LOVERS KEY – BONITA BEACH NOURISHMENT PROJECT ENVIRONMENTAL ASSESSMENT

LEE COUNTY FLORIDA

U.S. ARMY CORPS OF ENGINEERS

BUREAU OF OCEAN ENERGY MANAGEMENT

January 18, 2024

EXECUTIVE SUMMARY

LOVERS KEY – BONITA BEACH NOURISHMENT PROJECT

ENVIRONMENTAL ASSESSMENT

LEE COUNTY, FLORIDA

PROJECT OVERVIEW

Lee County proactively manages their coastal resources by implementing a comprehensive beach management program. One of the main components of this program includes nourishment of segments of the shoreline, historically utilizing offshore sand resources supplemented with intermittent truck haul projects and inlet bypassing. The County's program includes nourishing and sustaining two beaches in Lee County, Lovers Key and Bonita Beach, utilizing sand from an offshore Borrow Area and two nearshore Borrow Areas. The County's program allows them to manage their coastline and protect their communities through periodic beach nourishment events and to construct emergency projects to repair storm damages. On September 28, 2022, Hurricane Ian impacted the entire coastline of Lee County. An immediate post-storm assessment based on pre- and post-storm observations showed considerable loss to the County's beaches and dunes. The scheduled nourishment project for the Lovers Key – Bonita Beach Nourishment Project (Project) is scheduled for Fall 2023 and will include a component to offset some or all of Hurricane Ian losses including the natural shoreline segment along South Bonita Beach. Nourishment of Lovers Key and Bonita Beach is currently permitted by the Florida Department of Environmental Protection (FDEP) Permit #0311811-001-JC (expires June 24, 2028) and U.S. Army Corps of Engineers (USACE) Permit #SAJ-2012-00198(IP-MJD) (expires Sept 3, 2028). The County applied for modification to the permits. FDEP issued a major modification #0311811-004-JM on December 14, 2022 (expires June 24, 2028) and is currently processing a minor modification. The USACE permit modification is still in process.

PROJECT LOCATION

The Project is located on the southwest Florida coastline in Lee County. The County is bordered to the west and southwest by the Gulf of Mexico, to the south by Collier County, to the east by Hendry and Collier Counties, and to the north by Charlotte County. The Region of Interest (ROI) encompasses approximately six (6) miles of coastline from the north end of Lovers Key to the south end of Bonita Beach then extending over 29 nautical miles (NM) to the offshore Borrow Area located on the Outer Continental Shelf (OCS), managed by the Bureau of Ocean Energy Management (BOEM), in Federal waters (Figure 1).

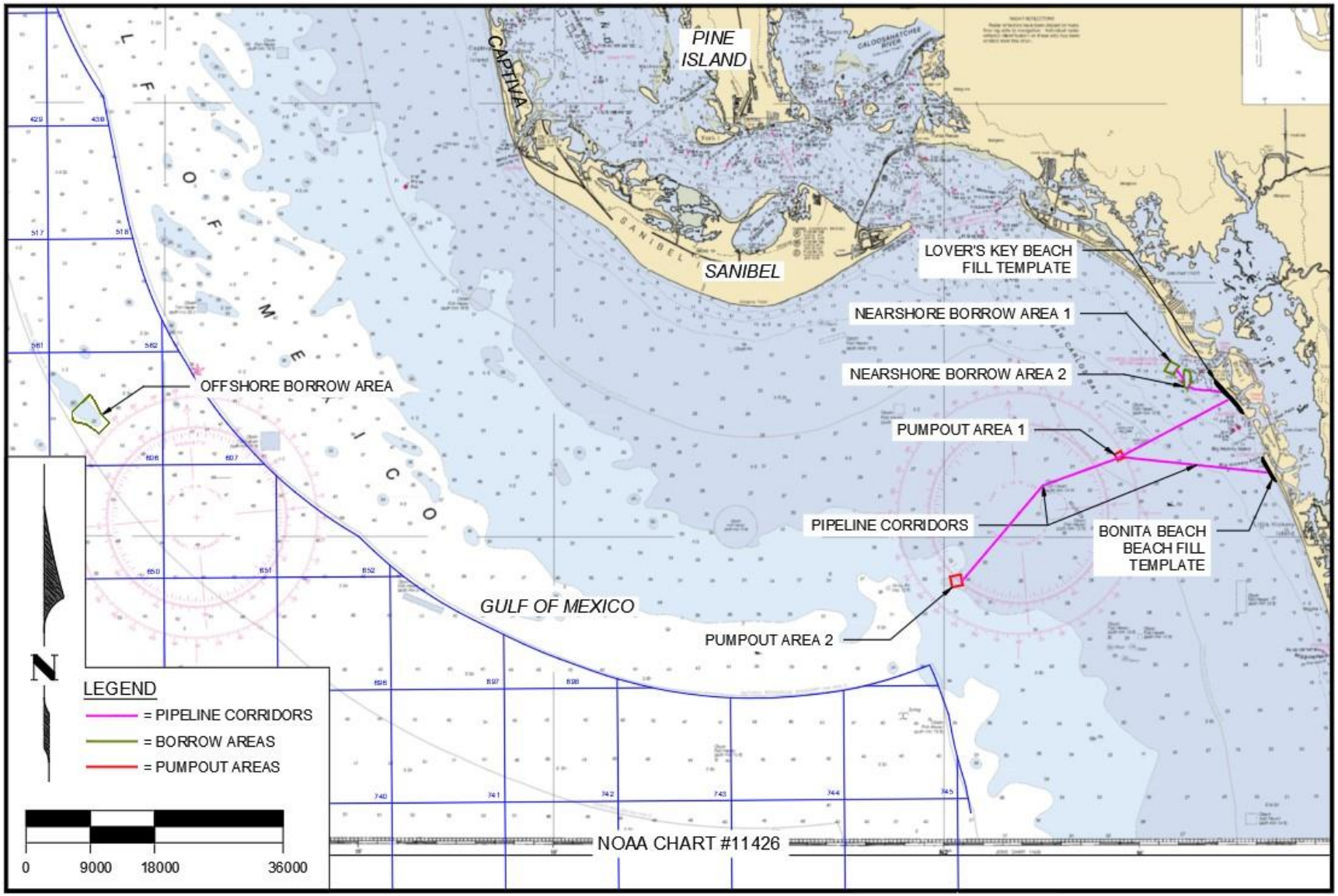

Figure 1. Project Location Map

PURPOSE AND NEED

The Project includes restoration of designated critically eroding beaches and their long-term maintenance and nourishment, maximizing the infusion of beach-quality sand into the coastal system, and implementing projects that contribute most significantly to addressing the State's beach erosion problems. The purpose of the Project is to provide storm damage reduction benefits; create, restore, and sustain habitat for Threatened and Endangered (T&E) species including but not limited to marine turtles and shorebirds, and provide recreational benefits. The need for the Project is based on the annual monitoring conducted by the County which documented the erosion losses since the last nourishment event and the significant damage caused by Hurricane Ian.

PROPOSED ACTION

Beach Fills

The limits of the engineered beach and dune on Lovers Key extend from 500 feet north of R-215 to R-221 equal to approximately 6,200 feet. The proposed beach fill template includes the permitted footprint and an increased berm elevation of +3.5 feet North American Vertical Datum of 1988 (NAVD88) to account for sea level change. The limits of the engineered beach and dune on Bonita Beach extend from R-226 to R-230 equal to approximately 3,900 feet. The proposed beach fill template includes a 75-foot-wide design beach plus 95 feet to account for advanced nourishment and equilibrium profile adjustment, and an increased berm elevation of +4.9 feet NAVD88 to account for sea level change. The southern end of Bonita Beach (South Bonita Beach) from R-230 to the Lee-Collier County line (R-239) is a previously unrestored section of shoreline that was impacted by Hurricane Ian. Sand placement above Mean High Water (MHW) is proposed in a one-time event to offset the storm losses.

