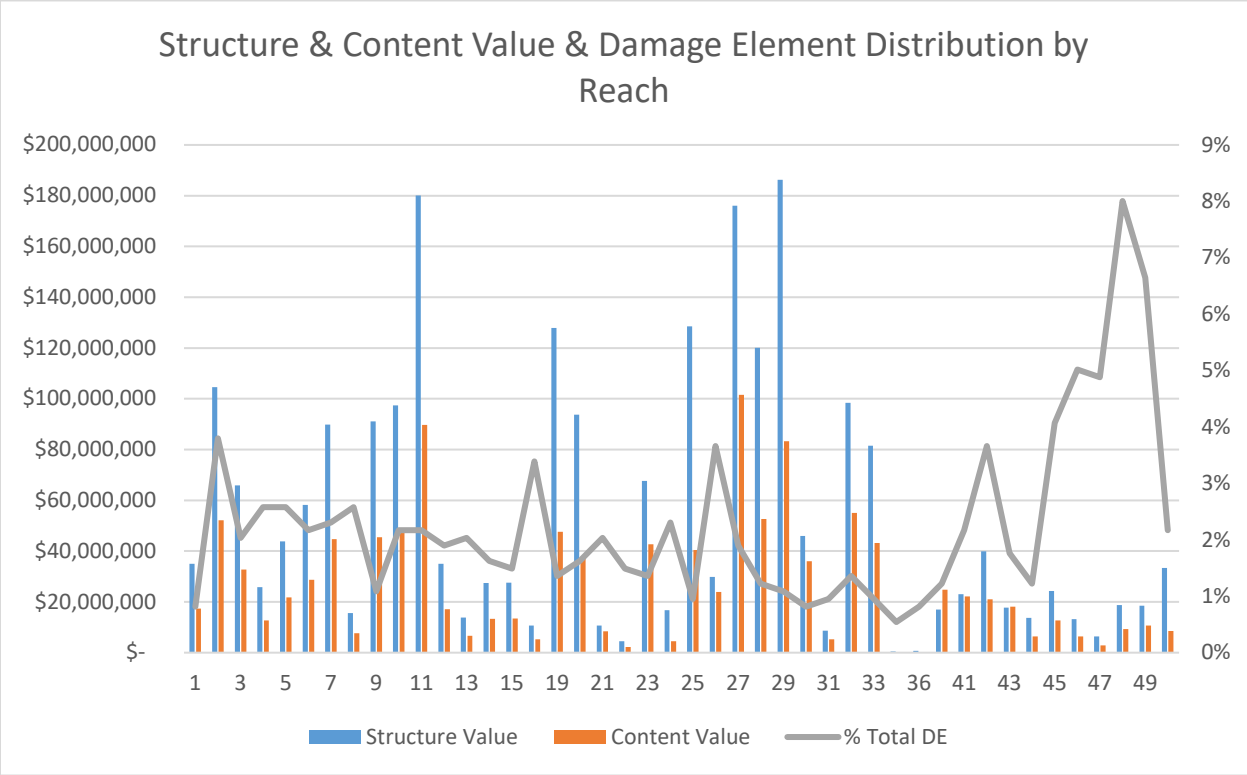


Figure 4-5. Structure & Content Value & DE Distribution

For modeling and reporting purposes the structure inventory was separated into ten different structure types. Table 4-5 provides a summary of these structure types and the associated inventory values.

4.2.4 Coastal Storm Risk Management Benefits

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

Benefits are stated in constant Fiscal Year (FY) 2020 dollars. The POA is 50 years from 2025 through and including all of the year 2074, there are five pre-project base years, 2020 through 2024. The base year is 2025. The structure inventory is valued at 2019 dollars.

Table 4-5. Summary of Structure Types and Inventory Values

Structure Type	Structure Count	% of Total Structure	Structure Value	Content Value	Total
Commercial	20	3%	$20,489,000	$10,245,000	$30,734,000
Gazebo	50	7%	$3,397,000	NA	$3,397,000
Multi-Family Residential (1-2 Floors)	88	12%	$223,682,000	$122,705,000	$346,387,000
Multi-Family Residential (3+floors)	84	11%	$1,991,789,000	$1,003,613,000	$2,995,402,000
Pool	134	18%	$7,786,000	NA	$7,786,000
Single-Family Residential	167	23%	$94,852,000	$47,426,000	$142,278,000
Walkway	194	26%	$3,301,000	NA	$3,301,000
Grand Total	739	100%	$2,345,298,000	$1,183,989,000	$3,529,284,000

4.2.4.1 Benefit Estimation Approach using Beach-*fx*

Beach-*fx* was developed by the USACE, ERDC. The planning model was certified in April 2009 by the Model Certificate Headquarters Panel based on recommendations from the CSRM Planning Center of Expertise and in accordance with EC 1105-2-412 (Assuring Quality of Planning Models). Beach-*fx* links the predictive capability of coastal evolution modeling with project area infrastructure information, structure and content damage functions and economic valuations to estimate the costs and total damages under various CSRM alternatives. This output is then used to estimate the benefits of each alternative. As an event-based Monte Carlo life-cycle simulation, Beach-fx fully incorporates risk and uncertainty. It is used to simulate future coastal storm damages at existing and future years and to compute accumulated present worth damages and costs. Storm damage is defined as the ongoing monetary loss to contents and structures incurred as a direct result of waves, erosion and inundation

caused by a storm event of a given magnitude and probability. The model also computes permanent shoreline reductions so that land loss benefits can be derived exogenously. These damages and associated costs are calculated over a 50-year POA based on storm probabilities, tide cycle, tidal phase, SLC, beach morphology and many other factors.

The future structure inventory and values are the same as the existing condition. This approach neglects any increase in value due to future development. Due to the uncertainty involved in projections of future development, using the existing inventory is preferable and considered conservative for Florida where coastal development has historically increased in density and value in real-dollar terms; however, the study area has approximately two undeveloped lots on Okaloosa Island and approximately 15 undeveloped lots in the Destin area. If these lots are built upon, additional damages could be introduced into the study area; however, there is too much uncertainty around the timing of building the structure, value, first floor elevation and construction type to establish assumptions regarding future structures.

The future-without project damages will be used as the base condition. Potential alternatives are measured against this base condition. The difference between without and with project damages will be used to estimate project benefits.

Once benefits for each of the alternatives are calculated, they will be compared to the costs of implementing the alternative. The Federally preferred plan is the plan that maximizes net benefits, also termed the NED plan. Net benefits are derived by subtracting the cost of any given alternative from the benefits of that alternative (benefits – costs = net benefits).

4.2.4.2 Model Assumptions

The list of items below presents the initial modeling assumptions used.

- Start year: The year in which the simulations begin is 2020. This year determines the starting shoreline position which will be impacted by standard erosion and storm forces throughout the POA. It is also the starting point for the sea-level rise projections.

- Base year: The year in which the benefits of a constructed Federal project would be expected to begin accruing, in this case 2025.

- Period of analysis: 50 years (2025 to 2074)

- Discount Rate: For plan selection, the Fiscal Year 2020 Federal Water Resources Discount rate of 2.75% was used.

- Damage Functions: Damage functions were developed by the Institute of Water Resources (IWR) Coastal Storm Damage Workshop, Coastal Storm Damage Relationships based on expert elicitation in 2002 and were used in combination with damage functions developed for the North Atlantic Coastal Comprehensive Study.

- Coastal Armoring: No coastal properties are armored or will be armored in the future.

- Number of time rebuilding allowed: 50

- Future development: Future development has not been assumed to occur on currently vacant lots. The damages and benefits are based only on existing infrastructure.

- Content-to-Structure value ratios: site specific surveys about content values are not available, content values were assumed to be 50% of the structure value for all structure types. This is consistent with other Beach-fx analyses in Florida.

- Sea Level Rise (SLR): Analysis based on USACE intermediate curve.

4.2.4.3 Risk and Uncertainty

Uncertainty was quantified for errors in the underlying components of structure values for residential and nonresidential structures, content to structure value ratios for residential and nonresidential structures, depth-percent damage relationship for both residential and nonresidential structures, and first floor elevations for all structures. Beach-fx used the uncertainty surrounding these variables to estimate the uncertainty surrounding the storm-damage relationships developed for each reach in the study area. The list below shows uncertainty parameters around key inputs for the economics.

- Structure Value: 10-15% plus or minus the most likely value
- Content Value: 10-15% plus or minus the most likely value
- Time to Rebuild: most likely value 1.5 years; minimum 1 year and maximum 2 years.
- First Floor Elevation: 10% plus or minus the most likely value

4.2.4.4 Emergency Nourishment

In the without project condition, it is assumed that emergency nourishment will be performed as needed. When a disaster is declared for a particular county, the FEMA can provide up to 6 cy per square foot to mitigate for loss. The NFS indicated that, in

the absence of a Federal project, they will acquire emergency funding, possibly through the FEMA, to pursue nourishment action after a significant storm.

4.3 Engineering Analysis

The engineering analysis conducted for the detailed evaluation of alternatives consisted of gathering information necessary to utilize within established models to provide input for benefit determination. Once the modeling process was complete, the results were reviewed for consistency and reasonableness and, if needed, new or revised data was obtained, and the models were rerun. More detail about this process can be found in Appendix A, Engineering.

4.3.1 Modeling Data

Various data were used in the engineering analyses and included below is a discussion of specific data used. The information herein is not exhaustive, but a more detailed presentation can be found in Appendix A, Engineering.

4.3.1.1 Tides

Okaloosa County astronomical tides are characterized as diurnal (one high and one low per day). No tidal reference stations are present within the study area. The NOAA station 8729840 in Pensacola, FL is used for the tidal datums and historic water levels in this study.

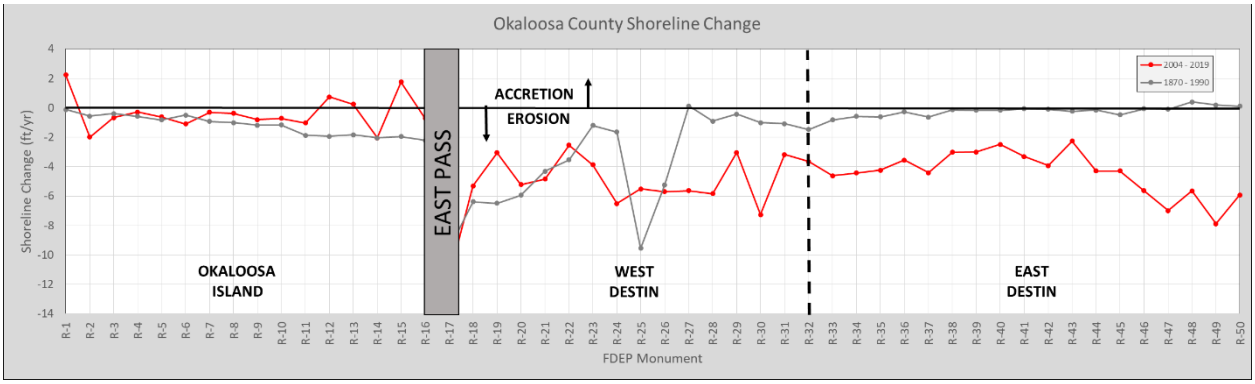
4.3.1.2 Surveys and Imagery

Beach profile surveys are taken along a single transect that starts from the dry portion of the beach and extends into the water. These surveys result in distance-elevation coordinates that characterize beach conditions such as dunes, berms, and offshore bars. Beach surveys for Okaloosa were available that ranged from 1995 to 2017 originating from the FDEP. The surveys ranged from R01 on the western end of Okaloosa Island to R50 on the Walton County line for a total of 48 survey lines.

4.3.1.3 Historic Shoreline Analysis

The Okaloosa County shoreline is relatively stable except for a small section adjacent and east of East Pass. A linear rate of regression analysis using historic shorelines obtained from the FDEP confirms this observation. Shoreline position data obtained from the FDEP uses the R-monument locations as a baseline and provides the distance seaward to the Mean High Water Line (MHWL). FDEP data were found to be higher resolution and accuracy than the USGS shoreline database. Historic shoreline data for Okaloosa County are available on the FDEP website in an ASCII format and includes data source and scale. The raw data were filtered for the R-monuments within the project area (R01-R50) to remove erroneous data and correct data inconsistencies.

Linear rates of regression were then computed across defined temporal ranges. The 1870-1990 temporal range and, for comparison, the 2004 – 2019 temporal range is



plotted in Figure 4-6.

Figure 4-6. 1870-1990 and 2004-2019 Shoreline Change Rates vs. R-Monument Locations

4.3.1.4 Representative Profiles

Representative profiles are areas of morphologic and economic similarity. Each area is represented by a single cross-shore profile and is composed of two segments (upper and submerged profiles). The upper beach profiles represent the initial project conditions and are developed from the most recent profile surveys available (in this case FDEP surveys from 2017). The 50 surveys were initially reduced to 7 profiles. After further observation profile 2 and profile 3 were combined due to similarities in the average profile shape. The profiles in each area were aligned at the dune and berm features present and averaged together. The resulting averaged features were then combined to develop the representative upper beach profiles based on the survey data from the Destin survey from 2017 and the Okaloosa Island survey taken in 2016.

The submerged profiles were developed from spatially averaged surveys from the Destin survey of 2017 and the Okaloosa Island survey of 2016 to represent the offshore. Through an analysis of the submerged profiles, it was decided that there would be six unique submerged profiles. Similar to the upper beach profiles, the submerged profiles were developed by averaging the aligned profiles at key morphologic features (inshore bar, central bar, and if present offshore bar). The submerged profiles were averaged spatially. A summary is shown in Table 4-6 giving the FDEP R-monuments used for each profile.

Table 4-6. Okaloosa County CSRM Representative Profile Delineations by R-Monument

Reach	Station Start	Station End
RP1	R01	R06
RP2	R07	R15
RP4	R17	R26
RP5	R27	R30
RP6	R31	R38
RP7	R39	R50

Beach-*fx* uses a simplified representation of the beach profile such that key morphological features are defined by single values such as dune height, dune width, berm width, etc. (Figure 4-7).

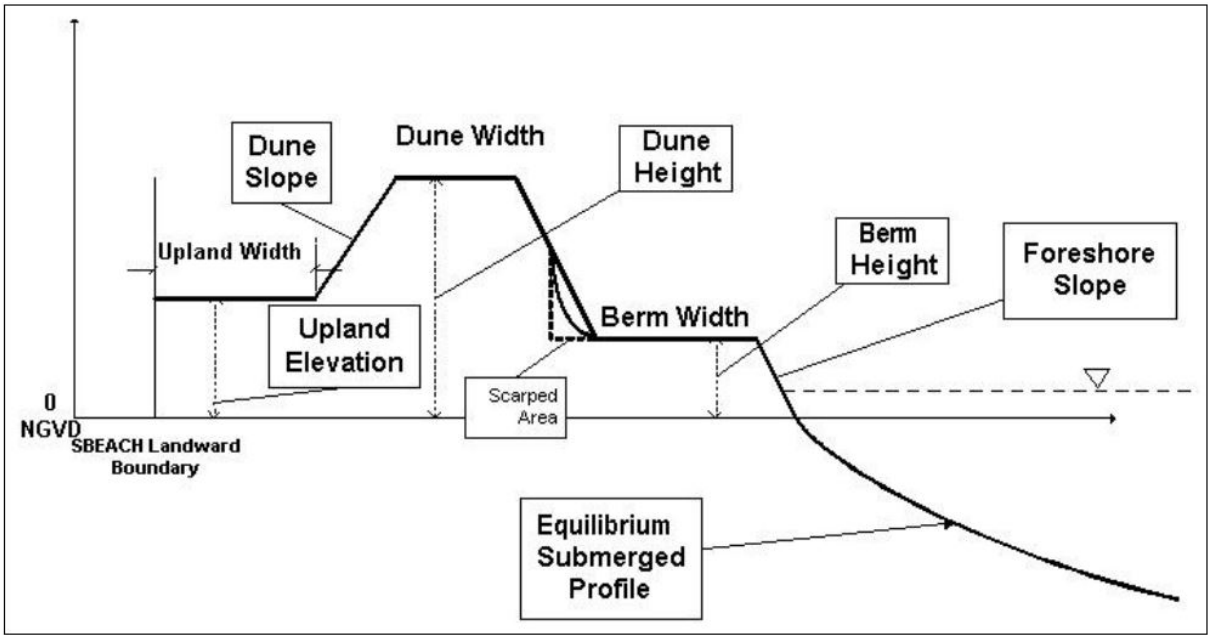


Figure 4-7. Beach-*fx* Idealized Profile Definitions

4.3.2 Beach-*fx* Monte Carlo Simulation Model

4.3.2.1 Model Overview

The planning model Beach-fx was used to analyze both the future without project conditions and planned nourishment alternatives. Beach-fx is an engineering economic model that implements Monte-Carlo methods to quantify the uncertainty associated with future beach renourishment projects (Gravens et. al. 2007). The model is event-driven, and provides estimates of storm damages along coastal zones. Beach-fx simulates the condition of a beach profile, as it evolves due to storms and background erosion. Typical Beach-fx simulations include between 100-300 lifecycles, each with a unique sequence and number of storm events. Across all lifecycles, the model returns on average historically observed rates (number and frequency of storm events, shoreline erosion, etc.).

Input to Beach-fx includes meteorology, coastal morphology, economics, and planning processes. A simplified model architecture of Beach-fx can be seen in Figure 4-8. Beach-fx is a data-driven model, in that it relies on relational databases that are accessed at runtime. The input database (IDB) contains information that defines the study area, and includes initial conditions, plausible storm events, storm occurrence rates, and damageable elements. The output database (ODB) stores various model simulation statistics and output.

Within Beach-fx, no profile response computations are performed at runtime. Rather, the shore response database (SRD) is populated externally and contains the profile responses to storm events as well as cross-shore profiles of damage driving parameters (inundation, erosion, and waves). At runtime, the SRD serves as a lookup table providing post-storm profile information and cross-shore profiles of damage drivers for each pre-storm profile and storm event.

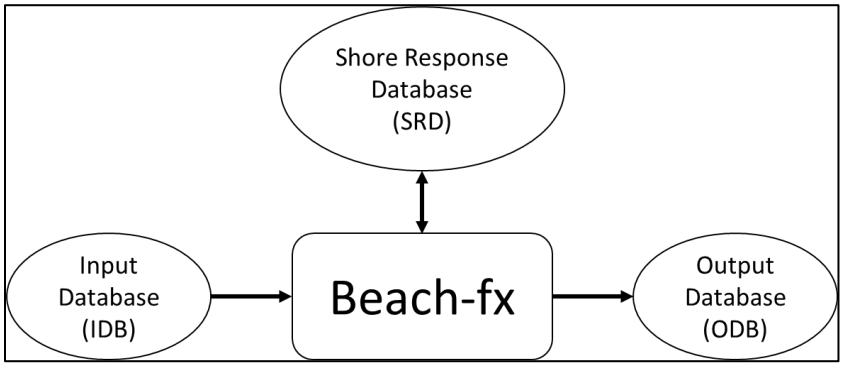


Figure 4-8. Simplified Beach-*fx* Computational Architecture

4.3.2.2 Storm Response Database (SRD)

The SRD is a relational database used to pre-store results of SBEACH runs for all plausible storms, and a range of pre-defined profiles, as expressed by ranges of berm width, dune width, and dune height. Two kinds of results from SBEACH are stored: changes in berm width, dune width, dune height, and upland width, and cross-shore profiles of erosion, wave height, and water depth. The SRD is site and study specific, that is, it is created for each shore protection study. The SRD, once generated, is used as a 'lookup table' by the Monte Carlo simulation. Within the Monte Carlo simulation, the shoreline modifications are tracked continuously by the simplified profile representation (primarily dune width and height and berm width). The driving force for profile change is the list of plausible storms. These plausible storms are then used to create SBEACH input, which is run against a range of profiles that is expected to cover the range of natural and managed beach and dune profiles. For each such pair (storm and profile), both simplified and detailed SBEACH results are stored in the SRD. The output of SBEACH for a given run is an ASCII file that describes the initial, final, maximum, and minimum cross-shore profiles, and the water and wave heights along the cross-shore. This file must be post-processed by software that extracts the values of changes in berm width, dune width, and dune height, and stores the information in the SRD.

4.3.3 Storm Induced Beach Change Model (SBEACH)

4.3.3.1 Storm Suite

A comprehensive suite of synthetic tropical storm surge hydrographs spanning the entire probabilistic space was previously developed through the application of high-fidelity numerical models for hydrodynamics (ADCIRC; Hench, 1994) and waves (STWAVE; Massey, et. al. 2011) in support of the Alabama Coastal Comprehensive Plan. The numerically generated storm surge hydrographs resulting from this study will be stored in the Coastal Hazards System (https://chs.erdc.dren.mil). Each of the plausible tropical storms have been assigned spatially dependent relative probabilities of occurrence based on the storm characteristics and intensities (Zhang et. al. 2018). The storm set was reduced to 11 using this design of experiment method. The fit given by the reduced storm set against the hazard curve for storm surge is shown in Figure 4-9 and Figure 4-10 by the dotted lines. As more storms are added the curve matches the original curve more closely.

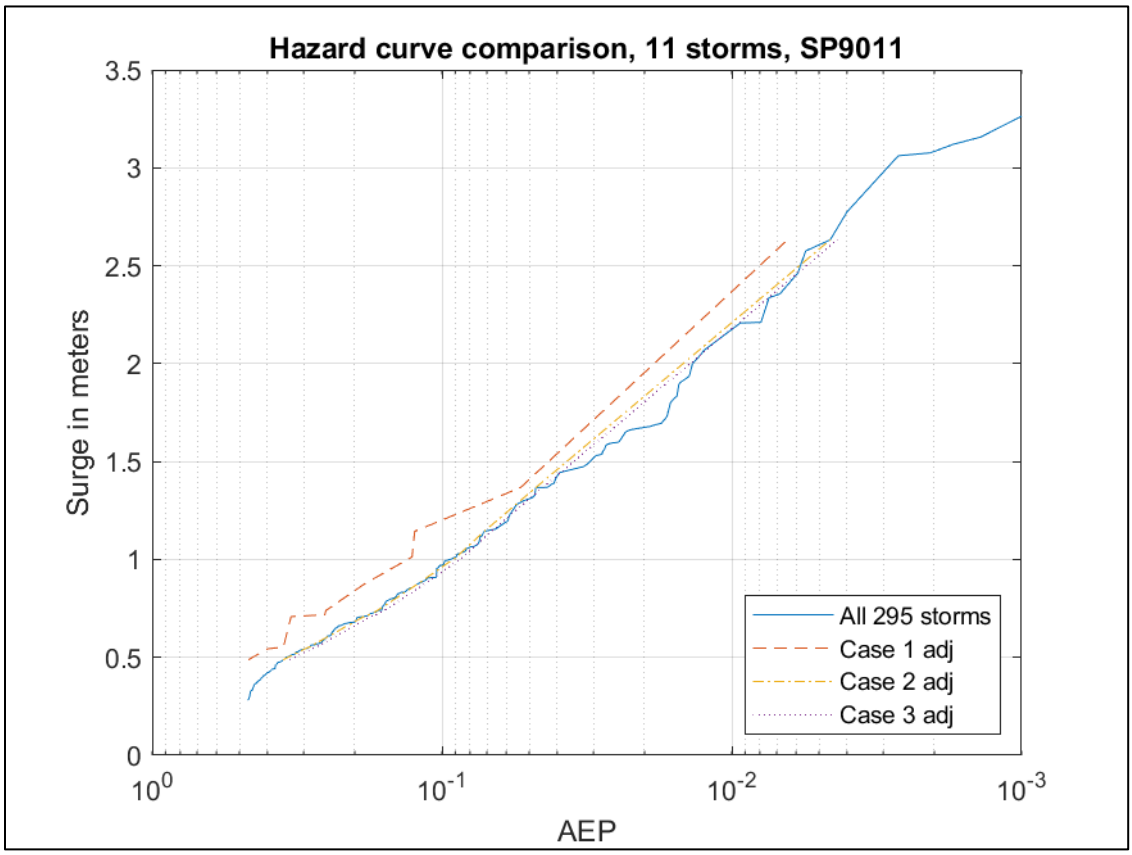


Figure 4-9. Surge vs. Annual Exceedance Probability Comparison, SP9011

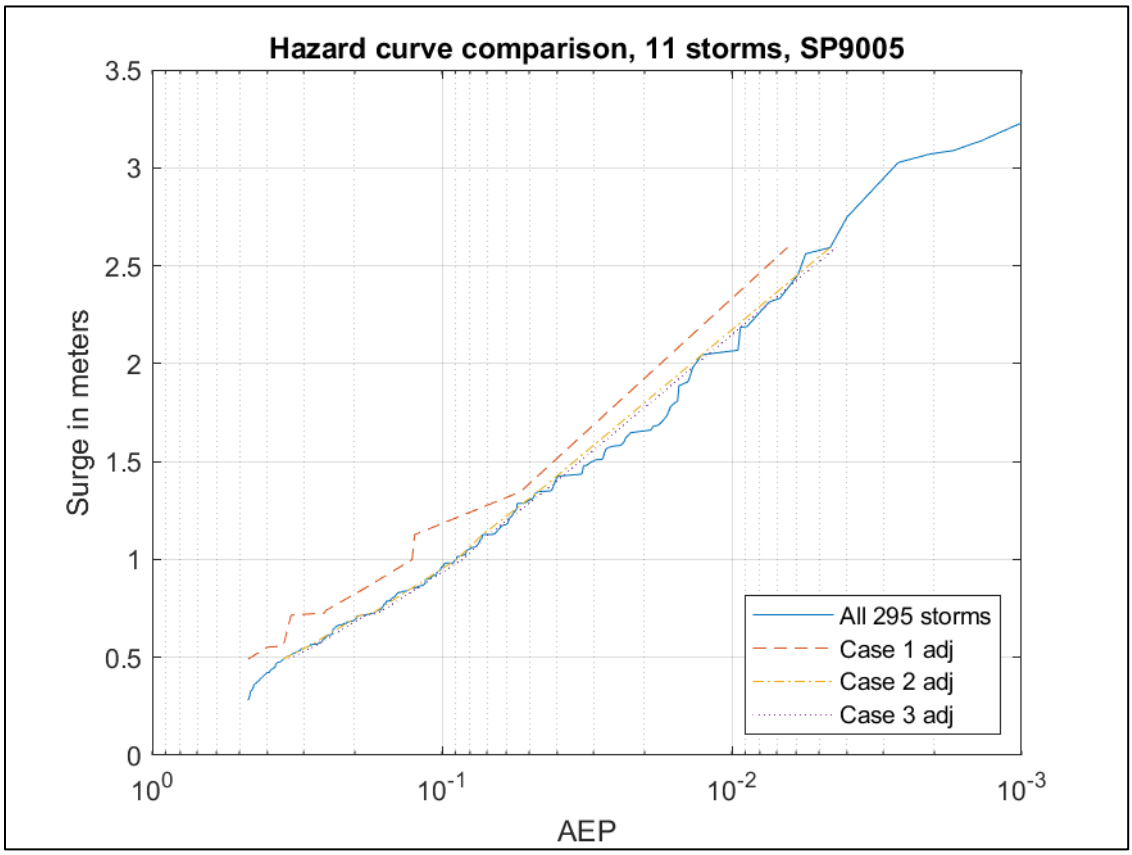


Figure 4-10. Surge vs. Annual Exceedance Probability Comparison, SP9005

4.3.3.2 Model Setup

A single save point was selected to provide environmental forcing for Beach-fx. The selection of a save point considered both the water depth and spatial location. Save point 443 (395027.31m East and 156107.03m North State Plane Zone 903) was chosen to represent the storm climatology since it met the water depth criteria at approximately 35 ft and was at a good representative location for the study. The save point is located offshore of Reach 1, and the wave climate is consistent across the study zone.

4.3.3.3 Storm Seasons

Beach-fx assigns storms by the probabilities given in the storms seasons database. These probabilities are derived initially from the design of experiment performed to get the representative storm suite. The sum of these probabilities given the estimated number of storms per year at 0.3381. These were then weighted against historical occurrences and placed into the seasons input file accordingly.

SECTION 5.0 ALTERNATIVE COMPARISON

The screening of the alternatives in the focused array in Section 4.1.2 resulted in the development of the Final Array of Alternatives as shown in Table 4-4.

5.1 Evaluation and comparison of Final Array of Alternatives

Evaluation of the Final Array of Alternatives was conducted utilizing Beach-*fx,* the USACE approved planning model for analyzing the physical performance and economic benefits and costs of CSRM projects. The model is data driven in that all site-specific information is contained within the input databases. Beach-*fx* integrates the engineering and economic analyses and incorporates uncertainty in both physical parameters and environmental forcing, which enables quantification of risk with respect to project evolution and economic costs and benefits of project implementation.

For the evaluation of the Final Array, the coastal shoreline of Okaloosa County was divided into two developed reaches, Okaloosa Island and Destin. The Destin reach was further divided into two study reaches, West Destin, and East Destin. All the reaches were divided into Beach-*fx* model reaches of about 1,000 feet based on the FDEP monuments. The Okaloosa Island Reach consisted of those lands between FDEP monuments R01 through R15. The West Destin Reach consisted of those lands between FDEP monuments R18 through R32 and the East Destin Reach consisted of FDEP monuments R33 through R50. Figure 5-1 and Figure 5-2 present the Okaloosa Island and Destin Reaches, respectively.

Within the Beach-*fx* model reaches, 739 DE were identified that could be subjected to storm damages. A summary of the DE and the approximate structure and content value for the reaches is shown in Table 5-1.

Table 5-1. Beach-*fx* Structural Elements

Study Reach	FDEP Monuments	Structural Elements	Total Value
Okaloosa Island	R01 - R15	231	$1,363,217,000
West Destin	R18 - R32	188	$1,671,536,000
East Destin	R33 – R50	318	$494,532,000

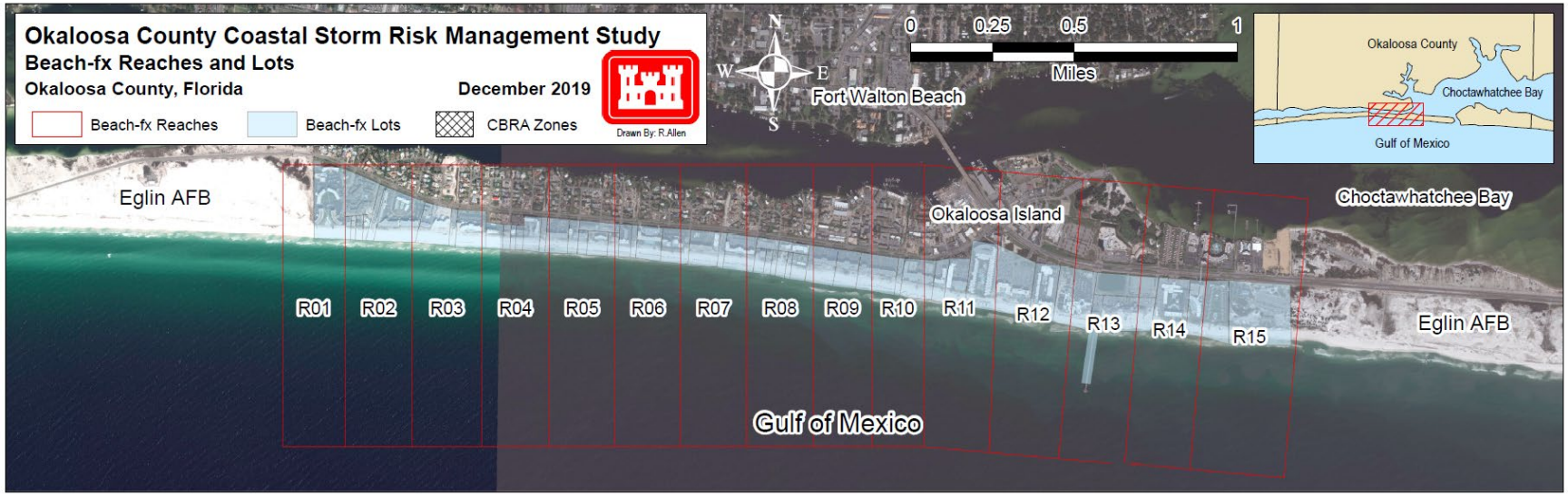


Figure 5-1. Okaloosa Island Beach-*fx* Reaches

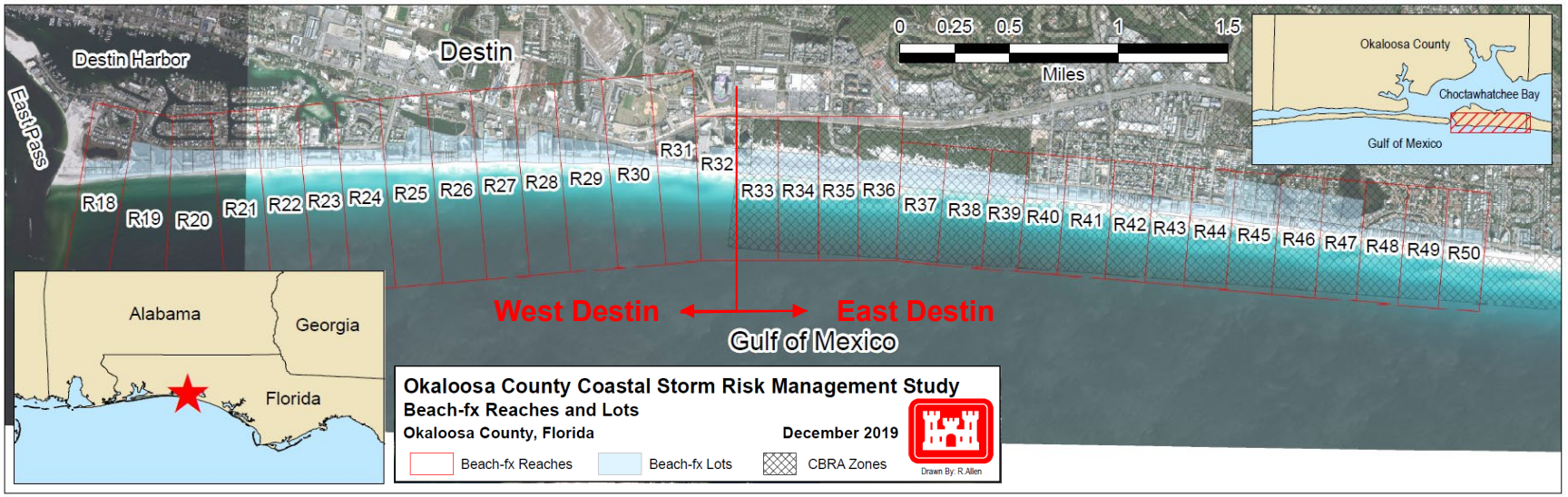


Figure 5-2. Destin Beach-*fx* Reaches

The Beach-*fx* analysis of Alternatives 1 and 2 considered a 50-year POA and a Discount rate of investment for Federal water resource projects of 2.75%. The Beach-*fx* analysis considered several profile components for determination of a plan that would maximize net benefits and the results were essentially an optimization of these components. These components included dune elevation, dune width, and berm width. To quickly develop the TSP, some benefit and cost information was not included as it was not readily available and would have proven time consuming and expensive for this level of evaluation; this included recreation, land loss benefits, real estate costs, planning, engineering and design (PED) costs, construction management (CM) costs, and operation and maintenance (O&M) costs. Because this CSRM project includes an initial nourishment and future renourishments, the values resulting from the Beach-*fx* analysis for the future renourishments were converted to a present value for the initial evaluation of the Final Array of alternatives. The initial evaluation of the East Destin Reach determined that the values resulting from the Beach-*fx* analysis were extremely low and could not support an economically justified project. As a result, the East Destin Reach was screened from further consideration. The initial evaluation of the West Destin Reach determined that the values resulting from the Beach-*fx* analysis did not produce positive net benefits. Considering the values that were not yet determined, land loss, recreation, West Destin was retained for further evaluation.

During further evaluation, the Beach-*fx* values for the Okaloosa Island Reach and the West Destin Reach were converted to average annual equivalent values for benefits, cost, and net benefits. For the Okaloosa Island Reach, the results of the Beach-*fx* analysis are shown in Table 5-2. The East Destin initial results are provided for informational purposes in Table 5-3 and the Beach-*fx* analysis results for West Destin are shown on Table 5-4.

Table 5-2. Okaloosa Island Beach-*fx* Analysis Results

Alternative	Option Number	Dune Height	Dune Width	Berm Width	AA Benefits	AA Cost	AA Net Benefits
2	1	14	10	10	$515,900	$345,200	$170,700
2	2	14	10	20	$543,900	$410,200	$133,700
2	3	14	10	30	$557,400	$464,300	$93,100
2	4	14	10	40	$598,400	$525,000	$73,400
2	7	15	10	10	$727,400	$570,100	$157,300
2	8	15	10	20	$725,800	$667,300	$58,500
2	10	16	10	10	$735,700	$912,100	$(176,400)

NED Component

Table 5-3. East Destin Beach-*fx* Analysis Results

Alternative	Option	Berm width	Average PV* Total Project Benefits	Average PV* Total Project Costs	Average PV* Net Benefits	Benefit to Cost Ratio (BCR)
1	A	10	$96,000	$4,475,000	($4,379,000)	0.02
1	B	20	$890,000	$7,031,000	($6,141,000)	0.12
1	C	30	$1,058,000	$9,801,000	($8,743,000)	0.10
1	D	80	$1,940,000	$20,694,000	($18,754,000)	0.09

***Present Value**

Table 5-4. West Destin Beach-*fx* Analysis Results

Alternative	Option Number	Dune Height	Dune Width	Berm Width	AA Benefits	AA Costs	AA Net Benefits
2	3	14	10	30	$667,200	$1,360,700	$(693,500)
2	4	14	10	40	$670,700	$1,393,900	$(723,200)
2	7	15	10	10	$718,000	$1,568,400	$(850,400)
2	8	15	10	20	$738,600	$1,604,300	$(865,700)
2	9	16	10	10	$735,700	$1,816,000	$(1,080,000)

NED Component

5.1.1 NED Benefits and Costs of the TSP

Using the Beach-*fx* results developed in the previous section, that valuation allowed the narrowing of the alternatives to those providing the highest net NED benefits in two of the study reaches, Okaloosa Island and West Destin. The alternative producing the greatest amount of net benefits for each reach was selected as a component of the NED plan. Table 5-5 presents the average annual benefits, average annual costs, and the BCR for the NED plan. It should be noted that these values do not include gross appraisal real estate costs, PED, CM, and O&M costs. The NED Plan was selected as the TSP.

Table 5-5. NED Benefits and Costs

Planning Reach	FWOP Average Annual Damages	FWP Average Annual Damages	Average Annual Project Benefits	Average Annual Costs	Average Annual Net Benefits	BCR
Okaloosa Island	$803,600	$287,700	$515,900	$345,200	$170,700	1.5
West Destin	$1,016,200	$349,000	$667,200	$1,360,700	($693,500)	0.5

5.1.2 Consideration of RED, EQ and Other Social Effects (OSE)

In addition to the NED benefits, consideration should be given to the other 1983 Principles and Guidelines Accounts, RED, EQ and OSE. For the Final Array, the "No Action" Alternative provides no improvement for any of the accounts. Alternative 1 was eliminated from further consideration leaving only Alternative 2 to consider for the RED,

EQ, and OSE accounts. For RED, the USACE Regional Economic System (RECONS) was utilized to evaluate regional economic impact and contribution associated with expenditures for the RP. It is estimate that project expenditures would support a total of 272 full-time equivalent jobs, $19,209,000 in labor income, $23,590,000 in the gross regional product, and $35,780,000 in economic output in the local impact area. More broadly, these expenditures support 483 full-time equivalent jobs, $36,788,000 in labor income, $48,041,000 in the gross regional product, and $80,327,000 in economic output in the nation.

For EQ, there would be limited temporary impacts during construction, improvement to biological resources and aesthetics, and no impact to cultural and historic resources as a result of project implementation. These changes would not alter the selected plan. For OSE, there would be no negative impacts on community cohesion or growth, minor to no appreciable impacts on tax or property values, and small positive impact to front row residents who are likely to incur less impacts from erosion and wave action due to the project implementation. These changes would not alter the selected plan.

5.2 Refinement of TSP

Once the TSP was identified and justified, further refinement of the TSP was performed to develop the RP. This included refinement of the dune slopes and inclusion of planform erosion rates that account for longshore erosion and end losses to the proposed berm. Refinement of the dune slopes resulted in a modification from a 10 H on 1 V slope to a 5 H on 1 slope for the dunes on both West Destin and Okaloosa Island reaches. This dune slope is more consistent with past dune permitting actions. This reduced fill volumes while only having a minor effect on CSRM benefits. The planform rates increased erosion and increased the fill volume required through the lifecycle of the project while reducing benefits. These refinements offset one another but resulted in an overall drop in benefits to the TSP. Figure 5-3 and Figure 5-4 show the refined profiles for Okaloosa Island and West Destin with new dune slopes.

The high sea level curve was also used for further analysis of the TSP. Although the project was formulated on the intermediate curve, it was noted that this area has been tracking on the high curve. In coordinating with the climate change community of practice and the vertical study team, the decision was made to utilize the high curve for further refinement of the TSP. Beach-fx was used to model the high sea level curve and resultant benefits, quantities and costs were used for estimation of the net benefits and BCR. The structure to content valuation ratio was changed to reflect IWR 96-R-12, IWR Report “Nonresidential Flood Depth-Damage Functions Derived from Expert Elicitation” (2012).

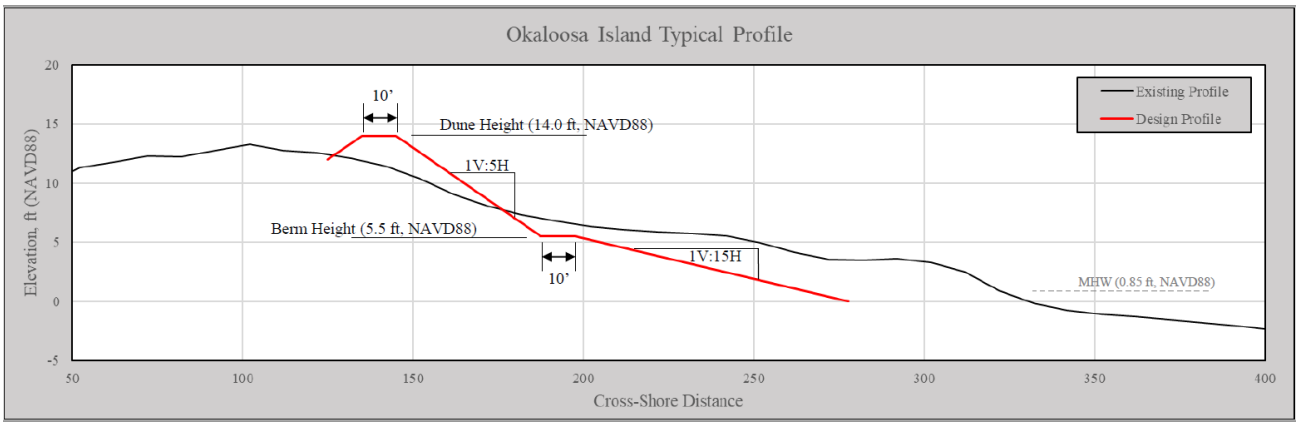


Figure 5-3. Refined TSP Typical Profile for Okaloosa Island

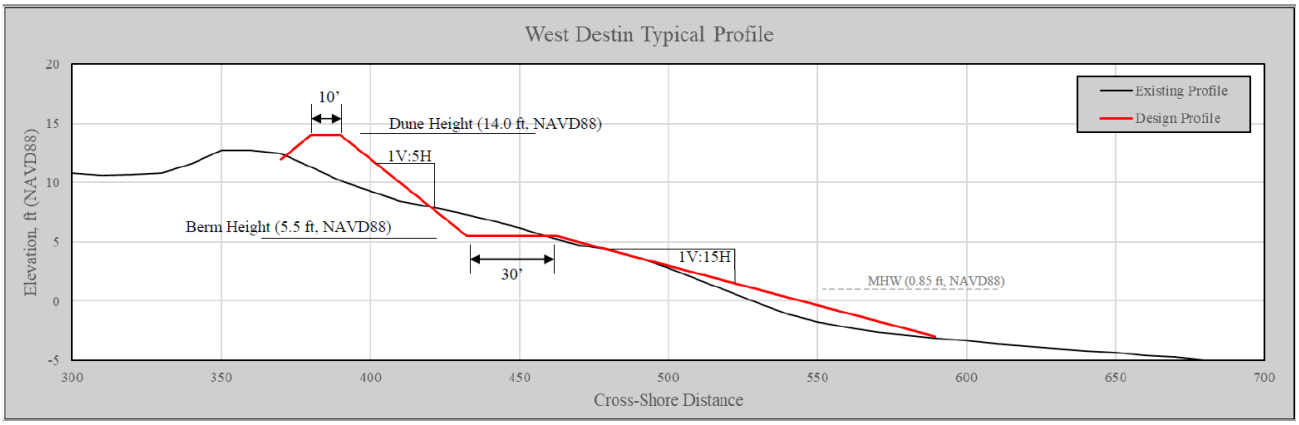


Figure 5-4. Refined TSP Typical Profile for West Destin

Planform rates are only applied to the West Destin reach in beach-fx as the design berm width for the Okaloosa Island reach is smaller than the existing beach width and any berm width extension in a future condition is expected to behave similar to background erosion rates. The West Destin reach design berm width will extend beyond the existing width and is expected to experience shoreline change rates more than the background erosion rate.

Another refinement to the TSP is changing the dune slope from 1V:10H to 1V:5H. This dune slope is more consistent with past dune permitting actions. The planform rates and dune slope change information incorporated into Beach-*fx* for modeling are documented in Appendix A, Engineering.

After the initial identification of the TSP, the Economic Guidance Memorandum, 21-01 was published which changed the Federal Interest Rate to 2.50%. Therefore, Beach-*fx*

modeling was conducted again using the FY2021 value for discounting and incorporating the refinements to the TSP as noted above. Table 5-6 shows the refined TSP cost, benefits, and net benefits at the high sea level curve but does not include real estate, PED, and CM or land loss benefits.

Table 5-6. Refined TSP Cost, Benefits and Net Benefits – Average Annual Equivalent (AAEQ) 2.5%

Planning Reach	Alternative	Option	Beach-*fx* Reaches	Average Annual Benefits	Average Annual Costs	Average Annual Net Benefits	BCR
Okaloosa Island	2	1	R01-R15	$1,294,600	$494,800	$799,800	2.6
West Destin	2	3	R18-R32	$673,800	$2,104,300	($1,403,600)	0.3

Note: Excludes Real Estate, PED, and CM costs. Does not include land loss benefits.

Applying plan form rates and changing the dune slope initiated the need for another look at the renourishment cycle. A minimum volume threshold of 80 percent retention was estimated to maintain the dune due to erosion rates. Once the threshold was met, a nourishment event was triggered. A free variable was used to estimate an average number of planned nourishments over the life cycle. This produced an average of 4 planned nourishment events. Next, modeling was performed that set the planned nourishment to a 9-year, 10-year and 11-year cycle to identify the planned nourishment cycle that produced the highest net benefits. Table 5-7 shows the average annual benefits, costs and net benefits that resulted from the planned nourishment optimization modeling. The results of the analysis indicated that a renourishment cycle of 10 years would be the optimal renourishment cycle. West Destin drives the renourishment cycle for the entire project.