The proposed volume for the next event scheduled for 2023 inclusive of Hurricane Ian impacts to construct and repair the engineered beaches and dunes equals 880,000 cubic yards (CY). The one-time placement above MHW to repair South Bonita Beach equals an additional 70,000 CY for a total of 950,000 CY. The total volume proposed for the 15-year period including subsequent nourishment for Lovers Key and Bonita Beach equals 2.04 million cubic yards (MCY).

Borrow Areas

The Project includes three Borrow Areas. Two permitted nearshore Borrow Areas, located within the Big Carlos Pass ebb shoal complex in state waters, have been utilized for initial construction and nourishment on the two beach fill segments. The sediment from the nearshore Borrow Areas is characterized by medium to fine-grained gray sand, which contains low silt content. One

proposed Borrow Area is located on the OCS. The sediment from the offshore Borrow Areas is characterized by medium to fine-grained gray sand, which contains low silt content. A compatibility analysis was completed comparing the native beach data and borrow area data which indicates that the sand from the Borrow Areas is compatible with the native beach sand. There are no hardbottom resources or submerged aquatic vegetation (SAV) within or adjacent to the three Borrow Areas. The available volume in the offshore Borrow Area is over 7 MCY. Assuming a cut to fill ratio of 20%, the volume anticipated to be dredged within the 15-year period equals 2.45 MCY. This equates to approximately 35% of the total available volume. To accommodate future needs greater than the estimate, for example, to address additional severe storms or needs outside of the anticipated nourishment cycle, a maximum volume of 3.00 MCY is included in the assessment.

Pipeline Corridors

The Project includes permitted Pipeline Corridors from the nearshore Borrow Areas to the Beach Fills, and proposed Pipeline Corridors and Pump-out Areas from the offshore Borrow Area to the two Beach Fills. There are no hardbottom resources or SAV adjacent to or within the Pipeline Corridors and Pump-out Areas.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

As required by the National Environmental Policy Act, a broad range of resources and natural processes, from physical and biological processes and resources and critical biological resources to cultural and socioeconomic resources, are described for the Project Area including the Beach Fills and Borrow Areas. The consequences of both implementation of the No-action Alternative and Nourishment Alternative as they apply to the Beach Fills and Borrow Areas are presented and discussed. The Project will have either no effect or short-term negative effects on environmental resources, followed in the mid- to long-term by positive effects as the affected environments recover from initial disturbance and the additional habitats created mature and reach equilibrium.

The Project will create and sustain beach and dune habitats for marine and estuarine fisheries resources and their forage species as well as for a wide variety of avian communities including shorebirds, wading birds, and colonial nesting birds, as well as migratory birds. A shorebird protection and bird abatement plan will be developed cooperatively with State and Federal wildlife agencies to protect avian resources during construction. Benthic resources in the Beach Fills and Borrow Areas will be disturbed by both excavation and fill placement during construction. These disturbances are unavoidable, and the habitats recover timely. The cumulative impact of Project implementation will create or restore over 83 acres of beach and dune habitats which will protect the interior estuarine resources from storm surge and breaching. A positive cumulative impact will

accrue to ecological benefits, including pelagic and benthic estuarine productivity, wildlife habitat, Essential Fish Habitat (EFH), migratory bird habitat, and habitat for T&E species into the future.

LOVERS KEY – BONITA BEACH NOURISHMENT PROJECT
ENVIRONMENTAL ASSESSMENT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

Appendix A: Correspondence and Permitting Documents

Permits

1. FDEP – Permit No. 0311811-001-JC: issued June 2013
2. FDEP – Permit Modification No. 0311811-004-JM: issued December 2022
3. FDEP – Permit Modification No. 0311811-005-JN: issued June 2023
4. USACE – Permit No. SAJ-2012-00198 (IP- MJD): issued September 2013
5. USACE – Permit Modification No. SAJ-2012-00198 (SP-SJF): issued December 2023

Tribal Letter

1. Tribal Historic Preservation Office Coordination Letter: June 2023

Coordination Letters

1. USACE Public Notice: October 2022
2. NMFS Consultation Letter: March 2023
3. NMFS Biological Opinion: issued August 2023
4. USFWS Biological Opinion: issued March 2013
5. USFWS Consultation Letter: March 2023
6. USFWS Biological Opinion: issued November 2023
7. BOEM Coordination Letters: Various

LOVERS KEY – BONITA BEACH NOURISHMENT PROJECT
ENVIRONMENTAL ASSESSMENT

1.0 INTRODUCTION

1.1 PROJECT DEFINITION

The Project setting consists of a beach and nearshore coastal saltwater system. There are two permitted Beach Fills, Lovers Key and Bonita Beach. Lovers Key is a State Park and development is limited to the Park infrastructure. Bonita Beach on Little Hickory Island is developed and includes single family, multi- family, condominium residences, and a County beach park. The south end of Bonita Beach is a natural beach. The beaches within the Project Area are publicly accessible.

The Project includes three Borrow Areas. Two permitted nearshore Borrow Areas, located within the Big Carlos Pass ebb shoal complex in state waters, have been utilized for prior restoration and nourishment on the two beach fills. The sediment from the nearshore Borrow Areas is characterized by medium to fine-grained gray sand, which contains low silt content. One proposed offshore Borrow Area is located on the OCS in federal waters. The sediment from the offshore Borrow Area is characterized by medium to fine-grained gray sand, which contains low silt content. A compatibility analysis was completed comparing the native beach data and Borrow Area data which indicates that the sand from the Borrow Areas is compatible with the native beach sand.

The Project includes permitted Pipeline Corridors from the nearshore Borrow Areas to the Beach Fills. The Project also includes proposed Pipeline Corridors from the offshore Borrow Area to the Beach Fills.

1.2 PROJECT PURPOSE AND NEED

The proposed Project includes restoration of designated critically eroding beaches and their long-term maintenance and nourishment, maximizing the infusion of beach-quality sand into the coastal system, and implementing projects that contribute most significantly to addressing the State's beach erosion problems. The purpose of the Project is to provide storm damage reduction benefits; create, restore, and sustain habitat for T&E species including but not limited to marine turtles and shorebirds, and provide recreational benefits. The need for the Project is based on the annual monitoring conducted by the County which documented the erosion losses since the last nourishment event and the significant damage caused by Hurricane Ian.

1.3 PROJECT LOCATION

The Project Area includes the permitted Beach Fills on Lovers Key and Bonita Beach; shoreline along South Bonita Beach, three Borrow Areas located in the Gulf of Mexico to the west and northwest of the islands in State and Federal waters; and Pipeline Corridors and Pump-Out Areas in State waters connecting to the Beach Fills (Figure 1-1).

The Project would affect waters of the United States associated with the Gulf of Mexico and Big Carlos Pass ebb shoal. The Project Site includes the Gulf of Mexico shoreline between 500 feet north of R-215 to R-221 on Lovers Key and between R-226 and R-239 on Bonita Beach.

Directions to the Project Site are as follows: From I-75 South take Exit 116, merge onto Bonita Beach Road SE (becomes Hickory Blvd. as it turns north after approximately 5.8 miles). Stay straight approximately 2.1 miles to Beach Access #10 (Little Hickory Island Beach Park) on your left for Bonita Beach. From Bonita Beach Access #10, exit to the right and then take the first left onto Estero Boulevard and in 2.6 miles turn left into the Park entrance for Lovers Key.

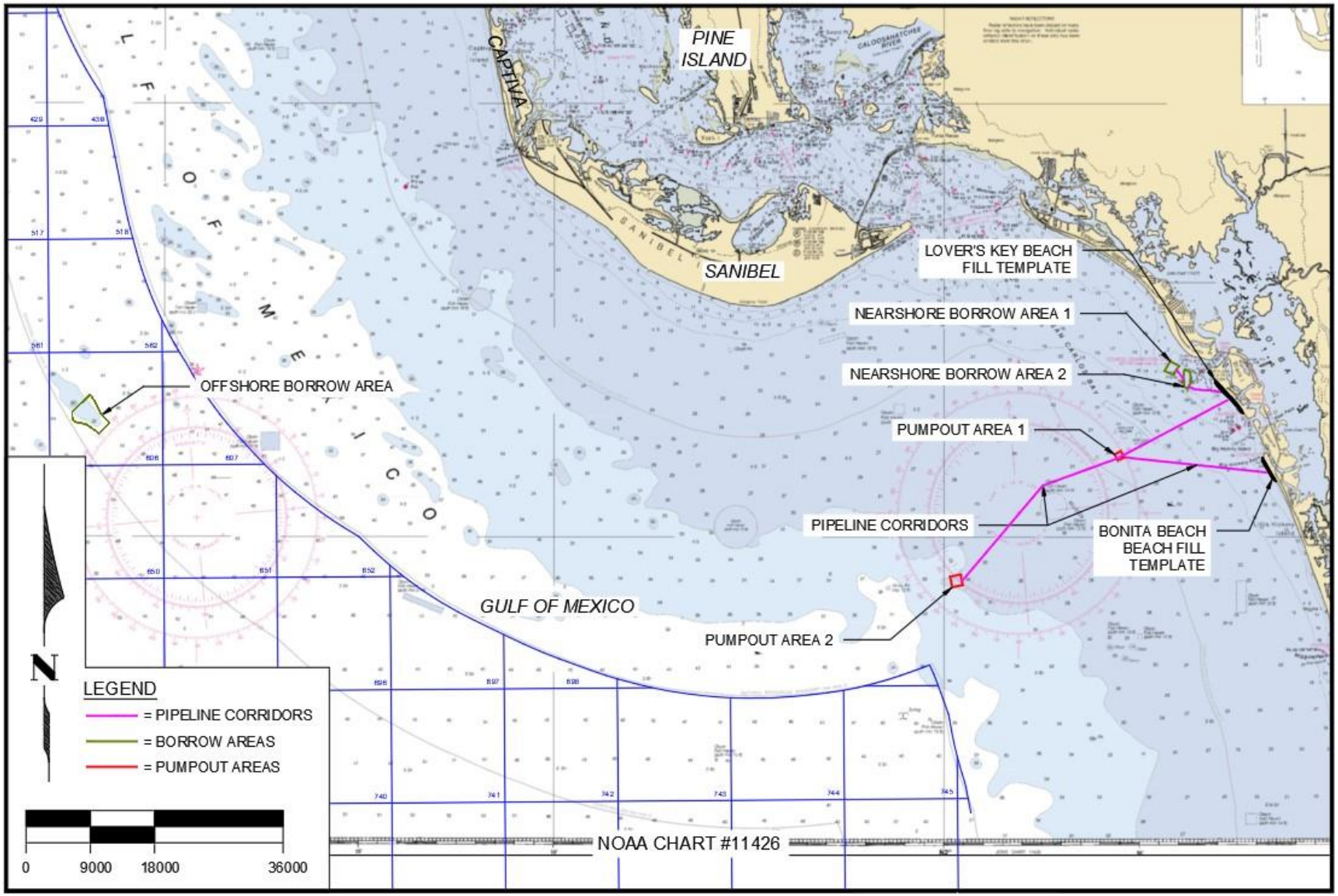

Figure 1-1. Project Location Map

1.4 PROJECT SETTING

1.4.1 History

1.4.1.1 Lovers Key

The Lovers Key initial construction project was completed in 2004 concurrent with the first Bonita Beach maintenance event. The initial project placed 570,240 CY to a design elevation of +2.9 feet NAVD88, crest slope of 1 vertical to 200 horizontal (1V:200H), and seaward berm face slope of 15H:1V (Lee County, 2008). A small dune feature was also constructed only at R-215 to an elevation of +4.9 feet NAVD88. The first maintenance event was completed in 2014. The first maintenance event placed 342,400 CY to the same design elevation and slopes.

1.4.1.2 Bonita Beach

The original Bonita Beach construction project was completed in 1995. The initial project placed 217,000 CY to a design elevation of +4.3 feet NAVD88, crest slope of 1 vertical to 200 horizontal (1V:200H), and seaward berm face slope of 15H:1V. The first maintenance event was completed in 2004 (Lee County, 2007). The first maintenance event placed 150,000 CY to the same design elevation and slopes. The second maintenance event was completed in 2014 and placed 140,200 CY to the same design elevation and slopes. South Bonita Beach is a natural beach, which has never been nourished, but has benefited over time from alongshore transport from the sand placement within the permitted Bonita Beach Fill.

1.4.2 Geologic Setting

1.4.2.1 Physiography

The Project Area extends from Big Carlos Pass at the north end of Lovers Key south to Bonita Beach along the Gulf Barrier Chain. The Gulf Barrier Chain extends approximately 186 NM from Anclote Key just north of the Pinellas County/Pasco County border, to Kice Island at Cape Romano. It includes 29 barrier islands and 30 inlets and has been described as the most morphologically diverse barrier island system in the world (Davis, 1997). The inner west-central Florida continental shelf is part of the vast west Florida shelf/slope system. Read (1985) described it as a distally steepened carbonate ramp, meaning that no shelf edge reef rim exists as it does in many tropical carbonate systems but that the shelf gradually increases gradient into deep water. The inner shelf exhibits a thin, patchy sediment cover that consist primarily of quartz sand and carbonate shell hash (Brooks et al., 2003), the latter component composed primarily of molluscan fragments. Separating the sediment patches are large expanses of limestone outcrops that represent the only substantial relief (up to 13 ft) on the modern inner shelf (Obrochta et al., 2003). The only

other appreciable relief on the inner shelf are the broad, low, shore-oblique sand ridges concentrated off the Indian Rocks Headland north of Tampa Bay (Edwards et al., 2003; Harrison et al., 2003) and off Sarasota Bay, north of the Project Area (Twichell et al., 2003).

1.4.2.2 Recent Development and Modern Configuration

The recent geologic development and modern configuration of the west-central Florida barrier coastline is directly related to the inner shelf because karst and physical processes, primarily storm systems, are major controlling factors. The barriers and related coastal environments along this part of the Florida peninsula likely developed during the late Holocene, as evidenced by the sediments beneath the present barrier islands, which had been dated to between 4,200 and 4,500 years old (Davis and Kuhn, 1985). The locations of the present barriers are believed to be controlled by the antecedent topography of the underlying limestone units. Specifically, there is a break in slope where the limestone is elevated, which provides a suitable foundation for barrier development. Some authors have suggested that these barriers formed at some distance offshore and migrated to the break in slope where stability was achieved, but no supporting data exist. However, there likely was at least modest migration of these islands due to overwash during the early stages of barrier development, a process that has been observed in barriers that developed during historic times (Davis, 1997).

1.4.2.3 Archaeological Implications

While freshwater and abundant native resources present the Gulf Coast as an area with a moderate-to-high potential to support a small well-distributed precontact population, the preservation of cultural material is unlikely. The reasons for this are multifold. First, the barrier island coastline is a sediment-starved system. Unconsolidated sediment cover along this portion of the coastline is commonly less than 3.3 feet indicating sediment accumulation rates are quite low, and suggesting rates of burial are insufficient to preserve material in situ. Second, the periodic reworking of sediments by storms re-suspends sedimentary materials, and although not transported for great distances, they are thoroughly mixed, thereby once again decreasing the potential for in-situ preservation. The lack of stratification in historic sediment cores illustrates this point (Brooks et al., 2003). Third, the karst processes that are responsible for producing the sinkholes and springs actively disturb the sea floor, and consequently help to obscure any possible preservation of incorporated features. Finally, observed bioerosion that typically occurs on the exposed limestone surface (Obrochta et al., 2003) further acts to disturb the sedimentary record (RCG, 2022).

1.4.3 Cultural Setting

1.4.3.1 Precontact Context

Previous research has indicated that any submerged precontact sites offshore on Florida's western continental shelf most likely will date from the Paleoindian and Archaic periods (approximately 12,000 to 2,500 years before present). Those cultural traditions span the transition between the late post-glacial Pleistocene and the early Holocene, a time period that was conducive for the preservation of archaeological sites. Inundated sites in shallower near-shore waters also potentially could include more recent Ceramic Period sites (RCG, 2022).