5.2.1 Sand Quantity Required

The estimated required volume of sand for the RP was calculated using the Beach-*fx* simulations and based off 2019 LiDAR surveys conducted by the USACE, Mobile District. The resulting volume of sand needed through the life of the project is projected to total about 11,033,000 cy. This volume assumes the USACE high SLC curve as a factor in the amount of material needed over the lifetime of the project; however, if sea

level change occurs at a more moderate or low rate, the values required for the project's lifecycle may be smaller than noted here or in Section 7.3, Appendix A, Engineering.

Table 5-7. Optimized Planned Nourishment Cycle – AAEQ 2.5%

Okaloosa Island[1]			
	AA Benefits	AA cost	Net Benefits
9-year	$1,363,000	$613,000	$749,000
10-year	$1,295,000	$495,000	$800,000
11-year	$1,269,000	$583,000	$686,000
West Destin			
	AA Benefits	AA cost	Net Benefits
9-year	$712,000	$2,314,000	$(1,602,000)
10-year	$674,000	$2,104,000	$(1,431,000)
11-year	$549,000	$2,243,000	$(1,694,000)

[1] - Does not include real estate, PED, and CM

5.2.2 Residual Risk

Residual risk is the risk that remains after the proposed CSRM is implemented. Residual risk includes the consequence of capacity exceedance as well as consideration of project performance, robustness, and resiliency. For the RP, residual risk remains in that project implementation is not expected to eliminate all damages. Approximately 46% percent of residual risk remains for Okaloosa County and approximately 68% remain for West Destin. Project implementation on Okaloosa Island mainly reduces flooding and project implementation on West Destin reduces flooding and wave attack.

The RP recommends a dune height of 14 feet along the project length. Water levels from flooding and waves are in some cases higher than 17 feet. This indicates flooding still overtops the dune and damage can still occur to structures in the future with project condition. Higher dune heights were evaluated during optimization and the most efficient dune height was 14 feet. Implementing a more costly higher dune decreased net benefits and therefore did not emerge as the NED plan. Similarly, additional measures (e.g., non-structural) added to the RP to reduce the residual risk were

assessed as not economically feasible. A graphical representation of the residual risk of the primary damage categories is shown on Figure 5-5 and Figure 5-6 for the Okaloosa Island reach and Figure 5-7 and Figure 5-8 for the West Destin reach.

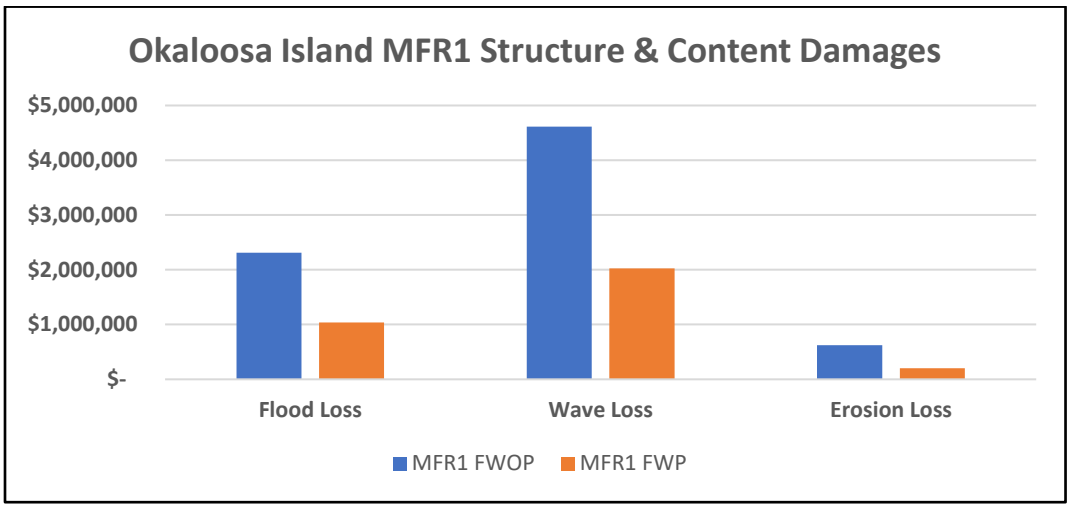


Figure 5-5. Residual Risk Okaloosa Island Damage Category MFR1

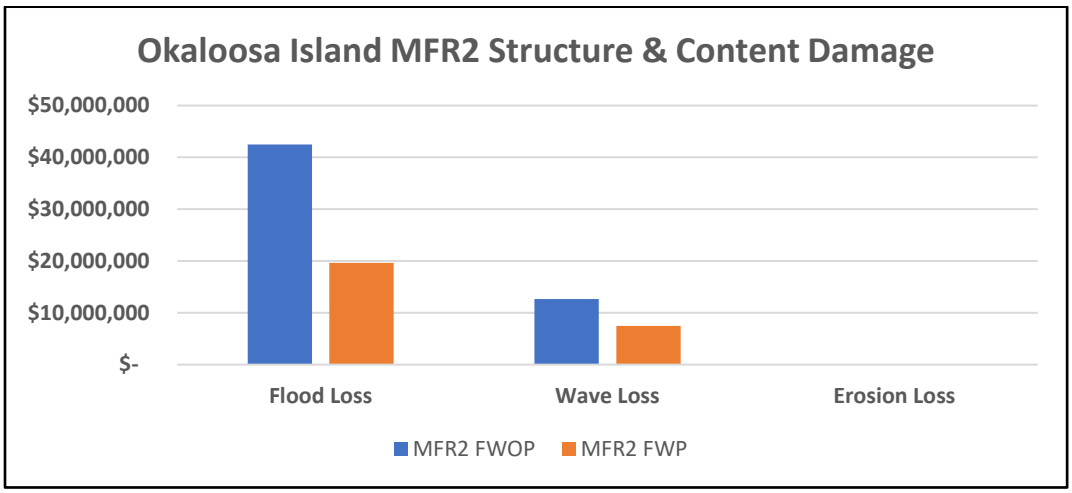


Figure 5-6. Residual Risk Okaloosa Island Damage Category MFR2

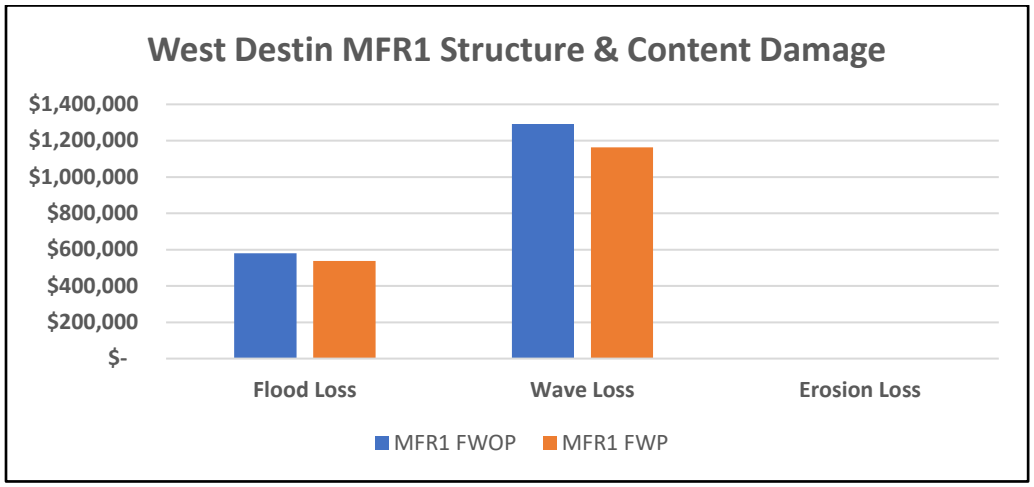


Figure 5-7. Residual Risk West Destin Damage Category MFR1

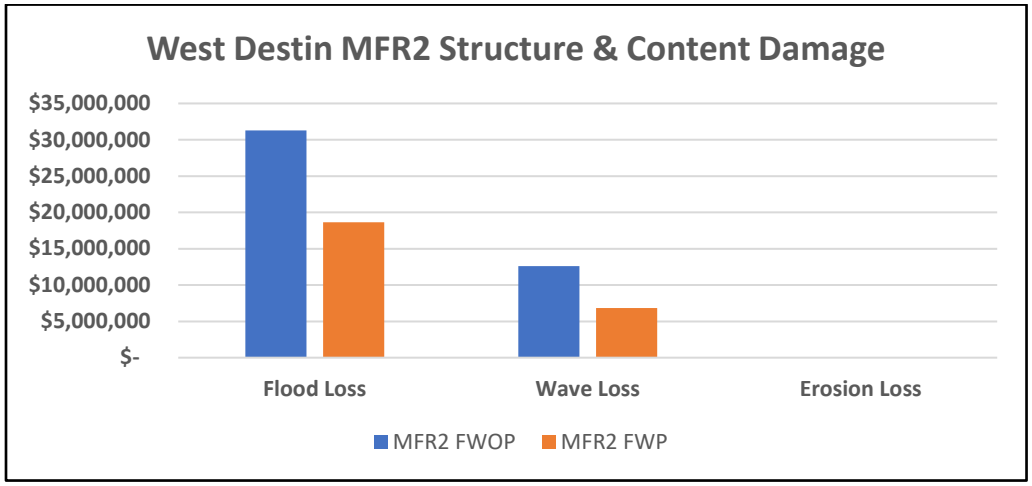


Figure 5-8. Residual Risk West Destin Damage Category MFR2

Additionally, there is risk that with RSLC, the protection afforded by the project may diminish with time particularly through the 100-year adaptation horizon. The NFS needs to consider future conditions and plan for actions that may be needed in the future. Section 6.2.3 provides further discussion on RSLC effects.

5.2.3 Land Loss Benefits

Erosion protection benefits include loss of land benefit which is measured as the value of near shore upland. A CSRM project that prevents the loss of land due to erosion accrues benefits to that project alternative. The land lost reduction benefit was

calculated for eroding reaches by calculating amount of land that would be lost during the study period times the value of near shore upland.

Prevention of land loss is a component of primary benefits but is not computed within the Beach-*fx* model. Therefore, the calculation of land loss benefits must be completed outside of the model and added to the structure and contents damage storm damage benefits as computed by Beach-*fx* to obtain the total benefits of the project. For land loss benefit estimation, two key pieces of information are needed: the square footage of the land lost each year and the market value of land in the project footprint.

For Okaloosa County, annual reduction in upland width across all Beach-*fx* study reaches was obtained from the Beach-*fx* output files based on modeled changes. ER 1165-2-130 does not allow land loss benefits to be claimed for beach areas subject to temporary shoreline recessions. Thus, changes in upland width are used as the appropriate measure of land loss.

Using the annual decrease in width for a specific reach and the corresponding length of shoreline eligible for land-loss benefits, the total annual square-footage of land lost is obtained on a reach-by-reach basis and then summed across all study reaches for a given project year. ER 1105-2-100 instructs that nearshore land values be used to estimate the value of land lost. The USACE, Mobile District Estate Division estimated a nearshore land value of $33.00 per square foot for the Okaloosa County front beach study area.

Using the analysis technique described for the USACE high sea level rise files, the total present value of land-loss benefits over the 50 year POA for Okaloosa Island is estimated at $344,000 AAEQ and for West Destin $1,309,000 AAEQ.

5.2.4 TSP Benefit and Cost Summary with Land Loss Benefits

This section shows the three categories of benefits to include storm damage reduction, reduction/elimination of emergency nourishment, and reduction in land loss benefits in comparison with the Beach-*fx* cost. Table 5-8. provides a summary of the AAEQ benefits of project implementation of dune and beach nourishment at Okaloosa Island and West Destin for Alternative 2.

Table 5-8. TSP Benefit and Cost Summary with Land Loss Benefits

Benefit Categories	Okaloosa Island[1]	West Destin[1]
Storm Damage Reduction	$1,144,600	$507,700
Reduction in Emergency Nourishment	$150,000	$166,000
Reduction in Land loss	$882,000	$1,309,000
Total Benefits	$2,176,600	$1,982,700
Average Annual Cost	$494,800	$2,104,300
Net Benefits	$1,681,800	($121,600)
BCR	4.4	0.9

1 Benefits are AAEQ at 2.5%. Does not include real estate, PED, and CM.

5.2.5 Sea Level Rise Considerations

The RP is evaluated with three different USACE SLR curves to show its performance in each scenario. Each of the SLR scenarios are considered equally likely to occur. The project was formulated, evaluated and compared with the USACE intermediate SLC. As previously noted, the project area based on the 19.5 year moving average of mean sea level has tracked more in line with the USACE high SLC and was used for refinement and developing detailed costs as provided in the Total Project Cost Summary (TPCS). Table 5-9 shows the RP Benefit and Cost for the different SLR scenarios. The TPCS was completed only for the high SLC, therefore the formulation cost that includes a unit cost and mobilization cost produced from Beach-*fx* based on estimated quantities are used in each scenario below to show the performance of each curve.

Table 5-9. Recommended Plan SLR Scenarios From Beach-*fx*

Okaloosa Island					
SLR Scenario	**AA CSDR Benefits**	**AA Land Loss Benefits**	**AA Cost**	**AA Net Benefits**	**BCR**
Low	$148,300	$245,000	$24,770	$368,500	15.9
Intermediate	$185,350	$344,000	$42,700	$486,600	12.4
High	$1,294,600	$882,000	$494,800	$1,681,800	4.4
West Destin					
SLR Scenario	**AA CSDR Benefits**	**AA Land Loss Benefits**	**AA Costs**	**AA Net Benefits**	**BCR**
Low	$301,700	$899,000	$962,700	$238,000	1.2
Intermediate	$417,700	$983,000	$1,217,800	$182,900	1.2
High	$673,700	$1,309,000	$2,104,300	$(121,600)	0.9

As shown in Table 5-9, the benefits and costs increase significantly for the high curve for Okaloosa Island. The land loss benefits are the same for Okaloosa Island due to the existing morphology of the beach. West Destin is not as sensitive to SLR as Okaloosa Island.

As noted above, each of the SLR scenarios are considered equally likely to occur. The project was formulated, evaluated and compared with the USACE intermediate SLC. As previously noted, since the moving average of mean sea level for the project area has tracked more in line with the USACE high SLC, it was used for refinement and developing detailed costs as provided in the Total Project Cost. If the high SLC does not occur the costs and benefits for the project would be closer to the intermediate results. Also, if the high SLC scenario does occur, then the RP may not be the plan that maximizes net benefits. Considering the earlier discussion on residual risk, if the high SLC was not to occur, based on Table 5-9 it would appear that the residual risk for the project would be greater.

SECTION 6.0 RECOMMENDED PLAN (RP)

A comprehensive review of the analysis was performed by the vertical team and the public and the vertical team endorsed the TSP (Alternative 2) as described in Section 5 to become the RP. The RP consists of berm and dune nourishment in the Okaloosa Island and West Destin reaches of the Okaloosa County shoreline shown in Figure 6-1. In the Okaloosa Island reach, the RP consists of providing a dune with a crest design elevation of 14 feet NAVD88 and a crest width of 10 feet with seaward and landward slope of 1V:5H; and a berm having a design crest width of 10 feet at a crest elevation of 5.5 feet NAVD88 then sloping seaward at 1V:15H. The Okaloosa Island reach extends approximately 16,500 feet between Eglin AFB property lines near FDEP monuments R-1 and R-15 with transitions of 450 feet on the Air Force property. The design profile for Okaloosa Island is shown on Figure 6-2. In the West Destin reach, the RP consists of providing a dune with a design crest elevation of 14 feet NAVD88 and a crest width of 10 feet with seaward and landward slope of 1V:5H, and a berm having a design crest width of 30 feet at a crest elevation of 5.5 feet NAVD88 then sloping seaward at 1V:15H. The West Destin reach extends approximately 16,000 feet from FDEP monument R-18 to R-32 with transitions of 450 feet at each terminus. The design profile for West Destin is shown on Figure 6-3.

6.1 Recommended Plan Cost Details

NED costs play a critical role in the evaluation and comparison of study alternatives. NED costs include both the financial and economic costs associated with a project throughout its lifecycle. Each of these types of costs and their sources are discussed in this section. For plan selection, fixed unit cost was used in Beach-*fx* modeling as well as mobilization and demobilization. Once the alternatives have been compared and the TSP identified, costs that were used in modeling require refinement.

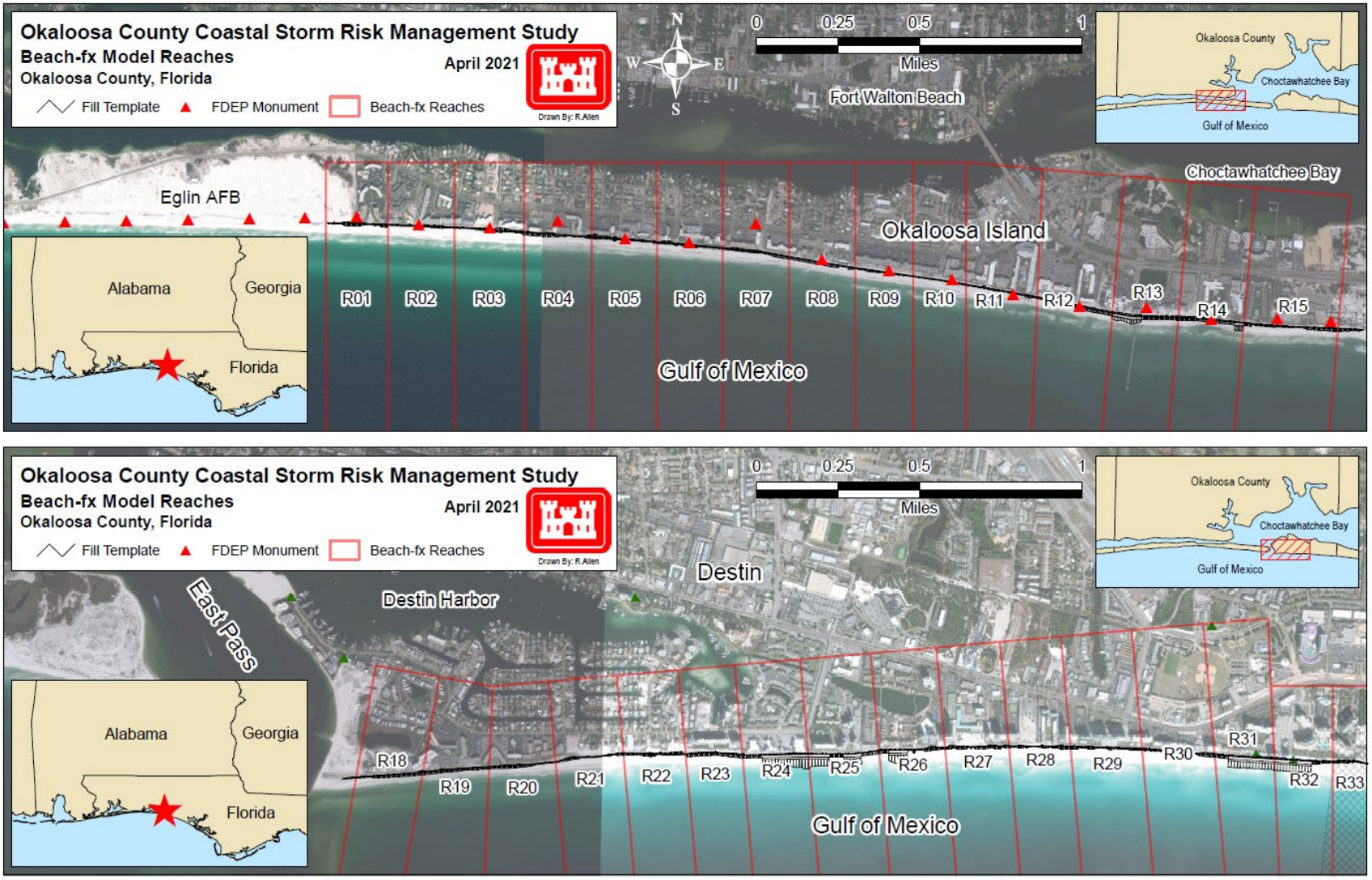


Figure 6-1. Recommended Plan Design Template Overview

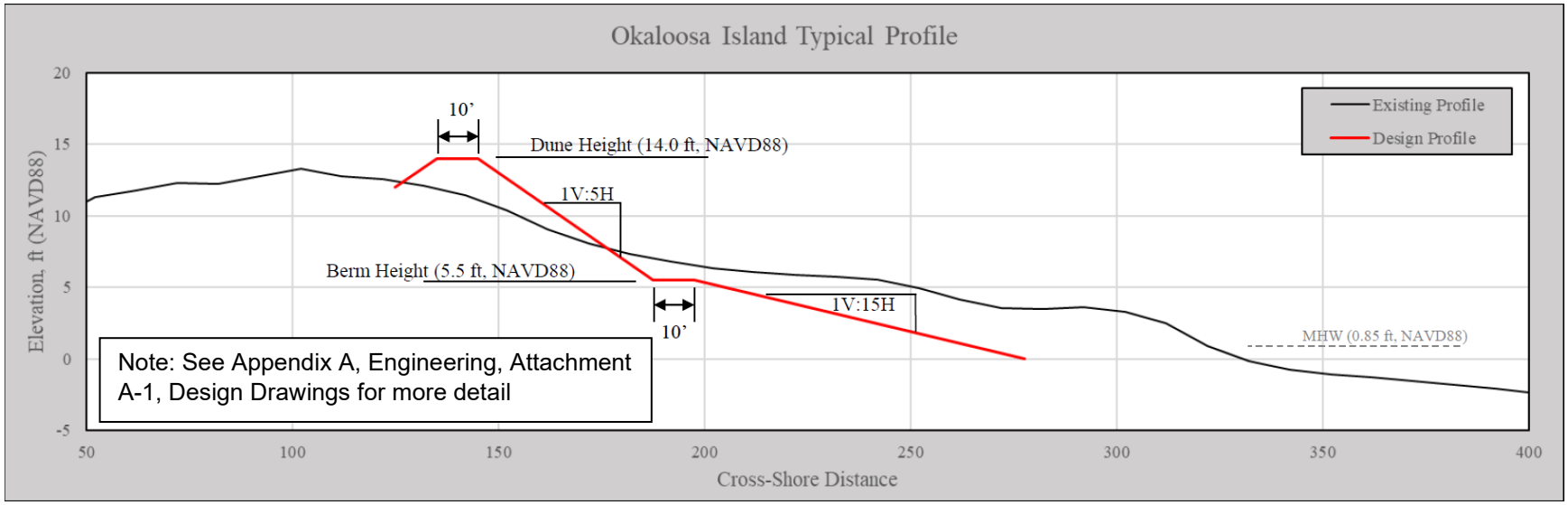


Figure 6-2. Okaloosa Island Typical Profile

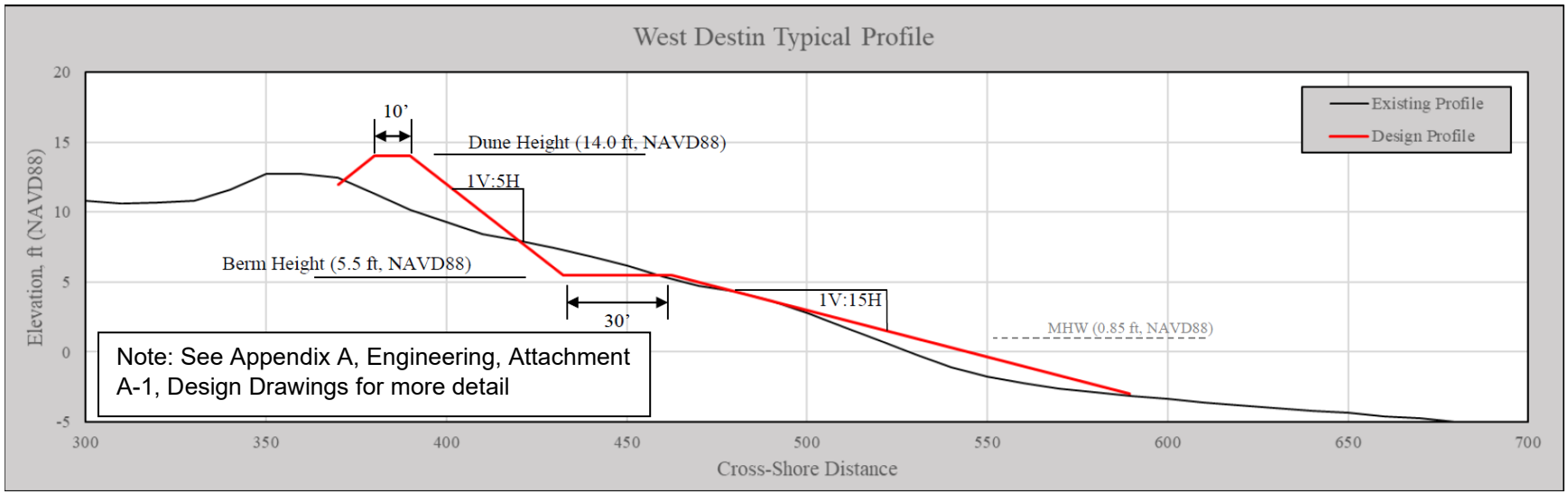


Figure 6-3. West Destin Typical Profile

6.1.1 NED Cost – Financial

Financial costs of the proposed project consist of the construction and mitigation costs accrued during construction of the project and over the lifecycle. More specifically these costs include:

- Land Construction Costs
- Dredging Costs
- Planning, Engineering, and Design Costs (PE&D)
- Construction Management (CM)
- Contingency Costs
- Mitigation Costs

The USACE, Mobile District Cost Engineering prepared the cost estimate for the proposed beach nourishment and dune raising/widening and beach renourishments in more detail than what was used in Beach-*fx*. The cost estimate prepared on the RP includes RE, PED, and CM costs. More details are available in Appendix A, Engineering. The sum of these costs is used to estimate Interest During Construction (IDC), which represents the economic cost of constructing a project. Together, these costs represent the estimated first cost of construction.

Financial cost not included above is the annual cost accrued over the life of a project due to Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) activities. OMRR&R was excluded from the list of financial costs above because it is not included in the calculation of IDC. IDC takes into account only those costs incurred during construction. For this study, OMRR&R was estimated to be about $87,000 per year for monitoring and other activities required to maintain the project. These requirements are summarized in the next section below. Detailed cost tables can be found in Attachment 2 to Appendix B, Economics.

6.1.1.1 Lands, Easements, Rights-of-Way, Relocations and Disposal Areas (LERRD)

There are 124 parcels anticipated to be impacted in the project area, totaling about 110 acres, in Perpetual Storm Damage Reduction Easements for the RP. A description of the required parcels can be found in Appendix D, Real Estate. The proposed perpetual beach storm damage reduction easements will be located landward of the MHWL or the Erosion Control Line (ECL) once the ECL is surveyed and recorded. The ECL is expected to be set by the FDEP during the PED phase of the project.

Material placed upon public lands seaward of the MHWL or proposed ECL will require a Consent of Use from the State of Florida. The Consent of Use grants the rights to place material on state-owned submerged lands in accordance with the beach nourishment plans submitted with the application for an ECL.

All acreage estimations are based on the average distance from the conceptual landward toe of the proposed dune to the MHWL. The MHWL normally corresponds with the ECL and is an estimate of where the ECL will be set. For planning purposes, an easement width extending from the maximum landward baseline to the MHWL is contemplated based on typical cross sections. In addition, at this stage, the conceptual nature of project design in the design template does not provide enough detail to accurately assess the acreage requirements.

The proposed CSRM project was been thoroughly reviewed by the USACE, Savannah District appraiser with additional review by USACE, Jacksonville District and USACE, SAD review appraiser. The appraiser determined a preliminary planning level estimation, included in the Baseline Cost Estimate for Real Estate (BCERE) given the preliminary nature of engineering design and limited understanding of contributing factors to cost. The NFS will receive credit towards its share of creditable real estate administrative project cost incurred for certification which will be based upon furnished documentation. For this particular project, the NFS administrative costs are those costs incurred for verifying ownership of lands, certification of those lands required for project purposes, legal opinions, title insurance, appraisals, condemnations, property analysis and/or other requirements to secure the land interests that will be necessary during the Preconstruction, Engineering and Design (PED) Phase. The LERRD requirements are conceptual at this time and subject to further refinement. Surveys would be needed at a later date in the PED phase. The current estimate of LERRD requirements totals $16,539,000, with $3,258,000 apportioned to Okaloosa Island and $13,281,000 apportioned to West Destin.

In the Okaloosa Island reach, transitions from the project template to the natural beach profile at either end will either be totally or partially on Air Force lands. The length of the transitions on Air Force lands are estimated to total 700 feet in length. The USACE, Mobile District has discussed use of this area with the Air Force and the NFS. The Air Force recommended their outgrant process as being the best path to gaining access and usage of the needed area. This process has been used by the NFS previously and is not expected to be a problem; however, the Air Force can not commit to project usage of their lands until the outgrant process has progressed to its conclusion. That process will be initiated by the NFS as part of the LERRD process.

6.1.1.2 Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R)

The projected OMRR&R costs for the NED plan are estimated to be $87,000 per year. The NFS will be responsible to maintain and operate the project to obtain the anticipated project benefits in accordance with the Operation and Maintenance Manual that will be prepared and provided by the USACE, Mobile District upon completion of project implementation. The NFS will be responsible for annual inspection of the project area as well as inspections following tropical storm events. The inspection will also include surveys to assess the amount of sand loss (or gain) annually or following storm events. To prevent reduction of protection afforded by dune and berm, the NFS will prevent development on or through the dune or berm. Annually, the NFS will till the beach area to reduce compaction for the purpose of turtle nesting. The NFS will also be responsible to ensure that the shoreline is maintained to be free of trash and debris to ensure recreation usage.

6.1.2 NED Cost - Economic

IDC represents an economic cost of building a project that is considered in the selection of the RP but does not factor in as a paid cost. IDC is the cost of the foregone opportunity to invest funds required to construct a project for another use. The hypothetical return on another investment, measured as IDC, is counted as an NED cost. As an economic, rather than a financial, cost, IDC is not considered in the determination of cost-sharing responsibilities.

IDC reflects that project construction costs are not incurred in one lump sum, but as a flow over the construction period. This analysis assumes that construction expenditures are incurred at a constant rate over the period of construction, an assumption which is supported by the *NED Manual for Deep Draft Navigation*. The calculation of IDC is summarized in the *NED Manual for Deep Draft Navigation.* Four months was assumed for IDC calculations based on USACE construction duration estimate.

6.1.2.1 Okaloosa Island Cost Details

The initial construction cost (in FY 2021 dollars) for Okaloosa Island is $8,359,000. The Okaloosa Island planning reach is not estimated to need a planned nourishment until year 2045. The estimated present value cost of planned nourishment for 2045 is $1,673,000, for 2055 is $6,357,000 and for 2065 is $7,145,000. The IDC calculated for four months at the 2.5 % discount rate is $26,000. The total of the nourishments plus IDC and O&M cost total $875,000 average annual equivalent. Table 6-1 summarizes this information.

Table 6-1. Okaloosa Island First Cost Details (PV)

	FY2021 Dollars
2025 Initial Construction	$8,359,000
2035 Planned Nourishment	$0
2045 Planned Nourishment	$1,673,000
2055 Planned Nourishment	$6,357,000
2065 Planned Nourishment	$7,145,000
Total First Cost	$23,535,000
Interest During Construction	$26,000
Total Economic Investment	$23,561,000
Average Annual First Cost	$831,000
Annual O&M	$44,000
Total Average Annual Cost	$874,000

Note: Values will be updated to match FY22 Cost Certification when the October 2021 Water Resources Discount Rate is available

6.1.2.2 West Destin Cost Details

The initial construction cost (in FY 2021 dollars) for West Destin is $22,067,000. The estimated present value cost of planned nourishment for 2035 is $10,002,000, for 2045 is $17,304,000, for 2055 is $15,795,000 and for 2065 is $11,532,000. The IDC calculated for four months at the 2.5 % discount rate is $68,000. The total of the

nourishments plus IDC and O&M total $2,750,000 average annual equivalent. Table 6-2 summarizes this information.

Table 6-2. West Destin Cost Details (PV)

	FY2021 Dollars
2025 Initial Construction	$22,067,000
2035 Planned Nourishment	$10,002,000
2045 Planned Nourishment	$17,304,000
2055 Planned Nourishment	$15,795,000
2065 Planned Nourishment	$11,532,000
Total First Cost	$76,701,000
Interest During Construction	$68,000
Total Economic Investment	$76,769,000
Average Annual First Cost	$2,707,000
Annual O&M	$44,000
Total Average Annual Cost	$2,750,000

Note: Values will be updated to match FY22 Cost Certification when the October 2021 Water Resources Discount Rate is available

6.1.2.3 Okaloosa County Project Cost

The initial construction cost is $30,426,000 at the FY21 price level. The initial construction is scheduled to take place in 2025 with four subsequent nourishment

actions completed in year 2065. The FY2021 cost of the subsequent planned nourishments in present values are $10,003,000 (2035), $18,977,600 (2045), $22,152,000 (2055) and $18,677,000 (2065). Total project first cost including Interest During Construction is $100,328,000. Table 6-3 summarizes this information. Additional project cost details can be found in Appendix A, Engineering.

Table 6-3. Recommended Plan Cost Summary

	FY2021 Dollars
2025 Initial Construction	$30,426,000
2035 Planned Nourishment	$10,003,000
2045 Planned Nourishment	$18,977,000
2055 Planned Nourishment	$22,153,000
2065 Planned Nourishment	$18,678,000
Total First Cost	$100,238,000
Interest During Construction	$93,000
Total Economic Investment	$100,331,000
Average Annual First Cost	$3,537,000
Annual O&M	$87,000
Total Average Annual Cost	$3,625,000

Note: Values will be updated to match FY22 Cost Certification when the October 2021 Water Resources Discount Rate is available

6.2 Benefits and Cost Summary of the Recommended Plan

The economic benefits of the plan are generated by reductions in coastal storm damages, reduction of emergency renourishment cost and land loss. Table 6-4 below shows a summary of the benefits and cost of the RP. The benefits presented do not include recreation.

Table 6-4. Summary of Benefits and Cost of the RP without Recreation

	Okaloosa Island	West Destin	Okaloosa County
Total Benefits	$2,177,000	$1,983,000	$4,160,000
Average Annual Cost	$874,000	$2,750,000	$3,625,000
Net Benefits	$1,302,000	($768,000)	$535,000
BCR	2.5	0.7	1.2

6.2.1 Recreation Benefits

According to ER-1105-2-100, incidental recreation benefits can be calculated in CSRM studies. While recreation benefits cannot make up more than 50% of the total benefits needed for project justification, the guidance states that "if the criterion for participation is met, then all recreation benefits are included in the benefit to cost analysis."

ER-1105-2-100 specifies that benefits arising from recreation opportunities created by a project be measured in terms of willingness to pay (WTP). Three acceptable calculation methods are outlined: (a) the travel cost method (TCM), (b) the contingent valuation method (CVM), and (c) the unit day value method (UDV).

The unit day value estimates a user's willingness to pay for a given recreational opportunity by assigning ratings to five criteria, overall quality of the experience, availability, carrying capacity, accessibility, and environment, designed to measure the quality of the overall recreation experience provided in the project area. According to guidance, UDV may be used to account for visitations of up to 750,000 per year. Data provided by VisaVue estimates about 7.2 million average annual visitors to Destin and Okaloosa Island beaches. Typically, when annual visitation exceeds the 750,000 thresholds, economists are required to employ a regional model, CVM and/or the TCM to estimate recreation benefits. Due to cost considerations the UDV method was selected to analyze recreation benefits and visitation was capped at 750,000 throughout the POA. Such a conservative visitation estimate implies that recreation benefits are

likely understated. Using the UDV method, it was estimated that for the Okaloosa Island and the West Destin reaches, the average annual recreation benefit would total $1,025,000 and $879,000, respectively. Further discussion of the recreation analysis can be found in Section 6.0, Appendix B, Economics,

6.2.1.1 Parking and Access

The USACE has several requirements that must be met to fully cost share in a CSRM project (see ER 1105-2-100 and ER 1165-2-130). One of these requirements is that the beaches must be available for public use. As described in ER 1165-2-130 (Federal Participation in Shore Protection, paragraph 6.h.) public use implies reasonable access and parking.

ER 1165-2-130 stipulates that to qualify for Federal cost sharing of CSRM projects, the local community must, at a minimum, provide public access and parking within a one quarter mile radius of any point of the project. Parking must satisfy the lesser of beach capacity or peak hour demand for that beach community. The peak demand hour had been previously identified as noon on the 4th of July holiday by the USACE. Total beach visitation and the associated recreation benefit depend on day trip visitors having adequate available public parking.

Within the project limit, there are 10 access points at Okaloosa Island and 3 access points at West Destin to the coastal shoreline. The access points generally consist of small parking areas and wooden walkways to the beach often supplemented with shoulder parking. At Okaloosa Island, all areas of the project are within 0.25 miles of a public access area, much of the beach having multiple access points within the 0.25 mile threshold. Figure 6-4 and Figure 6-5 show the current access points for Okaloosa Island and West Destin, respectively.

Okaloosa Island has enough public access locations across the project area to satisfy the 0.25 mile requirement; however, West Destin has limited public access points. Additionally, the number of parking spots must meet the lesser of beach capacity or peak hour demand for that beach community beach. There is a total of 586 parking spots (466 for Okaloosa Island and 120 for West Destin) available among the 22 public access points. Beach capacity peaks directly after a nourishment at 25,430 for Okaloosa Island and 14,798 for West Destin. It is possible that peak demand on the 4th of July will be less; however, it is unlikely that the 120 spots will be adequate to satisfy the demand at West Destin Beach.

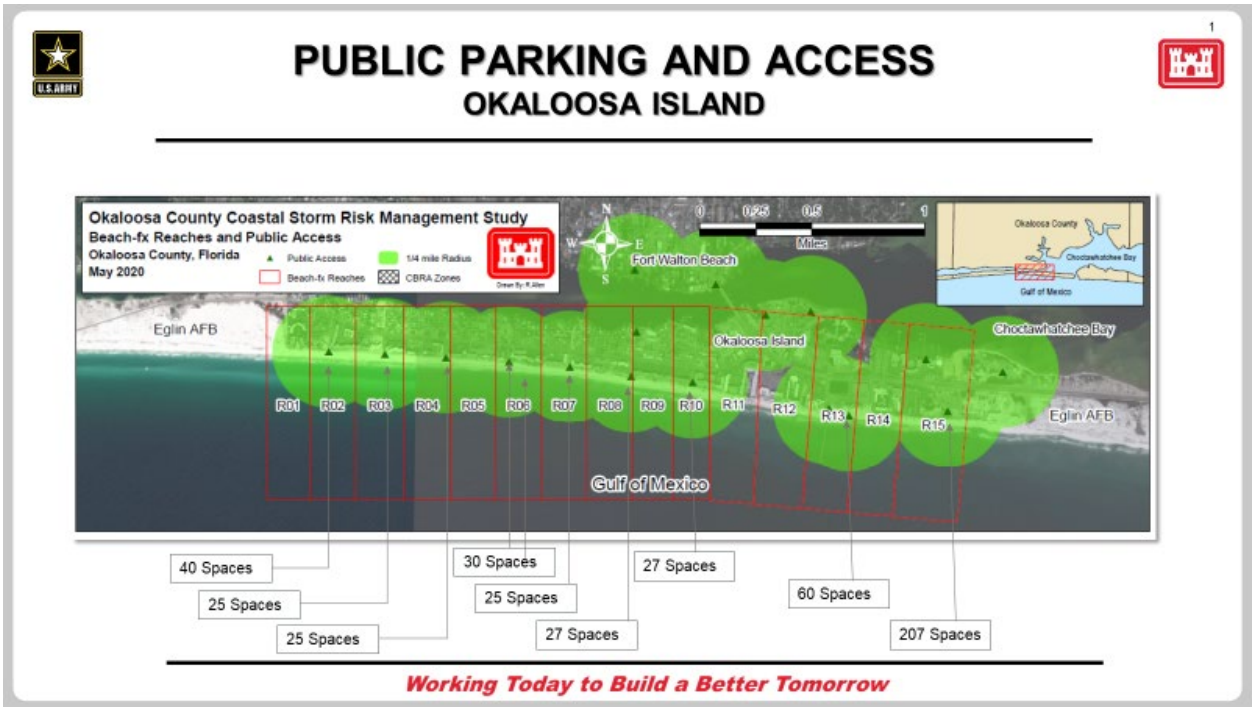


Figure 6-4. Public Parking and Access Okaloosa Island

Figure 6-5. Public Parking and Access West Destin

The local sponsor is aware of parking and access deficiencies at West Destin and is considering means to address this prior to the signing of the Project Partnership

Agreement (PPA), otherwise total project cost sharing could be adjusted. If the required number of parking spaces cannot be obtained, in some cases a public transportation system adequate for the needs of projected beach users may suffice instead (see ER 1165-2-130, Section 6h(2)). Land acquisition for parking and access is a non-Federal responsibility and is not factored into design & cost estimations for this project.

6.2.2 Refined Benefits and Costs of the RP

Adding the estimated recreation benefits to the CSRM benefits provides the total project benefits for the RP. Table 6-5 displays the refined benefits and costs for the RP.

Table 6-5. Refined RP Benefits and Costs (FY2021)

Okaloosa County Recommended Plan Costs and Benefits	
Total Project CSRM Benefits	$4,159,000
Total Recreation Benefits	$1,904,000
Total AAEQ Project Benefits	$6,063,000
Total AAEQ Cost	$ 3,625,000
Net Benefits	$ 2,438,000
BCR	1.7

6.2.3 Effects of RSLC on RP and Adaptation

While the RP is shown to be effective when averaged over the 50-year life cycle of the project, the project will inevitably have reduced effectiveness over time as sea levels rise. Therefore, an analysis was performed to ensure the effectiveness over the 50-year planning horizon and better understand the effectiveness over the 100-year adaptation horizon.

Tipping points, or transitions in project performance have been identified to inform the study team and the NFS on potential threats in the future. Based on the 1% AEP event the high sea level rise curve project performance was assessed. There is some subjectivity of the transition to when the project becomes less effective or completely ineffective; however, these transitions will inform the NFS reasonably well when they should consider adaptation measures for the RP or if an adaptive measure should be considered within the 50-year planning horizon.

With consideration to the 1% AEP event, based on Figure 6-6 and Figure 6-7, it is clear the dune and berm system retains some performance over the 50-year planning horizon. At 50 years into the future, the area behind the dune has not been inundated. This does not include a wave runup component so, while it can be reasonably assumed that there would be overwash, the project would perform at that elevation. Looking out to the 100-year adaptation horizon, the project would be completely overtopped. Therefore, the project is likely effective over the planning period of horizon but would need adaptation over the 100-year.

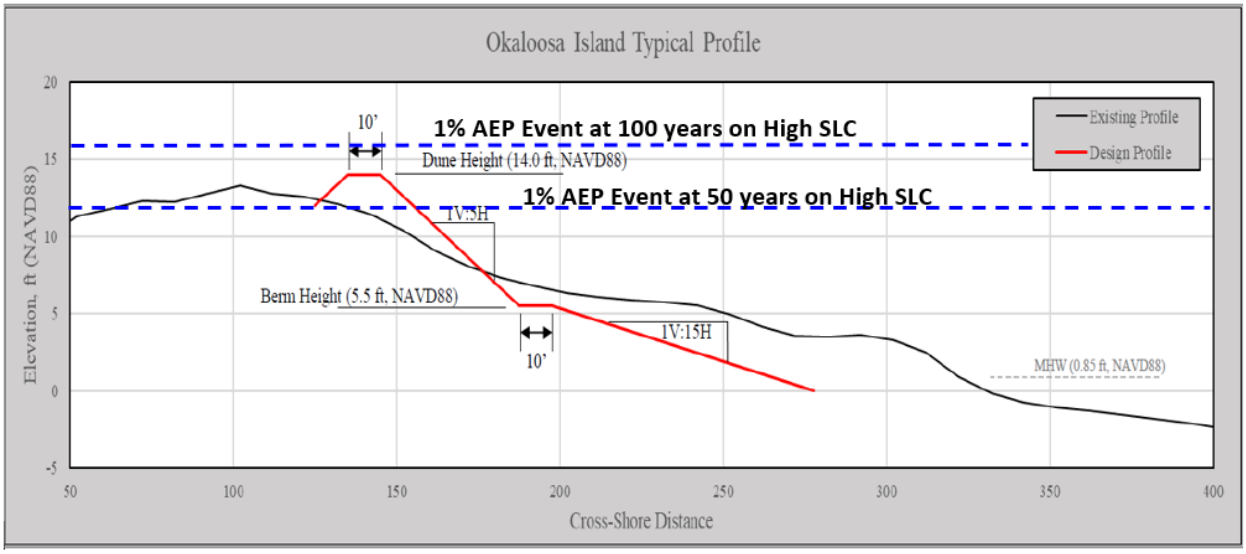


Figure 6-6. Okaloosa Island Dune and Berm Performance for 1% AEP Event

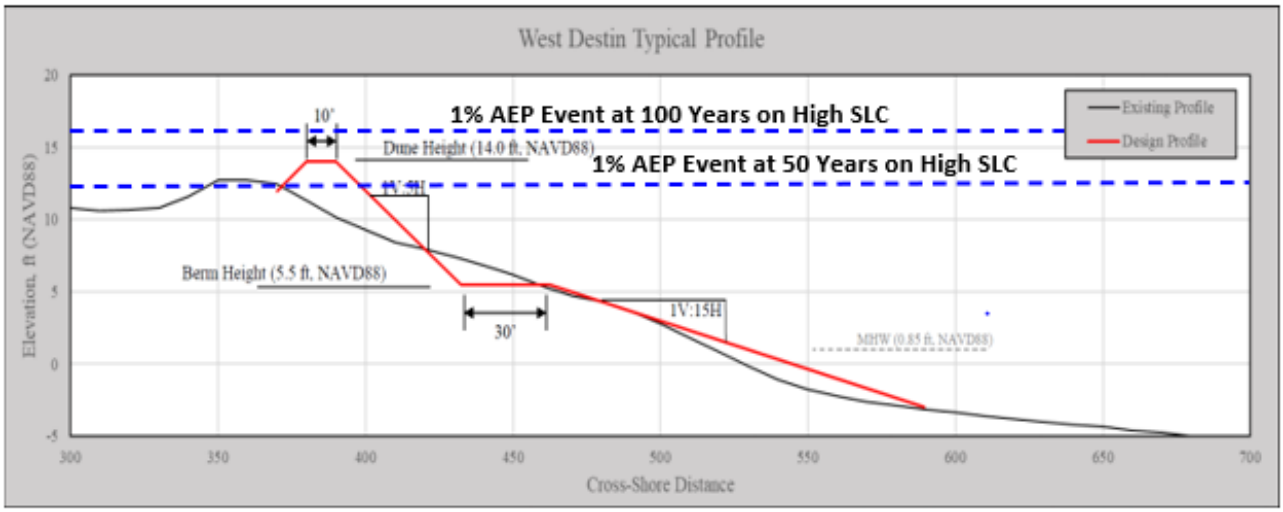


Figure 6-7. West Destin Dune and Berm Performance for 1% AEP Event

Figure 6-8 was developed to further understand when issues will begin to arise for the RP. Three trigger points that would initiate the need for an adaptation measure were identified. They are:

- When the 50% AEP equals the berm elevation
- When the 1% AEP reaches a dune elevation of 12 feet
- When the 1% AEP equals the dune crest elevation

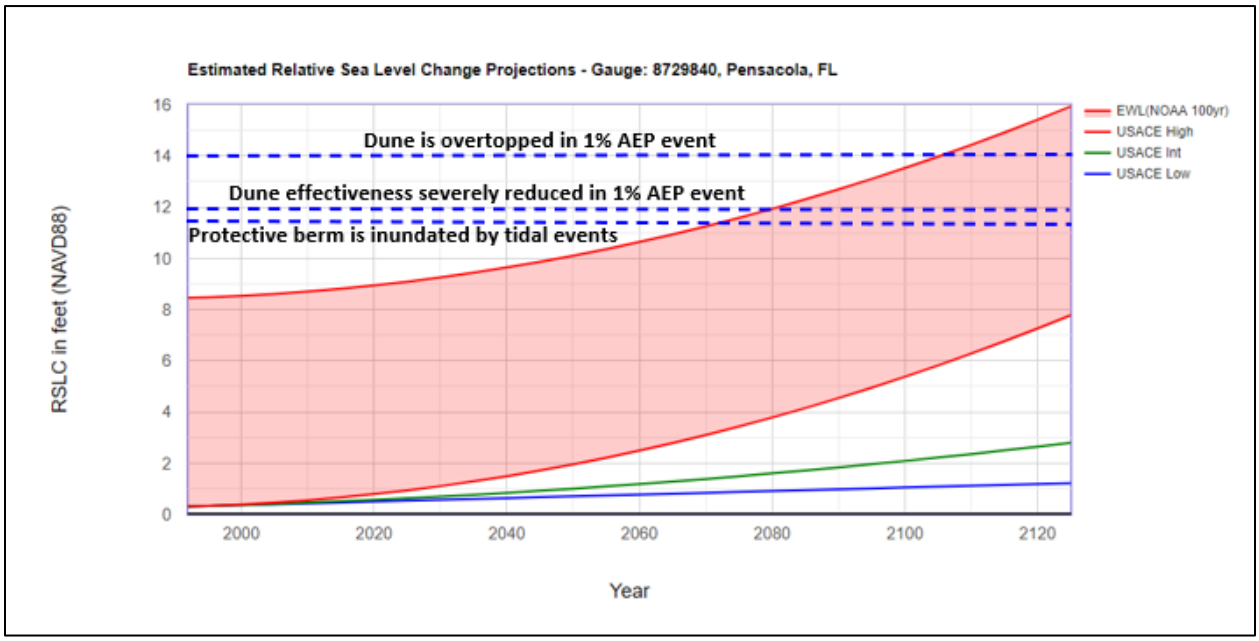


Figure 6-8. Trigger Points for Adaptation Measures

Based on these thresholds and the plot of relative sea level change below, the following was determined:

- By approximately year 2075, additional elevated fill should be considered for the berm to continue to provide protection from erosion of the dune during normal tidal conditions
- By approximately year 2081, elevation of the dune should be considered to continue to provide inundation protection for the 1% AEP event
- By approximately year 2113, the berm will be completely overtopped in the 1% AEP event. At this point elevation of the dune would not likely be practical.