1.4.3.2 Historic Context

The historic periods that may have contributed shipwrecks along the west-central coast of Florida span the years from the Spanish Period of early European colonization to the present day. Shipping has always been the principal means of transporting goods and materials in and out of the state, often under adverse weather conditions. Even in good weather, the prevailing winds and currents along Florida's Gulf coastline have tended to push vessels towards the coast. There have been numerous wrecks along this coastline; one estimate places the total number of historic shipwrecks in this general area at between 4,000 and 5,000 (Marx, 1987; Singer, 1998). Vessel types commonly wrecked along Florida's west coast have included ships, barks or barkentines, schooners, used primarily in the coastal and island trade, and steamers, which preempted most of the shipping trade in the 1800s (Singer, 1998). Based upon the review of available databases and cultural resource studies, the potential for encountering submerged cultural resources in the ROI is moderate to high (RCG, 2022).

1.5 EXISTING CONDITIONS

1.5.1 Beach Fills

Lovers Key resides in a State Park and development is limited to the park infrastructure. Bonita Beach is developed and includes single family, multi-family, condominium residences, and County beach park. The beaches are publicly accessible. The Lovers Key State Park primary structures included the pavilion, restrooms, and dune walkovers which were destroyed by Hurricane Ian. Structures along Bonita Beach include seawalls and dune walkovers for the residential and park properties which were also significantly impacted by Hurricane Ian. A dune system was present along some beach sections prior to the landfall of Hurricane Ian. There are no hardbottom resources or SAV adjacent to or within the permitted Beach Fills or proposed fill placement are above MHW on South Bonita Beach.

1.5.3 Borrow Areas

The Project includes three Borrow Areas. Two existing Borrow Areas (Figure 1-2), located within the Big Carlos Pass ebb shoal complex in State waters, have been utilized for initial restoration and nourishment on the two Beach Fills. One new Borrow Area (Figure 1-3) is located offshore on the OCS in Federal waters. The sediment from the nearshore Borrow Areas is characterized by medium to fine-grained gray sand, with an average mean grain size of 0.27 mm and silt content less than 1% (Coastal Tech, 2012). The sediment from the offshore Borrow Area is characterized by medium to fine-grained gray sand, with a mean grain size of 0.37 mm and silt content of less than 2%. A compatibility analysis was completed comparing the native beach data and Borrow Area data which indicates that the sand from the Borrow Areas is compatible with the native beach sand. There are no hardbottom resources or SAV adjacent to the three Borrow Areas. The available volume in the offshore Borrow Area is over 7 MCY.

1.5.4 Pipeline Corridors and Pump-Out Areas

The Project includes one Pipeline Corridor from the nearshore Borrow Areas to the Beach Fills which was surveyed for resources during the prior nourishment event, and new Pipeline Corridors from the offshore Pump-Out Areas to the Beach Fills (Figure 1-4). The new corridors were thoroughly surveyed for depth, sonar targets, and magnetic anomalies, and sited to avoid potential targets. The Pipeline Corridors do not require any excavation for pipeline installation, as the weighted sediment discharge pipelines will be placed directly on the sea floor. Booster pumps may be installed within the Pipeline Corridors and Pump-out Areas on anchored barges. They will not be installed on the sea floor. Anchoring limits shall be confined to the areas that have been surveyed and culturally cleared.

There are no hardbottom resources or SAV adjacent to or within the Pipeline Corridors and Pump-Out Areas. Octocorals (*Leptogorgia* sp.) were observed and located at three (3) discrete points along one segment between Pump-Out Area 1 and the Lovers Key Beach Fill. The occurrences of *Leptogorgia* sp. were limited to a few individual colonies (CEC, 2022).

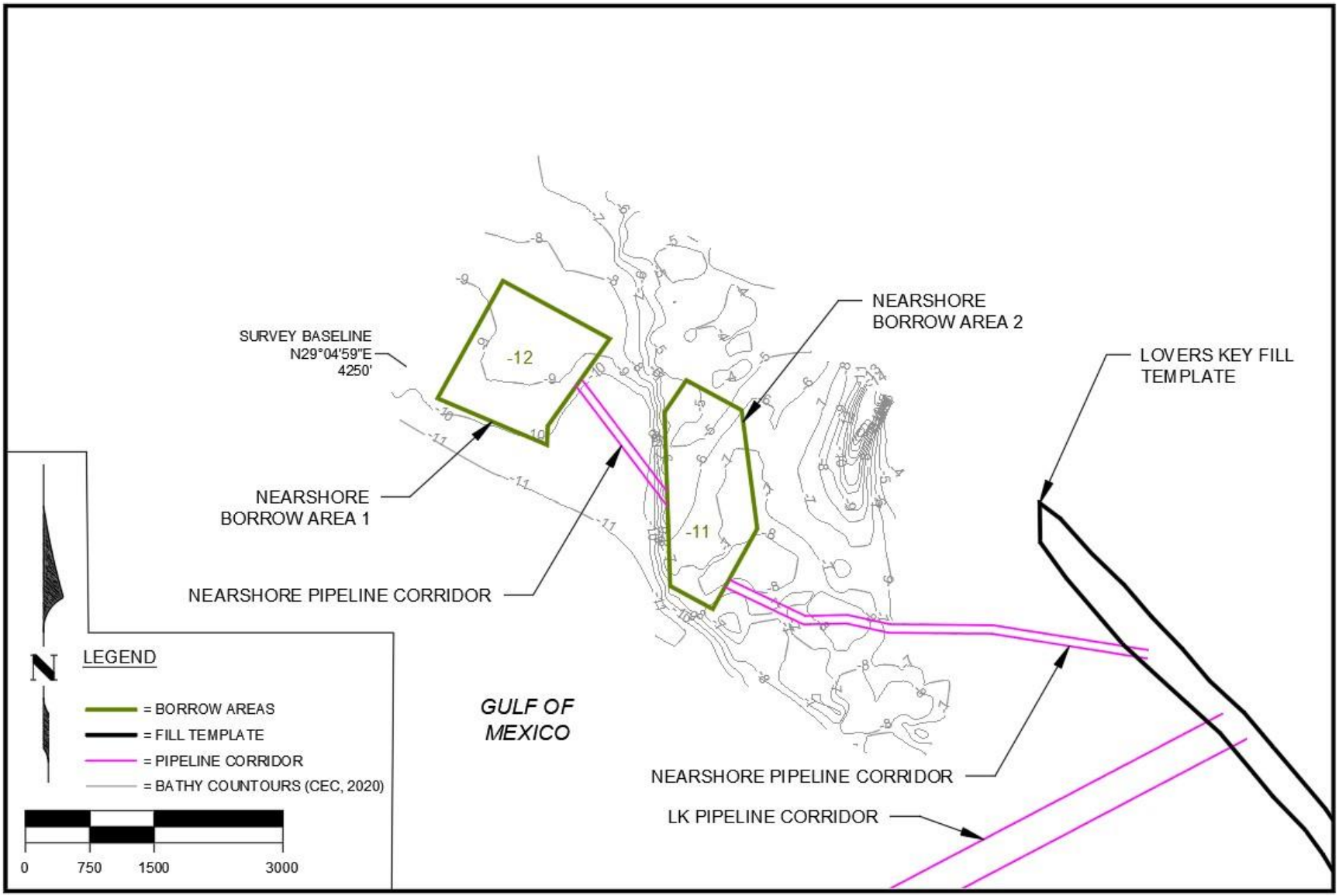

Figure 1-2. Nearshore Borrow Area Plan View

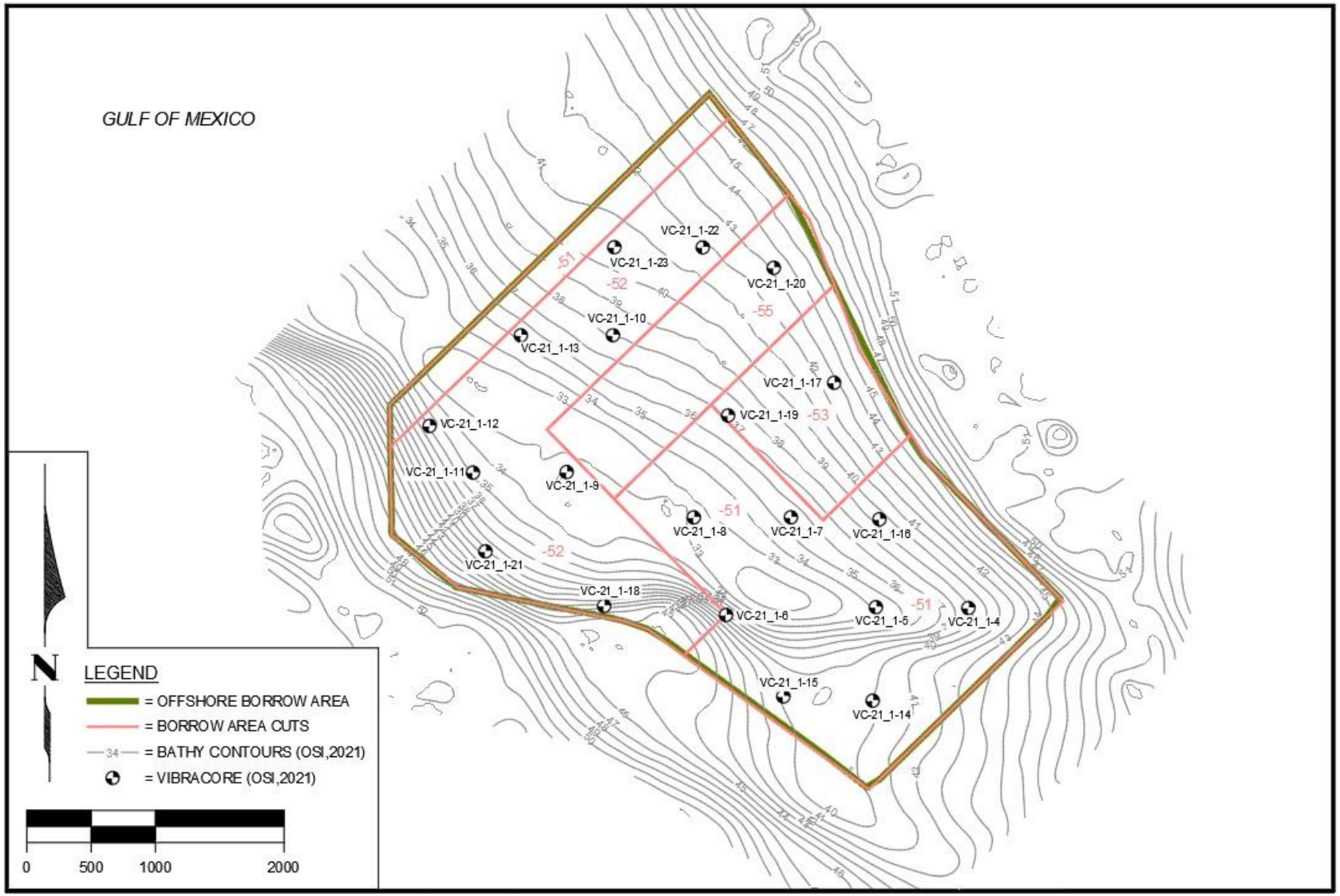

Figure 1-3. Offshore Borrow Area Plan View

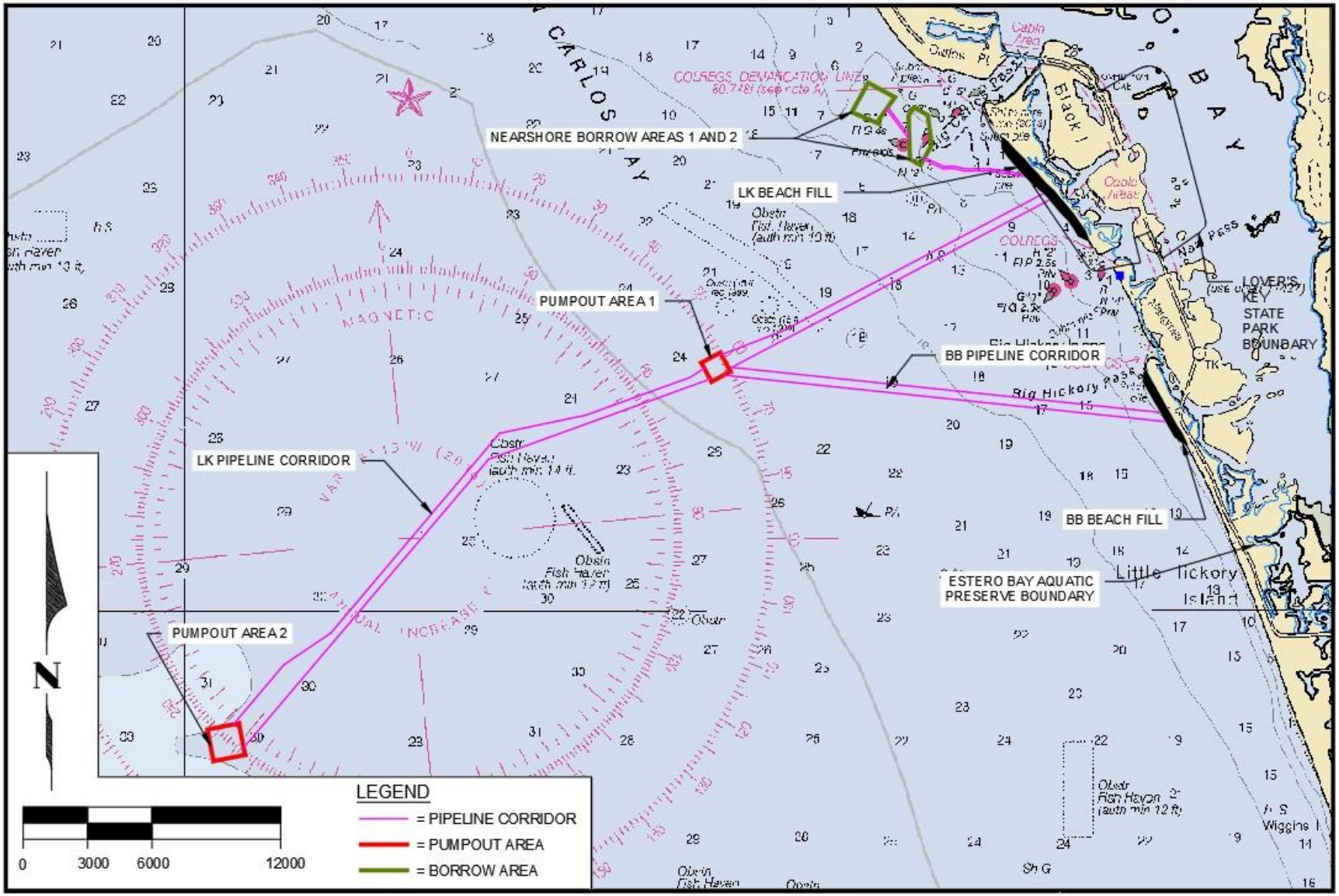

Figure 1-4. Pump-Out Area and Pipeline Corridor Overview

1.5.5 Construction Methods

Construction methods to be employed for excavation of the offshore Borrow Area include the hydraulic cutterhead dredge and scow barge method and the hopper dredge method. For the two methods the dredged sediment will be transported to one of the Pump-Out Areas and transferred through the submerged sediment pipeline which will exit the Gulf and come onto the dry beach and discharged into the fill template, where it will be graded using conventional earth moving equipment. Multiple booster pumps may be required for the process.

The construction method to be employed for excavation of the nearshore Borrow Areas is the hydraulic cutterhead method. The dredged sediment will be transported directly through the submerged sediment pipeline which will exit the Gulf and come onto the dry beach and discharged into the fill template, where it will be graded using conventional earth moving equipment. Multiple booster pumps may be required for the process.