6.2.3.1 Adaptation Measures for Recommended Plan

As the need for adaptation occurs near or past the end of the 50-year planning horizon, these measures will be discussed quantitatively.

Measure 1: Additional Beach Fill

By year 2075 the project will likely see an increase erosion of the dune due to very frequent inundation of the protective berm. By 2065 the NFS should begin considering elevating the berm to prolong the effectiveness of the dune by reducing frequent erosion of the dune toe. This would likely be a tolerable adaptive management measure.

Measure 2: Hardened Structures

Given the ineffectiveness of the RP through the 100-year adaptation horizon, the appetite for harden structures to provide protection may need to be reconsidered in the future. In year 2113, the dune system may become ineffective in providing coastal storm damage reduction from extreme events. Based on this, the NFS should begin engaging the community and resource agencies to assess and discuss the appetite for integration of hardened structures on the front beach. At this point, consideration for life safety may outweigh environmental concerns, or these concerns may have changed completely. To allow for time to implement a measure, the NFS should begin considering this in year 2100 to allow for time for implementation of the measure if deemed appropriate.

Measure 3: Buyouts/Relocation

Buyouts and/or relocation (retreat) may need to be reassessed in the future. It will likely be found that there is still no appetite for this measure as the front beach economy is the major economic driver for this area; however, a higher recurrence of episodic events in the future may change the appetite for this if a tipping point is reached. Similar to Measure 2, this should be considered near the year 2100 to allow for ample time to implement a solution.

6.2.3.2 Adaptation Summary

Based on the Beach-*fx* analysis the RP is an effective CSRM measure through the 50-year planning horizon of the project under the USACE high SLC curves. However, adaptation should be considered as early as 2065 as the project may not be effective by year 2113. It is important to note the uncertainty in the analysis above. The exact rate of RSLC is uncertain and may vary with time. Additionally, the probability of the recurrence of episodic events may change as the climate changes. Therefore, these adaptation measures are not meant to limit monitoring of changing conditions and the effectiveness of the RP.

6.2.4 Risks Through the Adaptation Horizon

Screening of measures has already identified that there is no Federally justified project in the back bay area, and that the RP is appropriate for the front beach; however, risk reduction measures should be understood for the entire study area to allow for the NFS to plan for future conditions or address current concerns to property damage and critical infrastructure. Furthermore, understanding risk through the 100-year adaptation horizon inform the NFS when other measures should be considered. This section describes remaining risk to infrastructure in the study area now and through the 100-year adaptation horizon.

6.2.4.1 Fort Walton Beach

Once relative sea level change approaches 2 feet, bulkheads in this area will begin to be overtopped in the 1% AEP event, following the high sea level rise curve. This would be likely to occur around year 2050. This, however, does not correspond to inundation of a large number of homes. The elevation of homes in the area is variable, with elevations ranging from 2-10+ feet. There is some low-lying infrastructure that needs to be investigated now which is identified in the FWOP. These include a school and water and wastewater facilities.

Bulkhead improvements should be considered as early as 2050 however a more detailed assessment of first floor elevations is recommended to understand the risk to structures. It is recommended that a survey be performed in this area before 2050 to better understand this risk. Critical infrastructure is a major concern today. Several facilities could see effects in the 1% AEP event and therefore, should be assessed by the NFS and included in updates to the hazard mitigation plan.

6.2.4.2 Ocean City

Bulkhead overtopping would begin to occur around 2048 which would begin to inundate property. Many homes in this area are elevated to various heights, so risk to property damage is low at this point. In this area, critical infrastructure would not be significantly affected until 2083.

While bulkheads would be overtopped in the 1% AEP event in the late 2040s, many homes in this area are elevated. It is recommended that a survey be performed in this area before 2040 to better understand this risk to structures.

6.2.4.3 Shalimar

In Shalimar, bulkheads are low with exposure to coastal storms already occurring well inland. Some minor roadway overtopping is already possible. Homes in this area are often elevated and therefore it is difficult to identify a tipping point to when major

structural damage would begin to occur in the 1% AEP storm. Similar to other areas in the back bay, it is recommended that a detailed survey of structures occur to assess risk. In this case, it would be recommended that this survey is done by 2030.

While there is no identified federal interest, the NFS could already begin considering increased armoring of bulkheads and storm surge barriers today to reduce damage to some residential and commercial structures.

6.2.4.4 Bluewater

Coastal Storm risk in the Bluewater community. Most bulkheaded areas sit on high ground and are not forecast to overtop in the 1% AEP event until 2113. There was no critical infrastructure identified as at risk in this area.

6.2.4.5 Back Bay Destin

Terrain in the back bay is highly variable. While some areas in East Destin sit on high ground, there are areas in West Destin that are much lower. The dune in the eastern back bay sits on high ground and would not be overtopped until after 2120. The area of West Destin back bay consists of many residential structures that appear to have been constructed after enactment of the National Flood Insurance Program. Homes in this area appear to be constructed above the 1% AEP storm and as such it is difficult to identify a tipping point to when major structural damage would begin to occur in the 1% AEP storm. Similar to other areas in the back bay, it is recommended that a detailed survey of structures occur to assess risk. In this case, it would be recommended that this survey is done by 2030.

6.2.4.6 Okaloosa Island

Front beach Okaloosa Island includes an existing dune with a variable height of 12-16 feet and, is included as part of the RP to raise the dune to a minimum 14 feet and elevate the berm to 5.5 feet. The effectiveness and the adaptability of the front beach are discussed previously in the RP; however, the back bay exposure is not addressed in the RP. The back bay upland is relatively low when compared to the front beach at an average elevation of 9 feet. The variability in the terrain inland protects the structures along the front beach considered in the analysis for the RP from back bay flooding. There would be no exposure from back bay flooding to the structures along the front in the 1% AEP event until after 2060 and, this would only affect some low-lying areas until after 2075. Additionally, flooding from the back bay affecting the front beach structures in a 1% AEP event would likely occur from different storms. Therefore, as the front beach structures and back bay structures along Okaloosa Island are separated by relatively high terrain, back bay flooding was not considered as part of the RP.

However, the structures located along the back bay remain vulnerable to flooding. While analysis of the back bay showed there was no federally justified project, consideration should be given to addressing flooding issues in the present. Some critical infrastructure is already vulnerable along the island due to back bay flooding. Additionally, flooding from the back bay in the 1% AEP event in some low-lying parts of the middle the island will increase after 2060. It is recommended that mapping of the flooding be used to address this future increase in vulnerability to the island.

SECTION 7.0 ENVIRONMENTAL CONSEQUENCES AND COMPLIANCE*

7.1 Summary of Alternatives*

The OCCSRM study process included the Choctawhatchee Bay shoreline area as well as the ocean frontage which is dominated by development, beach and dune. Through the plan formulation screening as well as an environmentally based screening of the natural features within the back bay, the USACE found that insufficient benefits could be derived through further alternative development of projects. Therefore, the alternatives being considered for project development are limited to the ocean frontage of the study area. Please see Section 4.1.2 for a detailed evaluation of the screening processes applied to the back bay portion of the study area. No further environmental impact analysis of environmental resources solely contained within Choctawhatchee Bay will be included in this section; rather, only those resources that could be affected by alternative development of the ocean frontage are evaluated for impact analysis.

7.2 No Action Alternative (Future Without Project)*

The Study identified multiple problems within its limits through evaluation of the existing conditions. Alternative development through plan formulation resulted in Proposed Action of beach and dune rehabilitation along the beach front of Okaloosa Island, and West Destin coastline. Should this project as proposed not occur, (FWOP, aka no action alternative), a likely scenario of continued environmental degradation could occur as described below.

In general, future conditions associated with not restoring the beach and dune system would result in the continued degradation of a valuable beach ecosystem and loss of these types of habitats and associated ecological and sociological benefits. According to the FDEP Critically Eroded Beach Report (FDEP 2020), there is a total of 6.8 miles of eroded beach and inlet shoreline in Okaloosa County. The critical eroded beach is found within the project area on Okaloosa Island from FDEP monument R01 to R15, and on the west Destin shoreline from R18 to R32. Dune restoration occurred along 2.8 miles of Okaloosa Island shoreline after hurricane storm damage in 1995, 1998, 2004, and 2012. Furthermore, the east shoreline of East Pass along Norriego Point has experienced significant erosion that has threatened structures from private residences to shoreline armoring. Storm events occurring since 2010 resulted in beach rehabilitation at Holiday Isles in the city of Destin, which was completed in 2013. Other subsequent storm events, notably Hurricane Michael in 2018, indicate that this erosional trend will continue. More recent storm damage along the beach front occurred in September 2020 from Hurricane Sally (FDEP 2020) that ranged from Level I (least damage) to Level IV (major damage).

Previously damaged habitats would remain particularly vulnerable to wave and storm surge activity from continual threat and would prevent the re-establishment of valuable natural resources. Desired opportunities to implement beach and dune restoration would be lost, including vegetation re-establishment of critical areas along the shoreline of Okaloosa County. As the area vulnerability persists, even minor storm activity threatens valuable dune and beach habitat including:

- Sea turtle nesting and foraging habitat,
- Shorebird nesting, foraging and roosting areas,
- Dune habitat supporting a biodiversity of native flora and fauna, and
- Beach ecosystem function.

Continued coastline erosion will have negative consequence to the nearshore watered environment that comprises EFH, along with Federally designated critical habitat for several threatened and endangered species under the ESA. Finally, a no-action scenario deprives the ecosystems of much needed stability and sustainability that is characteristic of a healthy coastal environment.

7.3 Alternative 2- Proposed Action (Recommended Plan (RP)*

The RP for the OCCSRM Feasibility Study consists of berm and dune nourishment in the Okaloosa Island and West Destin reaches of the study area. Section 6.0 contains a detailed discussion of the RP.

7.4 Alternative Environmental Consequences on Resources*

7.4.1 Beach and Dune Areas*

7.4.1.1 No Action Alternative*

The Okaloosa County shoreline would continue to erode, especially in the designated critical erosion zones as a result of the No Action Alternative. Loss of unconsolidated material along beach and dune would cause loss of valuable habitat to Federal and state protected species, as well as loss of biodiversity to these areas.

7.4.1.2 Alternative 2 – Proposed Action*

Alternative 2 would arrest continued coastal erosion along the FDEP mapped eroded coastal zone that includes the Okaloosa Island frontage from FDEP Monument R01 to R15, and the West Destin coastline east of Norriego Point (R18) to R32. Placement of unconsolidated material on existing dunes and beach berm would temporarily impact the resources that are present or utilize this habitat by construction disturbance.

Existing dune vegetation would be disturbed by material coverage. Benthic organisms would be buried by material placement on the beach berm and into the swash zone. Temporary loss of these habitat components would affect usage by species such as shorebirds and sea turtles during the duration of the project activities; however, these impacts would be offset by measures such as dune vegetation reestablishment from plantings and seedings.

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

7.4.2 Topography

7.4.2.1 No Action Alternative*

A no-action scenario would not provide the much-needed stability and sustainability that a healthy coastal environment could offer to the area. Topography at the dune and beach would continue to experience coastal erosion, which would further imperil an already critical eroded shoreline.

7.4.2.2 Alternative 2 – Proposed Action*

Disruption to the existing topography during construction activities would cause temporary impact to the dune and beach berm placement areas. Included in the design plan is the distribution and contouring of the material to reach the engineered dimensions and blend in with the general landscape along this coastline. Stabilization of the placed material will occur after construction through plantings as vegetation root networks become established in the dunes, and material settles to reach a stable equilibrium along the upper beach.

7.4.3 Geology*

7.4.3.1 No Action Alternative *

A no-action scenario would not provide the much-needed stability and sustainability that a healthy coastal environment could offer to the area. Coastal erosion would continue, which could alter the geomorphology of the shoreline.

7.4.3.2 Alternative 2 – Proposed Action*

Possible effects may occur in the project area itself (not the borrow areas), would be temporary disturbance along the shoreline during construction within the template; no significant permanent effects are expected to the geology. Borrow material would be used that is very similar to the native beach in terms of grain size distribution, carbonate content, and color. Therefore, USACE would expect the fill material to react to the coastal processes in a manner similar to the native beach sediments. Also, no placement of any groins or other hardened structures will occur that could affect sediment transport processes. USACE fully expects the beach to equilibrize over time and become similar in geomorphology to an enhanced existing configuration.

7.4.4 Soils Resources*

7.4.4.1 No Action Alternative*

The Okaloosa County shoreline would continue to erode in the littoral zone as well as tidal flat substrate as a result of the No Action Alternative. Loss of this soil resource would degrade these inner shoreline habitats for species dependent on the benthic species and those shorebirds who forage for them, such as the Federally protected piping plover and red knot.

7.4.4.2 Alternative 2 – Proposed Action*

Native soils within the proposed action area would be impacted by placement of dredged material on the beach and dune within the project footprint. Previous material placement from past projects within the footprint have already disturbed the soil resources at these locations. However, areas adjacent to the proposed project limits could be adversely impacted by slope slumping and inadvertent material coverage during onshore construction activities.

7.4.5 Native Beach Material*

7.4.5.1 No Action Alternative*

A no-action scenario would not provide the native, compatible material to provide stability and sustainability that for a healthy coastal environment. Coastal erosion would continue, which could alter the geomorphology of the shoreline.

7.4.5.2 Alternative 2 – Proposed Action*

The State of Florida requires shoreline storm protection and restoration activities that artificially placed sand on the beach derived from off-site native material sources must use sand having characteristics similar to the native beach sand in order preserve the beach's natural characteristics to the maximum extent practicable. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. During the PED phase of this project, a Sediment Quality Assurance Plan will be prepared that outlines the steps that must be taken to observe, sample, and test the placed sediments to assure compliance with the standards set by the state of Florida. The technical requirements addressed in this plan will include the location of dredging, sediment quality monitoring on the beach, and remedial actions if necessary.

7.4.6 Offshore Sand Resources*

7.4.6.1 No Action Alternative*

No impact would occur to the offshore borrow areas as a result of the No Action Alternative; the existing material would simply remain in place.

7.4.6.2 Alternative 2 – Proposed Action*

It is expected that the dredging action would have some impacts on the infaunal assemblages within the borrow area(s). Offshore equipment employed for borrow area excavation typically consists of a hopper/mechanical dredge and possibly pipelines, equipment barges, marker buoys, and small tugs. Dredging would temporarily affect water quality by increasing local turbidity levels around the dredging sites. Increased water column turbidity during sand excavation would be temporary and localized. The spatial extent of elevated turbidity is expected to be within 1,000 meters of the operation, with turbidity levels returning to ambient conditions within a few hours after completion of the dredging activities. Turbidity monitoring required by the FDEP pursuant to WQC for this project would address temporary impact to the nearshore ocean environment during dredging operations; no significant long-term impacts to water quality are expected to occur. Elevated turbidity levels resulting from construction should not have a significant negative effect on organisms inhabiting the area. Fish and

other mobile species may temporarily leave the dredging site if turbidity becomes too great. Dredging activities would result in some mortality of non-motile benthic organisms. Impacts to the benthic community are expected from physical removal of sediments and infauna, however, assuming that dredging does not produce deep depressions causing very fine sediment deposition or hypoxic or anoxic conditions, levels of infauna abundance and diversity are anticipated to recover within three months to 2.5 years (Brooks, et al. 2006). The borrow area does not contain any known hard bottom or associated communities; as such, dredging activities within the borrow area would have no impacts to hard bottom environments.

7.4.7 Intertidal Swash and Nearshore*

7.4.7.1 No Action Alternative*

The intertidal swash zone and nearshore environment within the alternative template would continue to destabilize or erode which would result in adverse effects for resources that rely on this habitat for life processes.

7.4.7.2 Alternative 2 – Proposed Action*

The intertidal swash and nearshore environment would experience impact from material placement on the beach that extends into these areas within the project footprint. As well, equipment such as pipelines, buoy markers and earth moving machinery within the swash zone and nearshore would temporary adversely affect the area for the duration of operations. However, impacts to these areas are expected to naturally recover within several months up to 3 years after disturbance has ceased.

7.4.8 Surface Water Resources*

7.4.8.1 No Action Alternative*

No impact would occur to the surface water quality as a result of the No Action Alternative.

7.4.8.2 Alternative 2 – Proposed Action*

A minor amount of silty material associated with the dredging and placement operations and its suspension would result in a localized increase in turbidity at the dredging and beach placement site. The direct placement of material on the beach will consist of beach quality sandy material and no significant long-term elevation of turbidity is expected. The State of Florida's water quality standards would be adhered, and water clarity would return to ambient conditions shortly after sediment placement within the project footprint. Furthermore, due to the short-term duration of dredging event, red tide is not anticipated to be exacerbated as a result of this activity. As required by the Clean Water Act (CWA), a Section 404 (b)(1) evaluation report for the borrow and placement

of sediment at the proposed beach placement areas has been prepared and can be found in the EA, Appendix C, Environmental.

7.4.9 Vegetation and Habitat*

7.4.9.1 No Action Alternative*

Dune vegetated areas would be subject to erosion from wind and wave storm damage and destabilization as a result of the No Action Alternative.

7.4.9.2 Alternative 2 – Proposed Action*

Vegetation within the proposed project area occurs mainly on the existing dunes landward of the beach. Placement of material on the dunes during construction is expected to kill off this vegetation. Impact from that disturbance would result in the temporary loss of this resource to wildlife including listed species such as Choctawhatchee beach mouse (although not known to occur within the project footprint), shorebirds, and other general wildlife. Vegetation planting, included in the planned dune construction activities, will replace the vegetation loss with native species that typically occur in the immediate region through planting of plugs and spreading a diverse seed mix. Establishment of native species will enhance biodiversity and establish stability to arrest erosion and further degradation, thus creating improved long-term habitat quality for listed species and general wildlife. Successful establishment of species will help prevent encroachment of noxious invasive species.

7.4.10 Fisheries Resources (EFH)*

7.4.10.1 No Action Alternative*

No impact would occur to local fisheries as a result of the No Action Alternative.

7.4.10.2 Alternative 2 – Proposed Action*

The proposed borrow and placement areas serve as habitat for various species identified in Table 2-5 and Table 2-7. The proposed action will not fill or destroy habitat considered necessary to sustain these species. The beach within the project area provides habitat for benthic and infaunal communities characterized by low species diversity. The studies by Cutler and Mahadevan (1982), Saloman and Naughton (1984), and Dial Cordy and Associates Inc. (2002) concluded that benthic communities inhabiting the swash and nearshore zones of Panama City Beach and Pensacola Beach were typical of the sandy panhandle Gulf of Mexico coastline. Therefore, a similar nearshore structure should exist along the beaches of Okaloosa County.

Material will be excavated from the borrow areas OK-A and OK-B via hopper/mechanical dredge and pumped onto the beach to create the desired template.

Most of the motile benthic and pelagic fauna, such as crab, shrimp, and fish, should be able to avoid the disturbed area and should recover shortly after the activity is completed. Both borrow areas are characterized as sandy bottoms and do not contain any hard-bottoms, coral reefs, oyster beds, or seagrass as indicated by extensive geotechnical offshore investigations performed to identify suitable offshore borrow areas as discussed in Section 2.1.7. No hard-bottom structures were identified in and around the proposed borrow area during these investigations.

No long-term direct impacts to managed species are anticipated; however, it is reasonable to anticipate some non-motile and motile invertebrate species will be physically affected through project operations. These species would recover rapidly following construction activities (Cutler and Mahadevan,1982).

7.4.11 Threatened and Endangered Species*

The following Federally listed species under the ESA are those that are anticipated to be present within the project area. As the back bay portion of the OCCSRM study area has been screened out for further alternative development, those species that are known only to occur in the back bay area are not included in this impact analysis. Some vegetation and animal species may occur but have not been confirmed in the project limit. Specific species surveys, such as sea turtle nesting, or presence of Choctawhatchee beach mouse and piping plover, will be conducted prior to construction.

7.4.11.1 Sea Turtles*

7.4.11.1.1 No Action Alternative*

No impact would occur to swimming sea turtles as a result of the No Action Alternative. However, destabilized beach front by continued erosion from storm events could adversely impact nesting sea turtles and possibly precipitate a decline in species population densities.

7.4.11.1.2 Alternative 2 – Proposed Action*

The effects of beach placement on nesting sea turtles have been extensively documented and indicate that nesting success rates may decrease the year following beach placement as a result of escarpments, altered beach profiles, and sand compaction. All efforts will be made to conduct the proposed dredging and placement activities outside of the sea turtle nesting window. Additionally, the conservation measures and recommendations specified in the for *Dredging of Gulf of Mexico Navigation Channels and Sand Mining Areas Using Hopper Dredges* (GRBO, NMFS, 2003 and amendments) and for Shoreline Protection Activities (SPBO, USFWS 2011 and amendments) will be followed to the maximum extent practicable. Consultation

with Federal agencies, the USFWS and the NMFS-PRD, has been initiated pursuant to the ESA. The USACE determined that the proposed action may likely adversely affect sea turtles' nesting on the beach. In addition, sea turtles at the borrow area(s) may likely be adversely affected by hopper dredging activities. Long term benefit of the project will enhance stability of the beach habitat for usage by nesting sea turtles.

7.4.11.2 Gulf Sturgeon*

7.4.11.2.1 No Action Alternative*

No impact would occur to Gulf Sturgeon as a result of the No Action Alternative. The use of the ocean in front of the beaches would not be affected from lack of a project. Furthermore, access for Gulf sturgeon into Choctawhatchee Bay is through East Pass Inlet, which is a Federal Navigation channel that is routinely maintained under management by USACE. Therefore, no blockage of this access would occur from the No Action Alternative.

7.4.11.2.2 Alternative 2 – Proposed Action*

Effects to Gulf sturgeon resulting from the proposed dredging activities would be confined to direct impacts associated with the dredge equipment at the offshore borrow site. Results from the use of hopper dredges may adversely affect Gulf sturgeon, and were considered in the Gulf Regional Biological Opinion (GRBO). The USACE, Mobile District will abide by the reasonable and prudent measures set forth in that opinion. Discountable impacts to Gulf sturgeon are anticipated with the use of a hydraulic cutter-head dredge, as stated in the GRBO.

7.4.11.3 Choctawhatchee Beach Mouse*

7.4.11.3.1 No Action Alternative*

Choctawhatchee Beach Mouse occurring on dune areas would be subject to entombment by storm surge damage or disturbance by destabilization. Loss of individual specimen from disturbance could possibly precipitate a decline in species population densities.

7.4.11.3.2 Alternative 2 – Proposed Action*

Choctawhatchee beach mouse are not reported to occur in the project area. However, critical habitat for the beach mouse directly abuts the project area at the eastern limit (R 32 – R33 interface). Detailed discussion of the proposed action's effects to Critical Habitat Unit 1 is presented in Section 7.4.12.2. The proposed project is not likely to adversely affect this species but is anticipated to benefit it by encouraging migration into the stabilized enhanced habitat, thus expanding its population. Any placement of sand directly on the beach and seaward of the toe of the existing primary dune line would not

generally impact existing habitat. Pipeline routes for beach construction typically avoid identified primary constituent elements for critical habitat. Considering that much of the mature coastal barrier sand dunes and scrub dune habitat on the Gulf coast of Florida has been lost and populations of beach mice have declined as a result, the development of new habitat or enhancement of existing habitat is beneficial to the recovery goals of beach mice. Dune restoration activities allow for the availability of materials for the natural formation and growth of primary and secondary dunes. Such processes would help in the development of new beach mouse habitat and may aid in expansion of existing populations by stabilizing and enhancing existing dune communities with available sand and associated aeolian transport processes. In turn, this promotes natural recruitment of native dune vegetation that contributes to the primary constituent elements for critical habitat by providing food resources for beach mice. Consultation with the USFWS regarding the effects of the proposed plan on Choctawhatchee beach mouse critical habitat has been initiated.

7.4.11.4 Piping Plover and Red Knot*

Shorebirds that occur along the Okaloosa County coastline include species that are protected under the Migratory Bird Treaty Act (MBTE) and ESA; see Sections 7.6.2 and 7.6.7, respectively, for more information about these regulations.

7.4.11.4.1 No Action Alternative*

Continued erosion on the compromised shoreline from future storm events would adversely affect shorebird usage from a degraded habitat as a result of the No Action Alternative.

7.4.11.4.2 Alternative 2 – Proposed Action*

Activities associated with the project area would cause temporary impact to protected shorebirds, including ESA protected piping plover and red knot. Usage of the dune and beach ecosystem for life cycle activities such as nesting, foraging, roosting, and overwintering during migration periods, would be disrupted during operations of dredging and sand placement. The activities associated with placement of the sand on the Okaloosa County beaches have been analyzed and coordinated under the SPBO (USFWS, 2011 and amendments). The SPBO does not include a determination for the piping plover or red knot which required separate coordination. The USACE has determined the project may affect, but is not likely to adversely affect piping plover and red knot.

7.4.11.5 Gulf Coast Lupine and Cruise's Golden-Aster *

7.4.11.5.1 No Action Alternative*

Gulf Coast Lupine and Cruise's Golden-Aster occurring on dune vegetated areas would be subject to loss from erosion by storm damage as a result of the No Action Alternative.

7.4.11.5.2 Alternative 2 – Proposed Action*

Although these plant species are vouchered to occur in dune habitat in Okaloosa County (Florida Plant Atlas, ISB USF, 2020), it is unknown if this species is present in dune habitat within the proposed action. If it is present within the dune system, placement of material during construction would temporary adversely affect those specimens that occur on the dune. Dune restoration measures are expected to enhance biodiversity to the habitat quality. Informal consultation with the USFWS has been initiated for this species.

7.4.11.6 Florida Perfoliate Reindeer Lichen*

7.4.11.6.1 No Action Alternative*

Florida Perfoliate Reindeer Lichen occurring on dune vegetated areas would be subject to loss from erosion by storm damage as a result of the No Action Alternative. Difficulty in natural regeneration could further imperil this species.

7.4.11.6.2 Alternative 2 – Proposed Action*

Although this lichen species is vouchered to occur in dune habitat in Okaloosa County (Florida Plant Atlas, ISB USF, 2020), the species is unlikely to be present in dune habitat within the proposed action due to disturbance by human foot traffic and pets. It is reported to be present on adjacent Eglin AFB managed lands on Okaloosa Island. If present within the dune system, placement of material during construction would adversely affect those specimens that occur on the dune. Based upon this information, the USACE determined the proposed action may affect but is not likely to adversely affect this plant species.

7.4.11.7 Gulf Coast Solitary Bee*

7.4.11.7.1 No Action Alternative*

Continued degradation to suitable dune habitat from erosion would occur to possible populations of Gulf Coast solitary bee along the beach front as a result of the No Action Alternative.

7.4.11.7.2 Alternative 2 – Proposed Action*

The Gulf coast solitary bee was petitioned for inclusion as a protected species by the USFWS in March 2020. At this time, no sightings of the bee have been documented. The bee is dependent on a commonly found dune plant known as the narrow leaf honeycombhead (*Balduina angustifolia)* that occurs on dunes in the Gulf and south Atlantic shorelines. If this host plant is present within the dune system, placement of material during construction would adversely affect those that occur on the dune. One management measure that could be employed is to include narrow leaf honeycombhead seed in the seed mix for handcast spreading during dune restoration vegetation planting. No effect to occur to this species is anticipated as a result of the proposed action.

7.4.11.8 Giant Manta Ray *

7.4.11.8.1 No Action Alternative*

No impact would occur to the Giant manta ray as a result of the No Action Alternative. The use of the ocean in front of the beaches would not be affected from lack of a project.

7.4.11.8.2 Alternative 2 – Proposed Action*

Based on the infrequency of takes relative to the overall amount of dredging that occurs in coastal waters, the NMFS-PRD concluded that it is extremely unlikely the Giant manta ray would be injured by mechanical equipment, such as clamshell and bucket dredges, nor would there be a risk of entrainment and impingement (no effect) to species from hopper dredging. The NMFS-PRD anticipates changes in water quality from turbidity by dredging and material placement may affect but are not likely to adversely affect the species as they can avoid localized areas of increased turbidity. Capture of Giant manta ray has been reported in relocation trawling associated with dredging in the Gulf of Mexico prior to listing of this species. The NMFS-PRD believes that capture of this species could occur in the future; thus, relocation trawling is likely to adversely affect Giant manta ray.

7.4.12 Critical Habitat*

7.4.12.1 Gulf Sturgeon*

7.4.12.1.1 No Action Alternative*

Minimal impact would occur to Gulf Sturgeon Critical Habitat as a result of the No Action Alternative. Foraging opportunities might become temporarily affected from substrate disturbance by storm wave and surge events in the nearshore of the Critical Habitat; however, these resources would stabilize once the storm has passed.

7.4.12.1.2 Alternative 2 – Proposed Action*

The project area from the MHWL of the mainland shoreline extending seaward one nautical mile is designated as Gulf sturgeon Critical Habitat unit 11. Loss of wintering feeding ground for Gulf sturgeon and other pelagic fish species would be temporary adversely affected and unable to provide foraging opportunity during the project activities. Gulf sturgeon critical habitat in the project area is restricted to the nearshore along the coast and East Pass inlet that provides access into Choctawhatchee Bay. Critical habitat for inland waters is not within the scope of the project area; therefore, the project would have no effect. Placement of beach berm sand is expected to shift with natural wave action to reach equilibrium in the nearshore. This natural process could affect the infauna organisms by burial from the disturbance. This temporary impact is anticipated to naturally return to pre-disturbance ambient conditions within a few months to two years. The USACE determined that the proposed action would not likely destroy or adversely modify Gulf sturgeon critical habitat.

7.4.12.2 Choctawhatchee Beach Mouse*

7.4.12.2.1 No Action Alternative*

Choctawhatchee Beach Mouse Critical Habitat (CBM 1) occurs outside of the Proposed Action footprint. No effect to this Critical Habitat is anticipated as a result of the No Action Alternative. However, steadily degrading habitat in the existing dunes within the Critical Habitat could occur from exposure to storm damage hazards.

7.4.12.2.2 Alternative 2 – Proposed Action*

Choctawhatchee Beach Mouse Critical Habitat Unit 1 occurs east of West Destin project in the Henderson Beach State Park limits. Recent tropical storm activity has eroded the primary dune and bluff systems throughout Okaloosa County. Restoration of the dune with desirable material placement and native vegetation will stabilize the system and enhance the dune habitat at the interface with CBM 1. Dune restoration activities allows for the availability of materials for the natural formation and growth of primary and secondary dunes. Restoration of the dunes immediately adjacent to the CBM 1 may also provide a minor degree of stability to the dunes at the west limit of CBM 1. Direct dune and beach placement of compatible sand and native vegetation planting may enhance existing habitat for beach mice to expand into the restored habitat. No effect to this Critical Habitat is anticipated as a result from the proposed action.

7.4.13 Economic, Socioeconomic, and Human Resources*

7.4.13.1 No Action Alternative*

Continued ecosystem degradation would continue to adversely impact economic, socioeconomic and human resources as a result of the No Action Alternative. As beach and dune slowly deteriorate, usage of these areas would diminish tourism and other socioeconomic related opportunities which would reduce the economic viability of the community.

7.4.13.2 Alternative 2 – Proposed Action*

The shoreline for recreation use would be inaccessible to the public during construction activities. This situation could have temporary economic and socioeconomic impacts for these communities. Once completed, the project would provide significant improvement to the beach for the recreational tourist industry as well as part time or full time residents of Okaloosa County. The project will allow Okaloosa County to continue economic growth at the current rates. In short, the project will allow economic growth in Okaloosa County to progress at the status quo rates.

7.4.14 Archaeological and Cultural Resources*

7.4.14.1 No Action Alternative*

The shoreline and offshore borrow portions of the proposed action's APE have been subjected to surveys to inventory and assess cultural resources. Pedestrian surveys and testing of the Okaloosa Island and West Destin shoreline portion of the APE and Phase I remote sensing surveys and Phase II diver verifications surveys of the proposed borrow areas for submerged historic resources have been conducted. These surveys did not identify any historic properties within the proposed APE. As no known artifacts or historic sites are documented within the proposed APE, no impact would occur to archaeological or cultural resources as a result of the No Action Alternative.

7.4.14.2 Alternative 2 – Proposed Action*

In accordance with Section 106 of the NHPA and other relevant cultural resource laws, coordination and consultation with the Florida SHPO, the USACE, Mobile District Tribal Partners, and other interested parties has been conducted regarding the USACE's recommendation that the proposed project will result in no historic properties affected according the 36 CFR § 800.4(d)(1).

7.4.15 Aesthetic (Visual Resources)*

7.4.15.1 No Action Alternative*

No impact would occur to visual resources as a result of the No Action Alternative.

7.4.15.2 Alternative 2 – Proposed Action*

During construction activities associated with the dredge and placement operation, visual impacts would occur within the project area. These unsightly impacts could include heavy and ancillary equipment operating along the shoreline as well as in the nearshore pipeline corridor from the borrow area(s). Some minor increases in turbidity may be noted in the immediate vicinity at the borrow area(s) and placement activities but these increases would be minor and short term in nature. Some temporary discoloration of the sand would occur following placement as the sands were dredged to be placed from an aerobic environment. Natural bleaching of the sand will occur within one to two months or less. The duration of the temporary impact would exist until construction activities have ceased. Post construction, the dune and beach would have enhanced aesthetic value from restoration, including a biodiverse plant community that would also attract wildlife such as shorebirds and other species usage in the improved habitats.

7.4.16 Recreation Resources*

7.4.16.1 No Action Alternative*

Without the project, tourism could be expected to decrease or remain the same due to the lack of an adequate beach front. Travel generated expenditures and employment could be expected to be stagnant. Recreational usage within the proposed action area could be diminished by continual erosion and other damage from wind, wave and storm surge from tropical storm events as a result of the No Action Alternative.

7.4.16.2 Alternative 2 – Proposed Action*

The shoreline for recreation use would be inaccessible to the public during construction activities. Recreational fishing, sunbathing and swimming will be temporarily affected by the project since the public, including fishermen, will not be allowed to enter active work areas. However, since the project will be constructed in sections and only those sections actually under construction will be closed to the public, impacts to these activities will be localized and relatively short-lived. This situation could have temporary economic and socioeconomic impacts for these communities. A usable recreational beach 50 - 100 feet wide stretching 6.2 miles along the project shore will draw additional visitors to the Gulf of Mexico shore. This will draw additional visitors to the Gulf of Mexico shore for the tourist industry as well as part time or full time residents of

Okaloosa County. In sum, the proposed project will have beneficial economic impacts and no significant adverse impacts to recreational values.

7.4.17 Air Quality*

7.4.17.1 No Action Alternative*

No impact would occur to air quality as a result of the No Action Alternative.

7.4.17.2 Alternative 2 – Proposed Action*

Air quality would be temporarily and insignificantly affected by the proposed action in Okaloosa County. Emissions are expected to occur and would result from the operation of the dredge, land-based equipment, and any other support equipment which may be on or adjacent to the construction areas. The project area in Okaloosa County is currently in attainment with NAAQS parameters. The proposed action would not affect the attainment status of the project area or region. A State Implementation Plan conformity determination (42 United States Code 7506 (c) is not required since the project area is in attainment for all criteria pollutants.

7.4.18 Noise*

7.4.18.1 No Action Alternative*

No impact of noise would occur as a result of the No Action Alternative.

7.4.18.2 Alternative 2 – Proposed Action*

Noise from the dredge and other associated support equipment would be evident in the project area during operations. Noise levels would be typical of what is already commonly accepted and occurring at the USACE dredging operation sites. While this noise would be evident to those workers on the job, residents, and by-standers in close proximity of the project, it would be short-term and insignificant. No long-term increase in noise would occur in or around the project area.

7.5 Reasonably Foreseeable Future*

Impacts on the environment that result from incremental impacts of the action when added to reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. This section analyzes the proposed action as well as any connected, cumulative, and similar existing and potential actions occurring in the area surrounding the site.

No projects are known to be interdependent upon this project. It is likely that renourishment events in the action area would occur in the future to maintain the beach

design profile and additional sand sources would be used. Renourishment is expected to occur at regular 10-year intervals with increasing occurrence if the area is impacted by tropical storm events. Several other known renourishments are occurring, have recently occurred, or are expected to occur within the Florida Panhandle. These include Pensacola Beach Restoration (8.2 miles of shoreline), Navarre Beach and Dune (3.6 miles of shoreline), and City of Destin Beach renourishment (6.9 miles of shoreline and a 210-acre borrow area). In addition, there is a beach rehabilitation project currently underway at Panama City Beach as a response to Hurricane Michael storm damage that occurred in 2018. This project will nourish about 18 miles of beach in Bay County and has been awarded. These projects are not all expected to occur within the same renourishment cycle (year), thus providing time for the natural system to recover. Impacts from the reasonably foreseeable future that would arise from renourishment efforts are anticipated to be similar in nature due to the conservation measures typically incorporated into beach nourishment projects and the dynamic nature of the nearshore zone and the rapid recovery time of the benthic assemblages.

The NFS is currently permitted to construct a project at Okaloosa Island and West Destin that is larger in footprint and configuration than the RP. While it is not part of the Federal recommendation, there is a possibility that it could be constructed in the future to supplement the RP or in lieu thereof, at the NFS's direction and expense.

7.6 Environmental Compliance and Agency Consultation*

This section identifies and indicates the status of the determinations, coordination, and consultations pertaining to the environmental compliance laws and regulations for this project. Table-8-1, Section 8-1, summarizes the status of the applicable coordination and consultations with the support agencies.

7.6.1 National Environmental Policy Act (NEPA) of 1969*

Environmental information on the RP has been compiled into this integrated Feasibility/ EA report, and has been prepared in accordance with the NEPA. Upon finalization of this EA a determination is made regarding the significance of the impacts resulting from this project. It is found that the total impacts are not considered significant. The preparation of an Environmental Impact Statement is not required. Upon approval, the District Commander will sign a Finding of No Significant Impact (FONSI).

7.6.2 Endangered Species Act (ESA) of 1973*

The USACE, Mobile District conducted informal consultation with the USFWS and NMFS-PRD as required under Section 7 of the ESA to address all species that may occur within or immediately adjacent to the RP. Letters requesting informal consultation were submitted to these named agencies on January 6, 2021. A letter of concurrence received June 24, 2021 from NMFS-PRD determined that "Because all potential project

effects to listed species and critical habitat were found to be extremely unlikely to occur, insignificant, or beneficial, we conclude that the proposed action is not likely to adversely affect listed species and critical habitat under NMFS's purview" and concluded the USCAE consultation responsibilities under the ESA for species under NMFS's purview.

The USFWS combined ESA Consultation and FWCAR was received by the Mobile District on July 19, 2021. The USFWS concurred with the USACE determination of likely to adversely affect listed sea turtles following the Terms and Conditions of the Statewide Programmatic Biological Opinion, (SPBO, 2015), but not likely to adversely affect the West Indian manatee through implementation of the Standard Manatee Conditions for in-water work. The USFWS also concurred with the USACE determination that the RP is not likely to adversely affect the red knot or piping plover. The Choctawhatchee beach mouse critical habitat is located outside of, but nearby the project site. This buffer, along with USFWS request to follow the SPBO (2015) Terms and Conditions applicable to this species, has no adverse effect to beach mice or its nearby critical habitat, as a result of the RP. Copies of all ESA Section 7 documents are provided in Appendix C, Environmental.

7.6.3 Magnuson-Stevens Fishery Conservation and Management Act of 1973 (MSFCMA)*

The (MSFCMA) requires that Federal agencies assess potential impacts to EFH for NMFS-HCD managed commercial fisheries. In accordance with the MSFCMA, any Federal action that has the potential to adversely affect EFH requires consultation with the NMFS-HCD.

The USACE will adhere to water quality requirements under the conditions specified by the FDEP to further reduce impacts to EFH. Based on the USACE assessment of the project in relation to impacts to fisheries resources, the overall impact to identified species is considered negligible given the relatively small area and will not result in significant impacts to EFH.

Consultation pursuant to the MSFCMA (PL 94-265) correspondence was submitted to the NMFS-HCD on January 22, 2021 for review of the USACE EFH assessment and subsequent information for the proposed selected plan. A letter of concurrence from the NMFS HRD was received on March 8, 2021 which determined any impacts from the project would be minimal, and no conservation measures are recommended at this time. A copy of this correspondence is contained in the Appendix C, Environmental.

7.6.4 Coastal Zone Management Act (CZMA) of 1972*

The CZMA (16 U.S.C. § 1451 et seq.) was enacted by Congress in 1972 to develop a national coastal management program that comprehensively manages and balances

competing uses of and impacts on any coastal area or resource. The program is implemented by individual state coastal management programs in partnership with the Federal Government.

According to the CZMA Federal consistency requirement, 16 U.S.C. § 1456, Federal activities must be consistent, to the maximum extent practicable, with a state's Federally approved coastal management program. The Federal consistency requirement is an important mechanism to address coastal effects, to ensure adequate Federal consideration of state coastal management programs, and to avoid conflicts between states and Federal agencies. The Coastal Zone Act Reauthorization Amendments of 1990 (P.L. 106-508), enacted on November 5, 1990, as well as the Coastal Zone Protection Act of 1996, amended and reauthorized the CZMA. The CZMA is administered by the Office of Ocean and Coastal Resource Management, within the NOAA National Ocean Service.

The FDEP is the lead agency for administering the state's coastal program. The USACE, Mobile District made the determination that following the review of this EA, the RP is consistent with the Florida Coastal Program to the maximum extent practicable. The USACE, Mobile District will request coastal zone consistency from the FDEP during the PED phase of this project that will be included in the Florida Joint Coastal Permit (JCP). The FDEP issued a memo in March 2021 to the Florida State Clearinghouse that the project as planned is consistent with their authorities under the FL CZMA. Furthermore, the FWC issued a letter of consistency in February 2021. Copies of these documents are included in Appendix C, Environmental.

7.6.5 Clean Air Act of 1972*

No air quality permits are required for this project.

7.6.6 Clean Water Act (CWA) of 1972*

The CWA states that it is unlawful to discharge any pollutant from a point source into navigable waters unless appropriate permits have been obtained through the Section 401 WQC process. Dredging material from the selected borrow site and placement of the material as described for the RP requires that a Section 401 WQC be obtained. A Section 401 WQC application will be prepared for submittal to the FDEP for the RP during the PED phase of the project. A Section 404 (b)(1) evaluation report is included in the EA under EA-Appendix C, Environmental. The report indicates no further physical, biological, or chemical testing is required pursuant to the 404(b)(1) Guidelines. Based on the information presented, no mitigation requirements have been identified.

7.6.7 Migratory Bird Treaty Act (MBTA)*

The MBTA makes it illegal to “take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter” a species identified in 50 CF 10.13. The USFWS has statutory authority and responsibility for enforcing the MBTA under 16 U.S.C. 703-712. Migratory species protected by the MBTA are internationally protected through conventions between the U.S. and Canada, Mexico, Japan, and Russia. Any species protected through one or more of the four international conventions is qualified for protection under the MBTA. Should project activities occur during the nesting season April 1 through August 31, conservation measures, such as shorebird nesting monitoring would be implemented as stipulated in the USFWS informal consultation letter of concurrence. The final rule for the revised list of migratory birds (2019) is included in EA-Appendix C, Environmental.

7.6.8 Bald and Golden Eagle Protection Act*

The Bald and Golden Eagle Protection Act (BGEPA) prohibits the “taking” of bald eagles (*Haliaeetus leucocephalus*) or golden eagles (*Aquila chrysaetos*) as defined in 16 U.S.C. 668-668c. “Take” is defined by the BGEPA as to “pursue, shoot, shoot at, poison, wound, kill capture, trap, collect, molest or disturb.” “Disturb” is further defined as “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." The BGEPA extends to activities occurring near nests when eagles are not present.

The FWC actively surveys and maintains records of bald eagle activity throughout the state. At this time, no bald eagle nests have been identified within the immediate area of the proposed action.

7.6.9 Marine Mammal Protection Act (MMPA)

The MMPA was enacted on October 21, 1972 to protect all marine mammals in US waters and restrict the importation of marine mammals and their products into the US. Jurisdiction for MMPA is shared between USFWS and the NMFS. In the Okaloosa coastal area, MMPA species typically encountered could include whales, dolphins, porpoise, and manatee.