The in-water work will be conducted using barge/vessel-based heavy equipment (vessel draft: 4 feet to 8 feet offshore, 3 feet to 4 feet inshore) with no blasting. The land-based work for beach fill construction, hot-spot maintenance, upland sand truck hauls, and maintenance grading would be conducted by bulldozers, excavators, front-end loaders, dump trucks, and off-road vehicles. In lieu of direct pumping, constructing temporary cells within the fill templates, stockpiling sand, and transporting the sand using loaders and trucks, operating above MHW, may be a technique utilized to place sand to address hurricane impacts on South Bonita Beach. The upland sand quarries proposed for future hot-spot maintenance and post-storm recovery include Stewart Mining Industries' Immokalee Mine, Vulcan Materials Company's Witherspoon Mine, E.R. Jahna Industries' Ortona Mine, and CEMEX Lake Wales Mine.

Work will be conducted 24 hours per day, seven days per week, throughout the entire year with no seasonal restrictions for Beach Fills, and restricted between November 1 and May 1 for the South Bonita Beach Repair utilizing the stockpiling and truck haul approach, outside of sea turtle nesting season. During sea turtle nesting season, staging areas and temporary storage for construction equipment and pipes shall be located off the beach to the maximum extent practicable. Nighttime storage of construction equipment that is not in use shall be located off the beach. All construction pipes that are in use on the beach shall be located as far landward as possible without compromising the integrity of a reconstructed dune or existing vegetation. Pipes placed parallel to vegetation shall be placed 10 feet away. If it is necessary to extend construction pipes past a known shorebird nesting site, then those pipes shall be placed landward of the site before birds are active in that area. No pipe or sediment shall be placed seaward of a shorebird nesting site during the shorebird nesting season.

2.0 ALTERNATIVES ANALYSIS

2.1 ALTERNATIVE DEVELOPMENT PROCESS

The first alternative considered was to construct the beaches and dunes to their engineered designs and conduct periodic nourishment. The second alternative considered was to construct the beaches and dunes to their engineered designs and place additional sand to repair the engineered beaches and dunes to offset the losses from Hurricane Ian. The third alternative considered was to construct the beaches and dunes to their engineered designs and place additional sand to repair the engineered beaches and dunes to offset the losses from Hurricane Ian, and a one-time sand placement above MHW to repair South Bonita Beach to offset losses from Hurricane Ian.

The three Nourishment Alternatives include periodic nourishment of the permitted fill templates on an eight (8) to ten (10) year cycle. Sand from the offshore Borrow Area will be utilized for the County's scheduled event in 2023. Sand from any of the three Borrow Areas may be utilized for nourishment during the next 15 years.

For the Nourishment Alternatives, the engineered beach fill template on Bonita Beach was modified to include an increased berm elevation to account for sea level change and additional beach fill width to serve as advanced nourishment between construction events. The engineered beach fill template on Lovers Key was also modified to include an increased berm elevation to account for sea level change. Based upon the hurricane damages, the Lovers Key fill template was modified to avoid potential scouring and/or escarpment formation landward of the proposed template. The template was redesigned to mimic pre-storm conditions based upon historical profiles plus address future storm impacts.

The fourth alternative considered was the No-action alternative in which no nourishment of the beaches and dunes would be accomplished, and natural processes would be allowed to run their course.

2.2 CONSTRUCT ENGINEERED BEACHES

For the Lovers Key fill design, a berm elevation of +3.5 feet NAVD88 was adopted to account for sea level change. A summary of the engineered beach design parameters is presented in Table 2-1.

Table 2-1. Engineered Beach Alternative Plan Dimensions and Elevations

Beach Fill Design Parameter	Lovers Key	Bonita Beach
Beach Elevation (Feet NAVD88)	3.5	4.9
Beach Width (Design)	75 (Avg)	75
Beach Width (Advanced Nourishment)	200 (Avg)	95
Beach Width (Total)	275 (Avg)	170
Beach Length (Feet)	6,200	3,900

The Lovers Key fill design is presented in Figure 2-1.

A performance evaluation of the Bonita Beach fill design was completed by the County (CEC, 2021a). Applying the results of a cross-shore sediment transport model to the Bonita Beach fill template, a 75-foot-wide design beach was adopted for the beach fill template to provide storm damage reduction benefits from 25-year return interval storm event. Based on the sea level change analysis, a berm elevation of +4.9 feet NAVD88 was adopted to account for sea level change. Utilizing the results of the shoreline and volume change calculations from the initial construction project through the two nourishment events, the initial profile adjustment was computed to approximately 45 feet and the background erosion rate for an 8-year nourishment cycle equated to approximately 50 feet. These values were adopted for the equilibrium profile adjustment and advanced nourishment components of the beach fill template equal to 95 feet for the total advanced nourishment component of the beach fill template. The Bonita Beach fill design is presented in Figure 2-2.

This alternative includes constructing the engineered beaches and dunes, scheduled for 2023, utilizing 827,500 CY. The total volume proposed for the 15-year period including subsequent nourishment equates to 1.92 MCY. The available volume in the offshore Borrow Area is over 7 MCY. Assuming a 20% cut to fill ratio, the required Borrow Area volume equates to 2.31 MCY which is approximately 33% of the total available volume. To accommodate cut to fill losses and future needs greater than the estimate, for example, to address additional severe storms or needs outside of the anticipated nourishment cycle, a maximum volume of 2.80 MCY is included in this alternative.