7.6.10 Fish and Wildlife Coordination Act of 1958, as amended

The FWCA requires that Federal agencies consult with the USFWS regarding fish and wildlife resources in the project area. Such coordination would typically result in a Fish and Wildlife Coordination Act Report (FWCAR). However, redundancy exists between

the roles of the ESA and the FWCA that would encourage a revised approach to meet compliance of these Acts. While USFWS prepared the ESA Section 7 consultation, evaluation also included FWCA requirements for compliance with this Act. This coordination was conducted with the USFWS in accordance with the FWCA regarding impacts to significant fish and wildlife resources and impacts to Federally listed or proposed species or their designated or proposed critical habitat, which is in accordance with Section 7 of the ESA. Funds were transferred to the USFWS to prepare this FWCAR. An agreement exists between the USACE and the USFWS to apply the Final FR/EA as the main coordination vehicle to develop the FWCAR.

After analysis of the Okaloosa County CSRM RP, the USFWS identified several non-binding FWCA recommendations to be considered as part of the project's implementation (see Appendix C, Environmental, for the complete documentation). A summary of those recommendations is listed below:

1. Construct the berm or dune features in a <u>non-linear</u> patter to emulate natural beach-dune systems. Gaps and open areas behind the "dunes" provide protected habitat for nesting shorebirds and beach mice.

   USACE response: This will be considered during PED phase.

2. 500-1,000-foot wide shoreline segments/zones where no sand deposition is allowed within the intertidal zone will be established every mile for survival and recovery of invertebrate food resources in identified areas with highest concentrations of shorebirds OR at a regular interval along the beach per the restoration protocol.

   USACE response: This will be considered, if feasible in limited project areas, during PED phase.

3. Any sand placement dunes, berms, or dunets, will be tapered 75 to 150 feet from inlet and outfall areas.

   USACE response: This recommendation is accepted and will be included in the design and project construction.

4. The Service discourages the use of sand fencing, but if deemed necessary, project must follow Service-provided best management practices, including the use of bio-degradable materials that don't require removal.

   USACE response: This recommendation is accepted.

5. Plant dune features in sparse density (less than 50%), but high plant species variety-- following the recommendations in Miller and Thetford's (2018) publication "Dune Restoration and Enhancement for the Florida Panhandle" for

species and installations found under “active restoration applications (page 19). https://edis.ifas.ufl.edu/pdf%5CSG%5CSG15600.pdf

USACE response: This will be investigated further during the PED phase for the project’s applicability, and if an array of plant species is available at that time, then the dunes will be planted accordingly.

6. Incorporate the use of coastalplain honeycombhead (*Balduina angustifolia*) behind the dune features to help support the expansion of use by the rare Gulf Coast solitary bee (*Hesperapis oraria*).

   USACE response: This recommendation will be considered during PED phase based on its market availability of the species for dune planting.

7. Project construction activities will avoid key nesting seasons of protected species.

   USACE response: This recommendation is not accepted. Typically, USACE coastal project activities can occur during nesting seasons. However, protective management measures will be addressed through implementation of biological opinion reasonable and prudent measures along with FDEP permit terms and conditions..

8. Protect permanent and ephemeral pools, lagoons and sand spits during project construction as these provide optimal foraging and roosting areas year around for shorebirds.

   USACE response: This recommendation is not accepted as these particular habitats are not present in the RP footprint.

9. Create a permanent pool feature between the Project area, east but adjacent Destin Pass inlet and protect it from disturbance. Around the created pool, spread out shell-mash for nesting shorebirds in sections at least 20 feet by 10 feet in size. Have the local sponsor commit to posting and roping around the newly created feature to reduce disturbance for roosting and nesting water- and shore-birds year around. Educational signs should be placed around the feature to explain the importance of these areas for birds.

   USACE response: This recommendation is not accepted as it requires measures that are not within the authorization of the RP.

10. Monitoring is the responsibility of the applicant and protocols for listed species and habitat features such as vegetative survival, expansion, and dune growth will be detailed in the restoration protocol. Per the adaptive management protocol, if certain restoration features are not successful, modifications within the intent and

scope of the original action will be made (i.e., a replanting or re-stabilization of a vegetative island) on the next sand placement event.

USACE response: The project is CSRM that will have an initial and future renourishment cycles. Monitoring will occur prior to and during project construction but outyear monitoring will not be conducted. No adaptive management protocol will be developed as part of this proposed action. Compliance with all environmental laws will occur.

11. Access will be granted for Service and other federally-permitted personnel to conduct monitoring of the project site.

    USACE response: This recommendation is accepted given it would not interfere with the USACE's construction activities.

12. US Geological Survey (USGS) recently published "Impacts of sediment removal from and placement in coastal barrier island systems" (Miselis et al. 2021). This publication identifies several knowledge gaps and recommendations necessary to inform future sand placement events. We recommend the Corps work with USGS and set up appropriate studies concerning the effects of sediment placement on short- and long- term time scales as summarized in sections 3.3.3 (p. 23), 4.4 (p. 30), 6.3.2 (p. 45), and 7.4 (p. 51).

    USACE response: This recommendation is not accepted as it exceeds USACE authorization.

13. Compliance and enforcement will be the responsibility of the local sponsor for the following rules within the habitat restoration project area:
    a. Post and rope (and signage if needed for compliance) will be installed ≥25 feet seaward of the starter dune to prevent human disturbance. For large projects this may not be attainable so focus will be on documented high disturbance areas. Untrampled beach areas maintain and establish vegetation, traps sand, and therefore new starter dunes are more likely to accumulate.

       USACE response: The NFS has implemented this measure as routine management of the beach.

    b. The local sponsor is to protect the "wrack line" (organic debris that washes up with the tide) within the Project Area, post-construction and between sand placement events. Beach cleaning could increase erosion. Suggesting alternatives methods of beach cleaning may reduce frequency of sand placement events. At the minimum, beach cleaning is to occur dune-side of the wrack line, leaving the primary wrack line protected.

USACE response: The NFS has implemented this measure as routine management of the beach.

c. Wildlife friendly lighting (The Dark Skies Initiative) will be used where lighting is needed and existing ordinances will be enforced. Lighting considerations will be incorporated throughout the entire affected coastal dune habitat to encompass all nocturnal coastal wildlife.

   USACE response: The NFS has implemented this measure as routine management of the beach.

d. Nighttime activities, other than walking, will not be permitted on the beach in the project footprint (for example, fires, driving, pets on beach).

   USACE response: The NFS has implemented this measure as routine management of the beach.

e. Pets will not be permitted on the beach in the project footprint (depending on the scope of the project, some limited areas can be used by pets if already authorized).

   USACE response: The NFS has implemented this measure as routine management of the beach.

f. Creation of driving corridors for vendors, and emergency personal that routinely travel the beaches.

   USACE response: The NFS has implemented this measure as routine management of the beach.

g. Predators will be deterred through installation of predator-proof trash receptacles at select roadside access points. Trash along the shoreline can be manually picked up as needed.

   USACE response: The NFS has implemented this measure as routine management of the beach.

h. An educational kiosk or signage will be placed at the project site providing information about coastal species and the benefit of habitat restoration and a receptacle for fishing line will be placed at access areas.

   USACE response: The NFS will consider this response.

All current coordination documents are included Appendix C, Environmental.

7.6.11 Coastal Barrier Resources Act (CBRA) Protected Shoreline*

The CBRA (PL 97-348) restricts Federal expenditures and financial assistance within designated CBRA zones in the Gulf and Atlantic Coasts. Two CBRA units are located within the project area. Coordination with the USFWS concerning the consistency of the selected plan in accordance with the requirements of CBRA for the units has been completed to ensure that the expenditure of Federal funds does not enhance the potential for development within these units. CBRA units that fall within the study limits include P32, and P32A as illustrated in Figure 5-2. Below is a description of each CBRA Unit and how it relates to the study:

Unit P32 - This unit is located at the eastern-most end of the study area in the city of Destin and corresponds with FDEP Monuments R40 through R50, adjacent to the eastern boundary with Walton County. No economically justified project could be identified in this area. Any activity within this reach would be local and would be 100% funded by the NFS. Since this segment is not part of the RP, no Federal funding will be used for construction in this segment, therefore the CBRA is not applicable with this project. Any future work conducted within this unit will be 100% funded by the NFS.

Unit P32A – This unit is located in the eastern section of the study area and corresponds to project segments R33 through R39. This unit includes the Henderson Beach State Park. This unit is not within a proposed construction area and abuts CBRA Unit 32. Even though the construction reach is small, it is believed that establishing the proposed beach-dune system will contribute to the overall sustainability of the fish and wildlife and various other natural resources including the dune lakes.

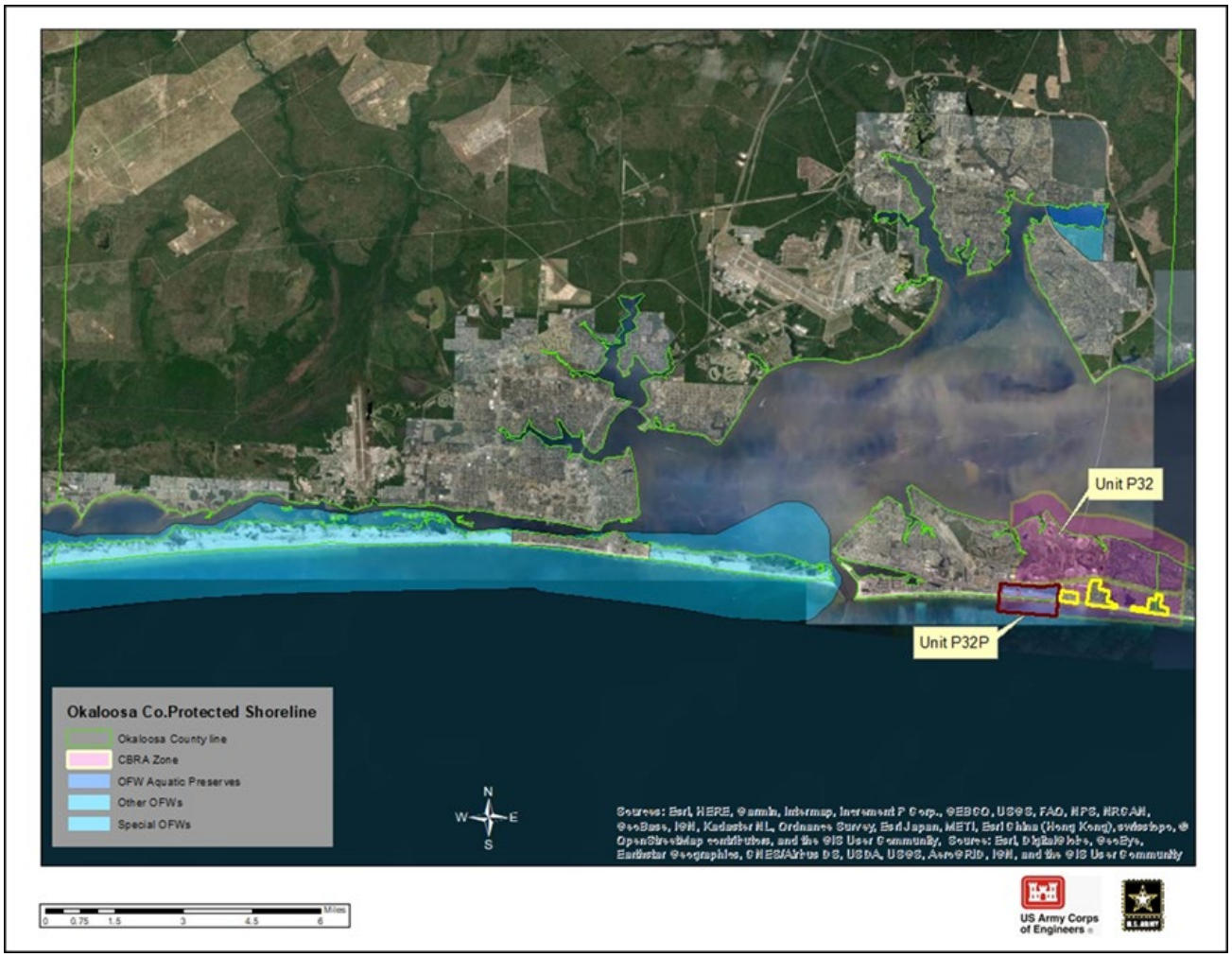
7.6.12 Gulf Islands National Seashore (GINS)*

In 1971, Congress established the GINS “in order to preserve for public use and enjoyment certain areas possessing outstanding natural, historic, and recreational values”. The NPS manages these lands in keeping with that purpose. The GINS includes Okaloosa Island from the western county line to East Pass and is encompassed in the study area, which corresponds to the OFW boundary as shown on Figure 7-1. Coordination with the NPS includes an accepted request for participation the NEPA action (this EA) as a cooperating agency, see EA, Appendix C, Environmental, for copy of letter and other communication. Impact to the shoreline is considered temporary and ultimately, the RP will benefit the beach and dune ecosystems.

7.6.13 Outstanding Florida Waters and Aquatic Preserve*

Florida has designated OFW (Sect 62-302.700, F.A.C.) along its state jurisdictional coastline; see Figure 7-1. OFW are waters designated worthy of special protection because of their natural attributes; the FDEP manages OFW to protect and maintain existing acceptable water quality standards. Within the study area, OFW occurs along the Okaloosa Island and nearshore from the west county line to East Pass, (same limits at the GINS). Rocky Bayou within Choctawhatchee Bay is a designated OFW Aquatic Preserve. Figure 7-1 depicts the OFW/AP along the Okaloosa Island shoreline. Although temporary impacts will occur to the OFW, the RP will ultimately benefit the designated area within the project footprint.

Figure 7-1. Okaloosa County Protected Coastline



SECTION 8.0 PUBLIC INVOLVEMENT, AGENCY CONSULTATION, AND PUBLIC REVIEW*

8.1 Agency Coordination and Compliance with Environmental Requirements*

Study scoping was developed in a scoping Charette workshop held in Okaloosa County in October 30, 2018. Scoping identified concerns regarding the effect on the local community, environment, impacts during construction, and safety. A summary of all coordination with Federal and Florida state environmental regulatory agencies is provided in Table-8-1. Consultation, collaboration, and other communication efforts are ongoing throughout the process of planning an execution of this project.

Table-8-1. Okaloosa County CSRM Summary of Agency Engagement

Correspondence Type (Topic Matter)	Date	Agency Name	Response	Outcome
FWCAR Request letter	Feb 18 2019	USFWS	Completed	Concurred
NEPA Cooperating Agency Partner Request Letter	Feb 6 2019	USFWS	email	Declined
		NOAA/NMFS	Letter	Accepted
		NPS	Email	Accepted
		EPA		No response
		Eglin AFB	Letter	Accepted
		FEMA		No response
		USGS		No response
		FDEP		No response
		FWC		No response
		FDOT	Ltr/email	Accepted/participating

Correspondence Type (Topic Matter)	Date	Agency Name	Response	Outcome
Agency Coordination Meeting Invitation (email) **Agency Coordination Meeting (webinar)**	Mar 7 2019 Mar 28 2019	CESAM USFWS NOAA/NMFS USGS NPS EPA Eglin AFB FDEP FWC SHPO FDOT Okaloosa Co	USFWS not able to attend; all others listed attended.	Topics discussed: study limits, purpose, need, objectives, alternatives development, natural resources (specific to agencies), and cultural resources. See MFR, PD-EC project folder
Informal EFH consultation initiated (email, phone)	Sep 26 2019	NMFS	Completed	EFH Assessment determination minimal effect
CBRA discussion		USFWS	Ongoing	JCP to be issued during PED
ESA Consultation		USFWS	Completed	Concurrence received; see Table 8-2
Charette Meeting	Oct 30 2018	Multiple		Onsite Okaloosa Co

Correspondence Type (Topic Matter)	Date	Agency Name	Response	Outcome
Public NEPA Scoping Meeting	Nov 15 2018	CESAM Non-Fed Sponsor		Onsite Okaloosa Co

8.2 Public Involvement and Review*

On November 15, 2018, a public meeting was held in Fort Walton Beach, Okaloosa County, Florida for the purpose of gaining scoping input from the general public. The open house format encouraged discussion between the USACE PDT, the NFS, and residents within the study area. Comments were applied in plan formulation of the study for alternative development.

The public review period of the draft FR/EA occurred from January 15, 2021 until February 17, 2021. No comments were received from the general public.

Comments received from state and Federal agencies include the following:

- Comment received from Eglin AFB on February 17, 2021 concluded no responses were received from the 50 subject matter experts to whom the draft FR/EA was distributed. Eglin AFB also requested a copy of the Final FR/EA and FONSI once completed. For more information regarding real estate coordination with Eglin AFB, see Appendix D, Real Estate.

- A Memorandum from the FDEP to the FL State Clearinghouse was received by the USACE, Mobile District on April 1, 2021 which addressed several comments stating that the USACE, Mobile District has developed a recommended solution that generally mirrors a previously authorized project that was defended during a court action. The memorandum concludes that “FDEP supports the selected plan as its authorization would create a Federal partnership going forward with these projects.” Other itemized comments were addressed throughout the project, such as references to recent 2020 FDEP publications regarding hurricane damage and critically eroded beach.

- A letter from FWC was received on February 17, 2021 which recommended several measures to reduce potential impact to nesting shorebirds such as leaving avoid leaving open sandy areas for extended time, conduct bird monitoring by a qualified monitor, establish a 300-foot buffer in the event

breeding or nesting activity is confirmed to occur during construction activities. Sea turtle nesting and manatee issues will be addressed during the FL Joint Coastal Permit application process.

- An email communication from the FL Clearinghouse was received on April 19, 2021 summarized the FDEP and FWC correspondence (presented above). An error was noted regarding designation of the USEPA designated brownfield, which has been corrected in the Final FR/EA to identify the site as a City of Fort Walton Beach designated brownfield area (Section 2.9.2). The correspondence also noted that further Environmental Resource Permits would likely be required for the proposed work and concluded the FDEP found that the subject project is consistent with the FL Coastal Management Program (FCMP). The final concurrence of the project's consistency with the FCMP will be determined in the permitting process.

Copies of these commentary documents are found in Appendix C, Environmental.

Environmental regulatory compliance has been conducted to address Federal and state requirements that address potential effects to resources and other concerns associated with the RP. A summary of all environmental compliance pursuant to Section 1005 WRRDA 2014 is presented in Table 8-2 below.

Table 8-2. Summary of Environmental Regulatory Compliance

Regulation/Agency	Date Initiated	Date Concurrence	Outcome
FWCA/USFWS	Jan 6, 2021	Jun 5, 2021*	FWCA report combined with ESA Section 7 consultation
ESA/USFWS	Jan 6, 2021	Jun 5, 2021*	Informal consultation
ESA/NMFS-PRD	Jan 6, 2021	Jun 24. 2021	Informal consultation; found not likely to adversely affect listed species or critical habitat
EFH/NMFS-HRD	Jan 22, 2021	Mar 8, 2021	Anticipated impacts from the Project would be terminal
NHPA/SHPO	Jan 11. 2021	Feb 4, 2021	Proposed activities are unlikely to affect historic properties

Regulation/Agency	Date Initiated	Date Concurrence	Outcome
NHPA/Seminole Tribe	Jan 11. 2021	Jan 26,2021	Tribe has no objections or comments regarding the Proposed Action at this time
NHPA/Muscogee Nation	Jan 11. 2021	Feb 23, 2021	No effects anticipated to any known historic properties; work can continue as planned
CWA 404(b)(1)	Jan 15, 2021		Released Draft version with IFR/EA; Final in Appendix C, Environmental
CWA 401/FDEP	Mar 1, 2021	Apr 19, 2021	Letter of reasonable assurance agency will issue JCP during PED phase
CZMA/FDEP	Mar 1, 2021	Apr 19, 2021	Letter of reasonable assurance agency will issue JCP during PED phase
CZMA/FWC	Feb 19, 2021	NA	Letter of reasonable assurance agency will issue JCP during PED phase
Contents of all correspondence between the USACE, Mobile District and Agencies are included in Appendix C, Environmental			

8.3 Project Delivery Team and List of Preparers*

The members of the PDT for the OCCSRM Integrated Feasibility Study with EA that contributed to the development of this report at listed in Table 8-3.

Table 8-3: Project Delivery Team/Preparer

Name	Affiliation
Jonas White	Project Manager, Civil Works Programs and Project Management Branch, USACE, Mobile District
Joe Paine	Plan Formulator, Plan Formulation Branch, USACE, Mobile District
Richard Allen	Coastal Engineer, Hydrology and Hydraulics Branch, USACE, Mobile District
Julie McGuire	Economist, USACE, Deep Draft Navigation Planning Center of Expertise (DDNPCX)
Kathleen McConnell	Environmental Planner, Environmental Resources Branch, USACE, Mobile District
Michael FitzHarris	Geologist, Geotechnical, Environmental, & HTRW Branch, USACE, Mobile District
George Ebai	Economist, Planning Branch, USACE, Charleston District
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Allan Annaert	Cost Engineer, Technical Support Branch, USACE, Mobile District
John Tetreau	Realty Specialist, Acquisition Branch, USACE, Mobile District
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8.4 Distribution List for Feasibility Draft Report/EA*

The draft integrated FR/EA was presented to the public and various agencies for review and commentary on January 15, 2021. The review period encompassed 30 days and terminated around March 16, 2021. A Notice of Availability announcing the review period was distributed to multiple stakeholders and other interested parties noted in Table 8-4 below.

Table 8-4. Summary of Distribution of Public and Agency Review and Commentary Period

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SECTION 9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 Environmental Operating Principles

The USACE EOPs were developed to ensure that all missions integrate sustainable environmental practices. The EOPs provided corporate direction to ensure USACE's role in, and responsibility for, sustainable use, stewardship, and restoration of natural resources across business practices for consideration of environmental impacts of actions along with collaboration within the larger environmental community.

The EOPs relate to the human environment and apply to all aspects of business and operations, including Civil Works. Re-committing to these principles and environmental stewardship will lead to more efficient and effective solutions and will enable USACE to further leverage resources through collaboration. This is essential for successful integrated resources management, restoration of the environment and sustainable and energy efficient approaches to all mission areas.

The reinvigorated EOPs, and their relation to the Okaloosa County CSRM, are:

- Foster sustainability as a way of life throughout the organization.

  The RP for the Okaloosa County CSRM includes renourishment events on a 10-year cycle for the 50 year life of the project. These renourishment events will create sustained habitat for the resources and the species dependent upon them.

- Proactively consider environmental consequences of all USACE activities and act accordingly.

  Early in the Okaloosa County CSRM study, outreach and coordination with Federal and state resource agencies and other stakeholders identified natural resources that could be affected by project activities. From this coordination, environmental concerns were identified and considered throughout the plan formulation process while developing alternatives for the ultimate decision that is the RP.

- Create mutually supporting economic and environmentally sustainable solutions.

  During alternatives development, economic viability included structural and non-structural management measures that were aligned with environmental measures such as nature and natural based features to create sustainable coastal stability for the life of the project.

- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the USACE, which may impact human and natural environments.

The RP of the Okaloosa County CSRM study is aligned with the USACE mission in the application of responsible and accountable laws and policies that promote human health and safety along with environmental stewardship in the establishment of sustained, stable ecosystems.

- Consider the environment in employing a risk management and systems approach throughout life cycles of projects and programs.

  Environmental compliance conducted throughout the study addresses risk that is specific to natural resources and their habitats by determining resiliency of sensitive species, both flora and fauna, as a measure of success for this USACE civil works project. Anticipating success of the RP, the project will provide environmental benefits, such as stable natural resource habitats, that far exceed the duration of the project.

- Leverage scientific, economic and social knowledge to understand the environmental context and effects of the USACE actions in a collaborative manner.

  Collaborated effort from Federal and state agencies, regional scientific community and literature, along with stakeholders' input provided a comprehensive environmental evaluation of the resources supported by onsite survey of habitats, possible adverse impacts, and the benefits of enhanced environmental quality from implementation of the RP.

- Employ an open, transparent process that respects views of individuals and groups interested in the USACE activities.

  Public and resource agency outreach during the study, along with ongoing communication with resource agencies and cooperating partners are ongoing throughout the duration of the study. These activities included a charrette and a public scoping meeting early in the study, and an agency coordination meeting. Agency coordination and outreach continues with study status update calls and other communications, as well as environmental compliance consultations.

9.2 EO 11988 Considerations

This study has considered the requirements of EO 11988, Flood Plain Management. EO 11988 requires federal agencies avoid, to the extent possible, the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health,

and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities."

The Water Resources Council Floodplain Management Guidelines for implementation of EO 11988, as referenced in USACE ER 1165-2-26, requires an eight step process that agencies should carry out as part of their decision making on projects that have potential impacts to, or are within the floodplain. The eight steps and project-specific responses to them are summarized below.

1. **Determine if a proposed action is in the base floodplain (that area which has a one percent or greater chance of flooding in any given year).** The proposed action is within the base floodplain; however, the project is designed to reduce damages to existing infrastructure located landward of the proposed project.
2. **If the action is in the base floodplain, identify and evaluate practicable alternatives to the action or to location of the action in the base floodplain.** Chapters 3 through 6 discuss the process of screening and analyzing both measures and alternatives. Nonstructural, structural, and NNBF measures were all considered in the process.
3. **If the action must be in the floodplain, advise the general public in the affected area and obtain their views and comments.** An EA and the NEPA procedures are being developed concurrently with the study. During this process the local stakeholders and the general public have been afforded the opportunity to review and comment on the study recommendations.
4. **Identify beneficial and adverse impacts due to the action and any expected losses of natural and beneficial floodplain values. Where actions proposed to be located outside the base floodplain will affect the base floodplain, impacts resulting from these actions should also be identified.** The anticipated impacts and environmental compliance associated with the RP are summarized in Section 7 and 8. The project is not expected to alter or impact the natural or beneficial floodplain values.
5. **If the action is likely to induce development in the base floodplain, determine if a practicable non-floodplain alternative for the development exists.** The project provides benefits primarily for existing and previously approved development and is not likely to induce significant development. Structural components of the project, and real estate requirements required for construction of the project will reduce the level of development that is at risk.
6. **As part of the planning process under the Principles and Guidelines, determine viable methods to minimize any adverse impacts of the action including any likely induced development for which there is no practicable**

alternative and methods to restore and preserve the natural and beneficial floodplain values. This should include reevaluation of the "no action" alternative. The project is not expected to induce development in the floodplain. In areas where the project will impact the natural or beneficial floodplain values, environmental mitigation is planned. Due to the built-out level of the area the impact to natural floodplains is considered minimal. Sections 3 through 6 of this report summarizes the alternative identification, screening and selection process. The "no action" alternative was included in the plan formulation phase.

7. **If the final determination is made that no practicable alternative exists to locating the action in the floodplain, advise the general public in the affected area of the findings.** The Draft Feasibility Report and Environmental Impact Statement were provided for public review. No public comments were received

8. **Recommend the plan most responsive to the planning objectives established by the study and consistent with the requirements of the EO.** The RP is the most responsive to all of the study objectives and the most consistent with the EO.

9.3 Cost Sharing

All project costs for the RP are allocated to the purpose of CSRM. Cost-sharing for initial construction would be 65% Federal and 35% non-Federal, consistent with requirements specified in Section 103(c)(5) of the Water Resources Development Act (WRDA) of 1986, as amended by WRDA 1996. Adjustments can be made to the cost share depending on property ownership and whether developed or not. It should be noted that the Okaloosa Island reach includes one parcel of 600 feet that is owned by the U.S. Air Force. This parcel, although a minor portion of the project, is located amid other parcels to be protected and is integral to the functionality and the resilience of the RP. It will be cost shared at 100% Federal. Also in the Okaloosa Island reach, transitions from the project template to the natural beach profile at either end will be on Air Force lands. The length of the transitions on Air Force lands are 450 feet each.

Table 9-1 presents the cost share adjustment for the initial nourishment. The adjustment results in a cost share for Okaloosa Island of 66.9% Federal and 33.1% non-Federal for initial construction and 62.7% Federal and 37.3% non-Federal for initial nourishment of West Destin. The overall project cost share for the initial nourishment is 64.8% Federal and 35.2% non-Federal.

Cost-sharing for periodic nourishment (continuing construction) would be 50% Federal and 50% non-Federal, consistent with Section 215 of WRDA 99. This share can also be adjusted based on property ownership and development. Using calculations similar to those used for the initial nourishments in Table 9-1, the resulting cost share is 51.6%

Federal and 48.4% non-Federal for renourishments of Okaloosa Island and 48.2% Federal and 51.8% non-Federal for renourishments of West Destin. The overall project cost share for the renourishments is 49.9% Federal and 50.1% non-Federal.

Table 9-1. Determination of Initial Construction Cost Share Percentages

Okaloosa Island						
Reach Condition	**Federal Participation**	**Non-Fed Participation**	**Length (17,400 feet with transitions)**	**% of Total Reach Length**	**Federal Share**	**Cost Share Percentage**
Private Undeveloped	0%	100%	90	0.52	0.000	
Private Developed	65%	35%	13,060	75.06	0.488	
Public Undeveloped*	65%	35%	2,800	16.09	0.104	
Public Developed	65%	35%	850	4.88	0.032	
Federal Lands**	100%	0%	600	3.45	0.034	
Total Federal cost Share					0.669	66.9
Non-Federal Cost Share						33.1
West Destin						
Reach Condition	**Federal Participation**	**Non-Fed Participation**	**Length (16,900 feet with transitions)**	**% of Total Reach Length**	**Federal Share**	**Cost Share Percentage**
Private Undeveloped	0%	100%	600	3.55	0.000	
Private Developed	65%	35%	15,400	91.12	0.592	
Public Undeveloped	65%	35%	900	5.33	0.035	
Total Federal Cost Share					0.627	62.7
Non-Federal Cost Share						37.3

*Includes 900 feet of transitions, parking areas and walkway accesses.
**Includes 600 feet of leased developed Air Force land.

The estimated Project First Cost (October 2021 Price Level) of the initial nourishment is $31,357,000, or $20,319,000 for the Federal and $11,038,000 for non-Federal cost share. Non-Federal interests are required to provide all lands, easements, rights-of-way, relocations and disposal (LERRDs) necessary for the project. The value of LERRD estimated for the RP included in the initial project cost is $16,539,000. Table 9-2 below details RP costs and the associated cost share for the initial project costs.

The estimated Project First Cost of the renourishments is $144,832,000, or $72,271,000 for the Federal and $72,561,000 for the non-Federal cost share. Table 9-2 below also details the renourishment cost share for the RP. Annual OMRR&R costs are 100 percent non-Federal responsibility and are estimated to total about $87,000. The Federal government is responsible for preparing and providing an OMRR&R manual to the sponsor.

As discussed in Section 6.2.1.1, one of the Federal requirements for cost sharing is that nourished beaches must be available for public use which includes reasonable access and parking. For those reaches that are not available for public use, any construction proposed in those areas would be at local expense. The actual cost share will be based on the parking and access available at the time the Project Partnership Agreement is executed between the NFS and the Government. Currently, the Okaloosa Island reach has adequate parking and access along approximately 16,500 feet of its length. The West Destin reach, on the other hand, only has adequate parking and access along about 3,000 feet of its approximately 16,000 feet of length. The NFS has indicated their intent to obtain additional parking and access to satisfy the Federal requirement prior to execution of the PPA. Any costs incurred by the NFS to satisfy these requirements are not considered project costs and are not creditable towards the total amount of the NFS's required contributions. The cost apportionment shown in Table 9-2 is computed to assume that 100 percent of the project would meet these requirements by the time the PPA is executed. If none of the additional required parking and access are obtained, the cost share for the project would be modified per Table 9-3.

Table 9-2. Project Cost Share

CONSTRUCTION COST SHARE (OCTOBER 2021 PRICE LEVEL)				
Area	**COST ITEM**	**PROJECT FIRST COST**	**FEDERAL SHARE (USACE)**	**NON-FEDERAL SHARE**
Okaloosa Island	**Initial Construction***	**$8,621,000**	**$5,567,000**	**$3,054,000******
	Renourishments***	**$36,359,000**	**$18,761,000**	**$17,598,000**
West Destin	**Initial Construction****	**$22,736,000**	**$14,255,000**	**$8,481,000*******
	Renourishments***	**$108,473,000**	**$52,284,000**	**$56,189,000**
Totals		**$176,189,000**	**$90,867,000**	**$85,322,000**

Note: Cost Share is 66.9% Federal and 33.1% non-Federal for Okaloosa Island Initial Construction Cost. Cost Share is 62.7% Federal and 37.3% non-Federal for West Destin Initial Construction Cost. Calculations assume adequate parking and access.
*Includes LERRD of $3,258,000
**Includes LERRD of $13,281,000
*** Costs shared at 51.6% Federal and 48.4% non-Federal for Okaloosa Island and 48.2% Federal and 51.8% non-Federal for West Destin.
****LERRD cost estimated to exceed cost share requirement by $204,000. The NFS would be due a reimbursement for the excess cost.
*****LERRD cost estimated to exceed cost share requirement by $4,800,000. The NFS would be due a reimbursement for the excess cost.

Table 9-3. Construction Cost Share Based on Current Conditions if no additional Public Access or Parking Obtained

		Fed % (Initial)	Non-Fed % (Initial)	Fed % (Renourish-ment)	Non-Fed % (Renourish-ment)
Total Project Length (ft)	32,500				
Length with adequate P&A	19,000	64.8	35.2	49.9	50.1
Length without adequate P&A	13,500	0	100	0	100
% Project with adequate P&A	58.5				
Total Adjusted Cost Share		37.9*	62.1	29.2*	70.8

*Calculated by multiplying the normal cost share % by the % project with adequate P&A

9.4 Items of Local Cooperation

Federal implementation of the project for coastal risk management includes, but is not limited to, the following required items of local cooperation to be undertaken by the NFS in accordance with applicable Federal laws, regulations, and policies:

a. Provide 35 percent of construction costs for initial construction of the project and 50 percent of construction costs for periodic nourishment allocated by the Federal government to coastal storm risk management; 100 percent of construction costs for initial construction and periodic nourishment allocated by the Federal government to beach improvements with exclusively private benefits; 100 percent of construction costs for initial construction and periodic nourishment allocated by the Federal government to improvements and other work located within the Coastal Barrier Resources System that the Federal government has determined are ineligible for Federal financial participation; and 100 percent of construction costs for initial construction and periodic nourishment allocated by the Federal government to the prevention of losses of undeveloped private lands, as further specified below:

1. Provide, during design, 35 percent of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

2. Provide all real property interests, including placement area improvements, and perform all relocations determined by the Federal government to be required for the project;

3. Provide, during construction, any additional contribution necessary to make its total contribution equal to at least 35 percent of construction costs for initial construction and 50 percent of construction costs for periodic nourishment;

b. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might reduce the level of coastal storm risk reduction the project affords, hinder operation and maintenance of the project, or interfere with the project's proper function;

c. Inform affected interests, at least yearly, of the extent of risk reduction afforded by the project; participate in and comply with applicable Federal floodplain management and flood insurance programs; prepare a floodplain management plan for the project to be implemented not later than one year after completion of construction of the project; and publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with the project;

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

e. At least annually and after storm events, at no cost to the Federal government, perform surveillance of the project to determine losses of material and provide results of such surveillance to the Federal government;

f. For shores, other than Federal shores, protected using Federal funds, ensure the continued public use of such shores compatible with the authorized purpose of the project;

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

h. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project to inspect the project, and, if necessary, to undertake work necessary to the proper functioning of the project for its authorized purpose;

i. Hold and save the Federal government free from all damages arising from design, construction, operation, maintenance, repair, rehabilitation, and replacement of

the project, except for damages due to the fault or negligence of the Federal government or its contractors;

j. Perform, or ensure performance of, any investigations for hazardous, toxic, and radioactive wastes (HTRW) that are determined necessary to identify the existence and extent of any HTRW regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, and any other applicable law, that may exist in, on, or under real property interests that the Federal government determines to be necessary for construction, operation and maintenance of the project;

k. Agree, as between the Federal government and the non-Federal sponsor, to be solely responsible for the performance and costs of cleanup and response of any HTRW regulated under applicable law that are located in, on, or under real property interests required for construction, operation, and maintenance of the project, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination, without reimbursement or credit by the Federal government;

l. Agree, as between the Federal government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the owner and operator of the project for the purpose of CERCLA liability or other applicable law, and to the maximum extent practicable shall carry out its responsibilities in a manner that will not cause HTRW liability to arise under applicable law; and

m. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. 4630 and 4655) and the Uniform Regulations contained in 49 C.F.R Part 24, in acquiring real property interests necessary for construction, operation, and maintenance of the project including those necessary for relocations, and placement area improvements; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

9.5 Recommendation

I concur with the findings of this Integrated Feasibility Report and EA and recommend that the plan, as fully detailed in this report, be authorized for construction as a Federal project.

I have given consideration to all significant aspects of the public interest. These interests include environmental, social, and economic effects that are anticipated from the implementation of the RP. The engineering feasibility and compatibility of the project with the policies, desires, and capabilities of Okaloosa County, the State of Florida, and other non-Federal interests have also been considered.

The recommendations contained herein reflect the information and policies available at this time. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of highest review levels within the Executive Branch. Consequently, the recommendations may be modified by the Chief of Engineers before they are transmitted to Congress as proposals for authorization and implementing funding; however, prior to transmittal to Congress, the NFS, the State, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Jeremy J. Chapman, PE
Colonel, U. S. Army
District Commander

SECTION 10.0 REFERENCES AND APPENDICES

10.1 References

10.1.1 Literature Cited- Environmental Assessment

Audubon Society, 2020. Atlantic Flyway Zone. https://www.audubon.org/birds/flyways?ms=digital-acq-ppc-google-x-20190000_google_grant&gclid=CjwKCAjw_NX7BRA1EiwA2dpg0jsjEM9BGtRHE1toVmDrGE5orflDdum854cwgd8zPvZSgkK3_Bk4UBoCFbsQAvD_BwE

Blunden, Jessica and Derek S. Arndt. 2019. *State of the Climate,* American Meteorological Society. Bulleting American Meteorological Society 2019 100(9): Si-S306 https://journals.ametsoc.org/bams/article/100/9/Si/344820/State-of-the-Climate-in-2018?searchresult=1

Brooks, R.A. et al. 2006. *The benthic community of the eastern US continental shelf: A literature synopsis of benthic faunal resources.* USGS Staff -- Published Research. 1051. http://digitalcommons.unl.edu/usgsstaffpub/1051

Byrnes, Mark P. et al. 2004. *Effects of Sand Mining on Physical Processes and Biological Communities Offshore New Jersey, U.S.A.* Journal of Coastal Research. Vol 20 (201): 25 – 43.

Choctawhatchee Basin Alliance Website: http://basinalliance.org/
General information of Choctawhatchee Bay: http://basinalliance.org/where-we-work-2/in-the-choctawhatchee-bay/about-the-choctawhatchee-bay/

Cutler and Mahadevan, 1982. *Long-Term Effects of Beach Nourishment on the Benthic Fauna of Panama City Beach, Florida.* Miscellaneous Report No. 82-2. U.S. Army Corps of Engineers Coastal Engineering Research Center, Fort Belvoir, VA.

Dial Cordy and Associates Inc. 2002. *Environmental Assessment, Beach Restoration Project, Pensacola Beach, Escambia County, FL*. Jacksonville Beach, FL.

Doheny, Matt. (Gordian – Construction Publishers and Consultants), Square Foot Costs with RSMeans Data, 2019 40th annual edition

E-Tech Environmental Consulting 2012. *Quality Control, Quality Assurance, Sampling Strategy Report, and Lab Results*, Contract Report, January 2012.

Florida Department of Environmental Protection (FDEP), Beaches, Inlets and Ports Program

Range Monuments: https://floridadep.gov/rcp/beaches-inlets-ports/documents/range-monuments

Florida Sand Rule (F.A.C. 62B-33.005(7)) https://www.flrules.org/gateway/ruleNo.asp?id=62B-33.005

Division of Water Resource Management 2019. *Critically Eroded Beaches in Florida.* Office of Resilience and Coastal Protection. https://floridadep.gov/rcp/beaches

Office of Resilience and Coastal Protection, *Hurricane Sally Post-Storm Beach Condition and Coastal Impact Report,* FDEP, Nov 2020

Florida Fish and Wildlife Conservation Commission (FWC) 2020

Eagle Nesting Locations Florida 1998 to 2016. https://www.arcgis.com/sharing/rest/content/items/eb20bf44aeea44a8ab4a47cd4329c6b6/info/metadata/metadata.xml?format=default&output=html

Sea turtle statistical data: https://f50006a.eos-intl.net/F50006A/OPAC/Details/Record.aspx?BibCode=452346

Choctawhatchee beach mouse data: https://myfwc.com/wildlifehabitats/profiles/mammals/land/choctawhatchee-beach-mouse/

Red tide information: Website: https://myfwc.com/research/redtide/general/about/

Florida Natural Areas Inventory (FNAI). 2010. Guide to the natural communities of Florida: 2010 edition. Florida Natural Areas Inventory, Tallahassee, FL, Florida Natural Area Inventory (FNAI) (2010) land use classification description https://www.fnai.org/naturalcommguide.cfm

Institute for Systematic Botany (ISB) Florida Atlas of Vascular Plants, 2020, University of South Florida; https://florida.plantatlas.usf.edu/

Hemminga, Martin and Carlos M. Duarte, 2008 *Seagrass Ecology,* Cambridge University Press, Cambridge, England UK

Hoyer, Mark V. et al. 2015. *Chain of eutrophication models for assessing the potential impact of nutrient enrichment on Choctawhatchee Bay, FL, USA.* Florida Academy of Sciences, Florida Scientist 78(1)
Website: https://oceanservice.noaa.gov/hazards/hab/gulf-mexico.html

International Panel on Climate Change (IPCC) 2017 climate change
https://www.ipcc.ch/data/

Eagle Nesting Locations Florida 1998 to 2016.
https://www.arcgis.com/sharing/rest/content/items/eb20bf44aeea44a8ab4a47cd4329c6b6/info/metadata/metadata.xml?format=default&output=html

National Oceanic and Atmospheric Administration (NOAA), US Dept of Commerce 2020
NOAA, 2019 *Gulf of Mexico/Florida: Harmful Algal Blooms Fall 2018 Red Tide Event that Affected Florida and Gulf Coast*
https://oceanservice.noaa.gov/hazards/hab/florida-2018.html

NOAA Global Climate Summary. 2018. NOAA National Centers for Environmental Information, State of the Climate: Global Climate Report for Annual 2018, published online January 2019, retrieved on September 21, 2020 from https://www.ncdc.noaa.gov/sotc/global/201813

NOAA 2019 U.S. Climate Data for the Ft. Walton Beach - Destin Region
https://www.usclimatedata.com/climate/destin/florida/united-states/usfl0610

National Marine Fisheries Service (NMFS)

2003, Addendums 2005, 2007. *Gulf Regional Biological Opinion (GRBO) to the U.S. Army Corps of Engineers (COE) In Hopper Dredging of Navigation Channels and Borrow Areas in the U.S. Gulf of Mexico*
https://www.fisheries.noaa.gov/content/endangered-species-act-section-7-biological-opinions-southeast

2019. SE US Fisheries data: https://www.fisheries.noaa.gov/southeast-science-surveys-and-research

2019 Essential Fish Habitat website:
https://www.fisheries.noaa.gov/national/habitat-conservation/essential-fish-habitat

National Resource Conservation Service (NRCS) Web Soil Survey data https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

Okaloosa County 2019 Demographics statistical data http://edr.state.fl.us/Content/area-profiles/county/okaloosa.pdf

Saloman, C.H. 1976. *The Benthic Fauna and Sediments of the Nearshore Zone off Panama City Beach, Florida*. Miscellaneous Report No. 76-10. U.S. Army Corps of Engineers Coastal Engineering Research Center, Fort Belvoir, VA.

Saloman, C.H. and Naughton, S.P. 1984. *Beach Restoration with Offshore Dredged Sand: Effects on Nearshore Macroinfauna*. Technical Memorandum NMFS-SEFC-133. National Oceanic and Atmospheric Administration, Washington, D.C.
Sea Turtle Conservancy, 2020, *Information about Sea Turtles: Threat from Coastal Armoring;* Sea Turtle Conservancy, Gainesville, FL, https://www.conserveturtles.org/information-sea-turtles-threats-coastal-armoring/
Taylor Engineering, Inc. OCT 2009 *Eglin AFB/ Okaloosa County/ Destin Sand Source Investigation- Okaloosa County*

USACE Engineer Circular (EC) 1165-2-212, 2011. Greenhouse gases, PM10 and PM25, Oct 2011
http://cdnassets.hw.net/fe/16/8baf8c4647429af893007d718f8d/ec11652212nov2011.pdf

US Census Bureau website: https://usafacts.org/data/topics/people-society/

US Environmental Protection Agency (USEPA)

Atmospheric gases emissions, 2018: *Inventory of U.S. Greenhouse Gas Emissions and Sinks,* https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

Coastal SLR, impacts of climate change, 2018: *Climate Change in Coastal Communities*
https://www.epa.gov/cre/climate-change-coastal-communities

National Ambient Air Quality Standards (NAAQS), General Conformity Rule, 1993, rev 2010
https://www.epa.gov/general-conformity/what-general-conformity

Clean Water Act Section 303(d) 2016: Impaired Waters and Total Maximum Daily Loads (TDMLs) in the Southeast – Region 4 .Website:
https://www.epa.gov/tmdl/impaired-waters-and-tmdls-southeast-region-4

Ocean acidity concentrations 2019. https://www.epa.gov/climate-indicators/climate-change-indicators-ocean-acidity

US Fish and Wildlife Service (USFWS), US Dept of Interior

Choctawhatchee Beach Mouse Recovery Plan, 1987. 5-Year Review, 2019 https://ecos.fws.gov/docs/five_year_review/doc6290.pdf

Gulf Coast Solitary Bee, 2020 website: hpps://www.fws.gov/southeast/wildlife/insects/gulf-coast-solitary-bee

Okaloosa Darter Recovery Plan, 1981. Downlisting Final Rule, 2011: https://www.fws.gov/panamacity/okaloosadarter.html

Panama City Field Office website: https://www.fws.gov/panamacity/stafflist.html

Federal Threatened, Endangered, Candidate and Species of Concern in the Panhandle of Florida 2017; Critical Habitat data. Websites: https://www.fws.gov/panamacity/specieslist.html https://ecos.fws.gov/ecp/report/table/critical-habitat.html

Statewide Programmatic Biological Opinion (SPBO). Revised March, 2015 Service Log Number: 41910-201 1-F-0170 https://www.fws.gov/panamacity/resources/2015SPBO.pdf

Information for Planning and Consultation (IPAC), 2020 https://ecos.fws.gov/ipac/

USGS Topographic 7.5 Quadrangle Destin FL, 2018. https://catalog.data.gov/dataset/usgs-us-topo-7-5-minute-map-for-destin-fl-2018

USGS Florida Geological Survey, 1993, Open-file Series 16

Hydrologic conditions, habitat characteristics, and occurrence of fishes in the Apalachicola River floodplain, Florida; second annual report of progress, October 1993-September 1994

https://pubs.er.usgs.gov/search?q=Florida+Geological+Survey%2C+1993%2C+Open-file+Series+16

Wolfe, S.H., J.A. Reidenauer, and D.B. Means. 1988. *An ecological characterization of the Florida Panhandle*. U.S. Fish Wildlife Service Biological Report 88(12); Minerals Management Serv. OCS Study\MMS 88-0063; 277 pp.

Yarbro, Laura A. and Paul R. Carlson Jr. 1011. *Seagrass Integrated Mapping and Monitoring for the State of Florida Mapping* SIMM Report No. 1, 2011 FWC Fish and Wildlife Research Institute, St. Petersburg, FL

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