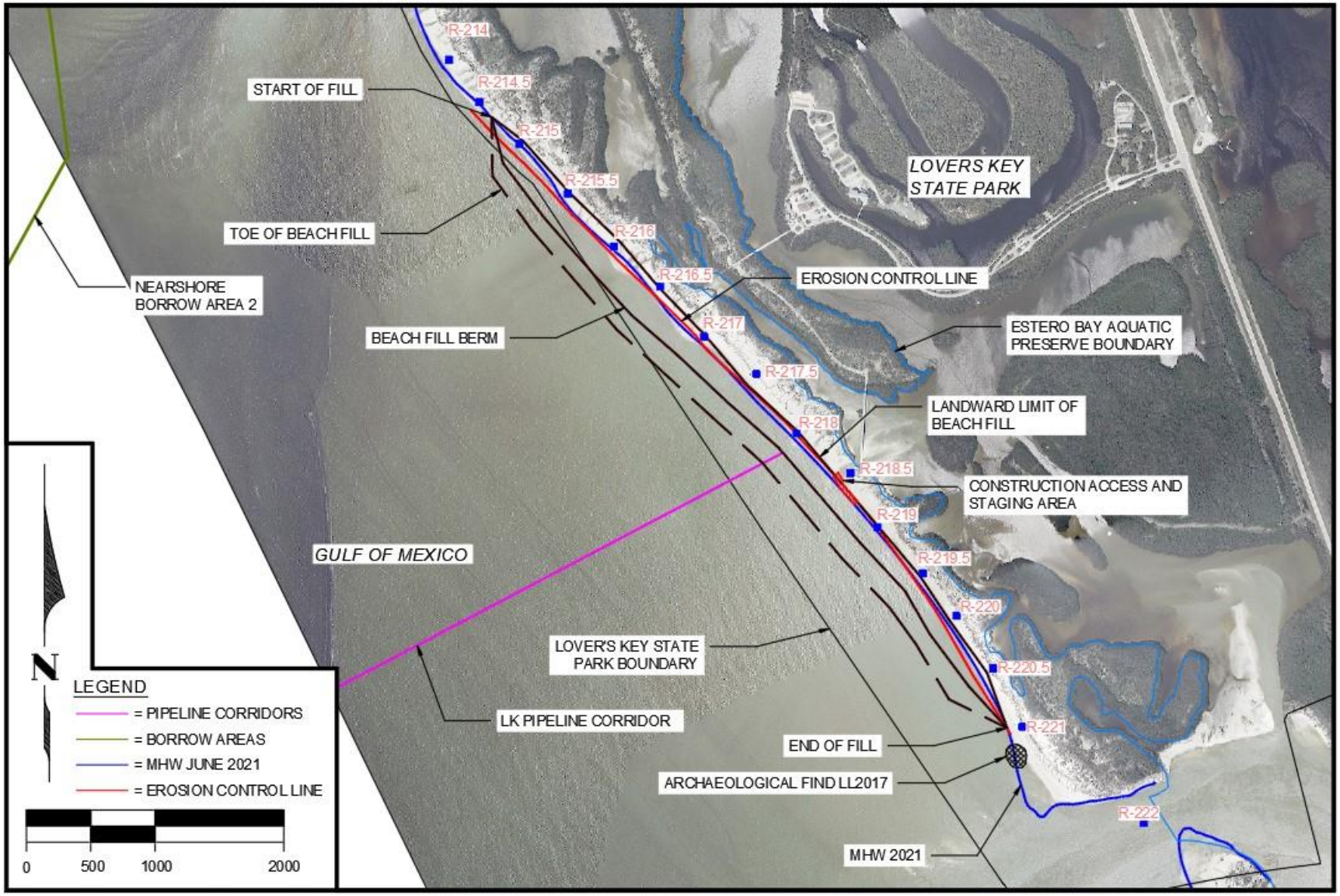

Figure 2-1. Lovers Key - Beach Fill Plan View

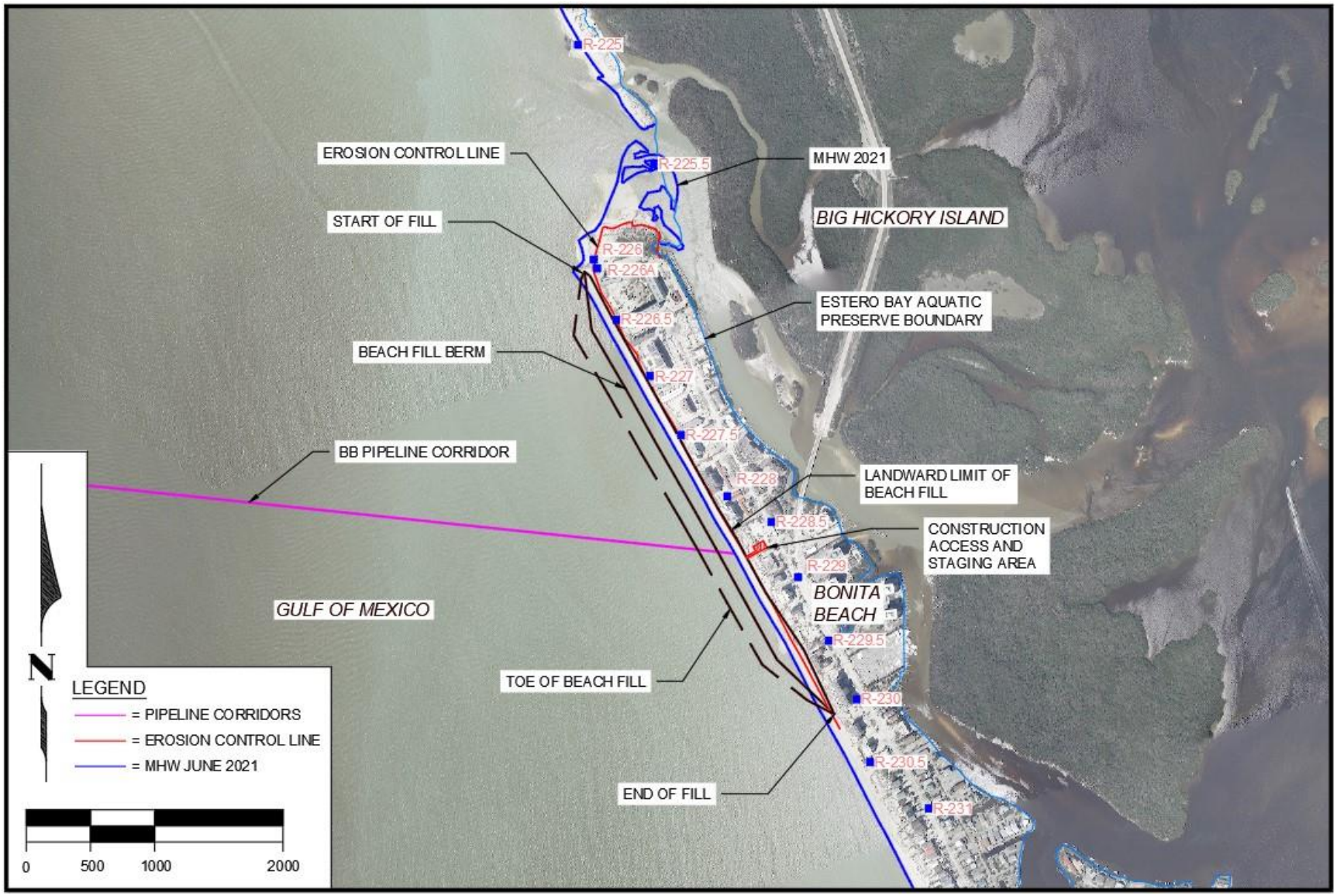

Figure 2-2. Bonita Beach - Beach Fill Plan View

2.3 CONSTRUCT AND REPAIR ENGINEERED BEACHES

On September 28, Hurricane Ian made first landfall in the United States in Southwest Florida as a Category 4 storm approximately 30 NM north of the Project Area. Hurricane Ian came ashore near Cayo Costa, Florida with maximum sustained winds of 150 mph, tying the record for the fifth-strongest hurricane on record to strike the United States. It was the first Category 4 hurricane to impact Southwest Florida since Hurricane Charley in 2004. Ian thrashed parts of Florida's western coast including Lovers Key and Bonita Beach, bringing intense winds, heavy rainfall, and catastrophic storm surges. A storm surge with inundation of an unprecedented 12 to 18 feet above ground level was reported along the coastline within the Project Area.

A post-storm assessment was conducted to quantify the incident related erosion. Utilizing pre- and post-storm surveys and applying background erosion computed to the depth of closure, the erosion losses directly attributable to Hurricane Ian on Lovers Key and Bonita equaled 52,500 CY.

This alternative includes constructing the engineered beaches and dunes and placing additional volume to repair the engineered beaches and dunes due to the impacts of Hurricane Ian. The work would be conducted concurrently with the County's scheduled nourishment event in 2023.

The volume inclusive of the Hurricane Ian losses is 880,000 CY. The total volume proposed for the 15-year period including subsequent nourishment equates to 1.97 MCY. Assuming a 20% cut to fill ratio, the required Borrow Area volume equates to 2.37 MCY which is approximately 34% of the total available volume. To accommodate cut to fill losses and future needs greater than the estimate, for example, to address additional severe storms or needs outside of the anticipated nourishment cycle, a maximum volume of 2.90 MCY is included in this alternative.

2.4 CONSTRUCT AND REPAIR ENGINEERED BEACHES AND REPAIR SOUTH BONITA BEACH

A post-Ian assessment was conducted to quantify the incident related erosion to the natural beach on the south end of Bonita Beach (Figure 2-3) contiguous to the permitted Bonita Beach fill template. Utilizing pre- and post-storm surveys and applying background erosion computed to MHW, the erosion losses directly attributable to Hurricane Ian on South Bonita Beach equaled 70,000 CY.

This alternative includes constructing the engineered beaches and dunes, placing additional volume to repair the engineered beaches and dunes due to the impacts of Hurricane Ian, and the one-time placement of additional volume above MHW to repair South Bonita Beach due to the impacts of Hurricane Ian. The work would be conducted concurrently with the County's scheduled nourishment event in 2023.

The volume for the next event inclusive of Hurricane Ian losses is 950,000 CY. The total volume proposed for the 15-year period including subsequent nourishment equates to 2.04 MCY. Assuming a 20% cut to fill ratio, the required Borrow Area volume equates to 2.45 MCY which is approximately 35% of the total available volume. To accommodate cut to fill losses and future needs greater than the estimate, for example, to address additional severe storms or needs outside of the anticipated nourishment cycle, a maximum volume of 3.00 MCY is included in this alternative.

2.5 NO-ACTION ALTERNATIVE

Under the No-action Alternative, the Project would not be constructed. There would be no offshore impacts to the Gulf bottom or species implicated with dredging or sand placement on beaches. Without nourishment, the Project Area would not be protected from future storm events. Ongoing erosion would continue along the shorelines. Benefits to dozens of T&E species and recreational value would not occur. The likelihood of future impacts to infrastructure would increase in the wake of severe storms.

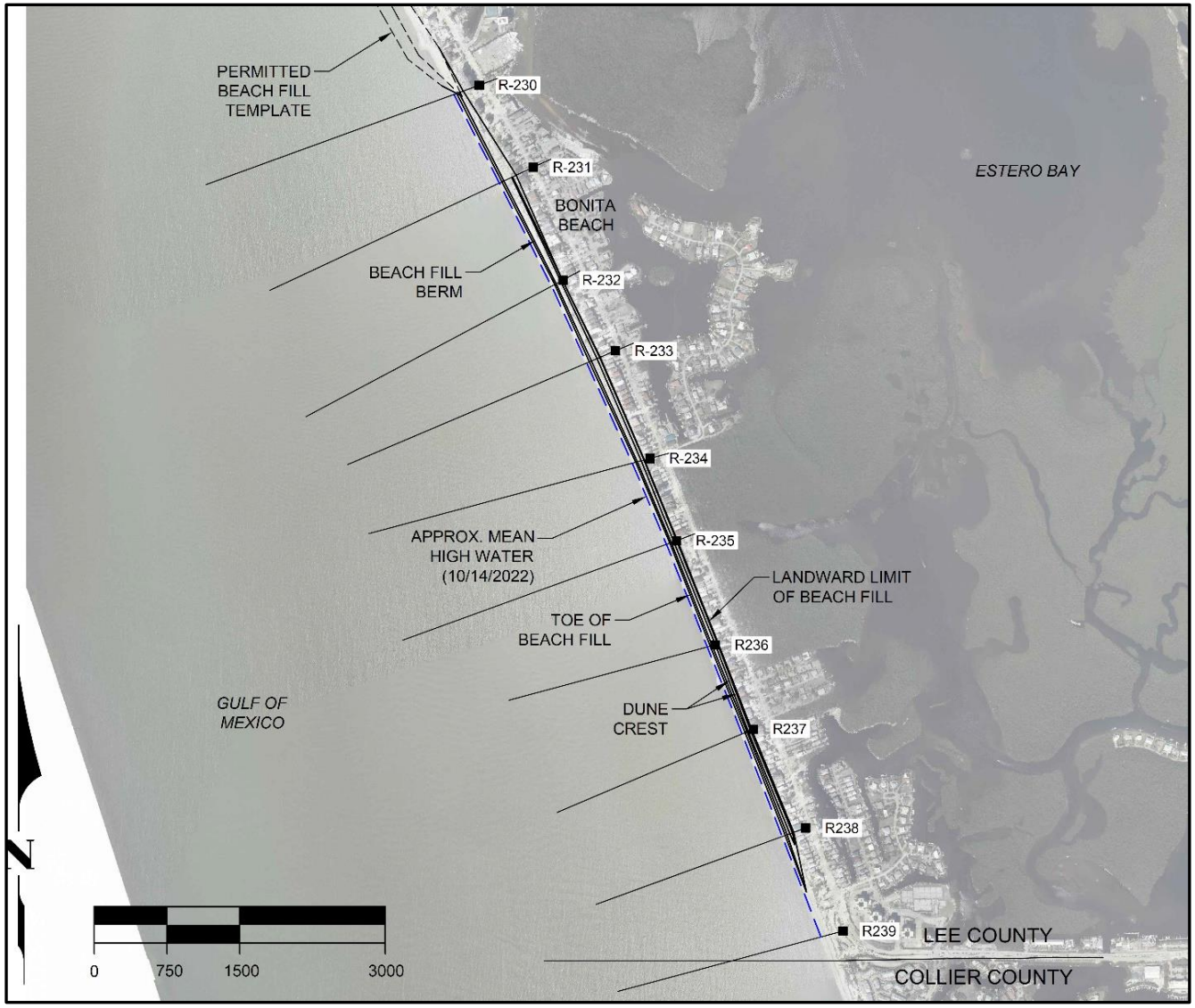

Figure 2-3. South Bonita Beach Repair Plan

2.6 RECOMMENDED ALTERNATIVE

The recommended alternative is to construct the engineered beaches and dunes, place additional volume to repair the engineered beaches and dunes due to the impacts of, and place additional volume above MHW to repair South Bonita Beach due to the impacts from Hurricane Ian. The work would be conducted under a single construction contract as part of the County's planned nourishment event in 2023. The volume equals 950,000 CY for the next event. Over a period of 15 years, including subsequent nourishment events, the volume equals 2.04 MCY. This is the alternative carried forward for consideration and is entitled the Nourishment Alternative. To accommodate cut to fill losses and future needs greater than the estimate, for example, to address additional severe storms or needs outside of the anticipated nourishment cycle, a maximum volume of 3.00 MCY is included in the alternative.

Beyond being the preferred alternative, this alternative is the most impactful as well as the most beneficial. It is dependent on FEMA funds becoming available in time for the County's scheduled event for Fall 2023. If the funds are not available, the next event will include constructing the engineered beaches and dunes and repairing South Bonita Beach which is less than the recommended alternative and therefore is covered by the assessment.

3.0 AFFECTED ENVIRONMENT

This section describes the existing environmental resources within the ROI that would potentially be affected if the Project was constructed. The environmental resources that are relevant to the decision-making process are described for the Beach Fills and Borrow Areas or together as applicable. This forms the baseline conditions for determining the environmental consequences, both impacts and benefits, of the Project.

3.1 PHYSICAL RESOURCES

3.1.1 Oceanographic and Coastal Processes

Oceanographic processes influencing the coastal zone are closely tied to climate and geography. The north-south latitude of the southwest Florida coast provides diverse conditions as weather systems pass. The State is situated at a latitudinal range where the passage of frontal systems dominates winter conditions and trade winds prevail during the summer. Tropical storms irregularly punctuate the summer conditions. These conditions are the fundamental control that influences the physical processes. During the summer the prevailing winds are southeasterly and southwesterly and blow at low to moderate velocities. This produces small waves along most of the coast, with the result that summer conditions generally produce south-to-north longshore drift. Winter conditions are very different. Cold fronts move southeasterly routinely resulting in strong north to south longshore drift. While reversals of transport occur, the net direction of sediment transport is from north to south (RCG, 2022).

Both wave and tide energies are considered to be low. Mean annual wave height averages between 4 and 10 inches (Tanner, 1960). Spring tidal ranges average less than 3 feet, making this a micro tidal coastline. The morphology of the barrier islands is a reflection of the interplay of both waves and tides. Another important aspect of the tidal climate is the tidal prism, which is a product of the tidal range and the area of the bays which it is supplying. The tidal prism is a major influence on the size and shape of inlets separating barrier islands (Davis, 1997).

3.1.2 Geology and Soils

The ROI is situated on the south-southwestern margin of the Florida Peninsula. Applin and Applin (1965) stated that in Lee County, about 13,000 feet of sedimentary rocks overlie a crystalline rack basement. This sequence of sedimentary rocks is the result of more than 100 million years of nearly continuous marine deposition on a gradually subsiding platform.

South Florida lies within the “Southern Zone” of the coastal lowlands of the Coastal Plain. Most of this province originated from a combination of depositional and erosional processes associated

with fluctuations in sea level during the late Pleistocene (Applin and Applin 1965). West and southwest of Lake Okeechobee the Sandy Flatlands and the Big Cypress Swamp also formed raised areas. The Southwest Coast includes a brackish estuarine environment where the fresh water from the Everglades meets the marine waters of the Gulf of Mexico.

The physiography of Lee County is largely controlled by its geology. Applin and Applin (1965) note that the geology of the region within Lee County is composed of five major sedimentary sequences known as formations. The oldest of these, the Tamiami Formation, is Miocene in age and underlies the Big Cypress Swamp and Sandy Flatlands. It contains a wide range of mixed carbonate-siliciclastic lithologies. The far east of Lee County is composed of formations deposited during the Pleistocene interglacial stages. The Fort Thompson Formation is the oldest of these, but its upper part interfingers with the lower parts of the generally overlying Anastasia and Miami Formation. The Anastasia and Miami Formation are contemporaneous and formed Sangamon Interglacial Stage of the Pleistocene epoch about 100,000 to 130,000 years ago.

3.1.2.1 Beach Fills

Coastal Technology Corporation (CTC, 2012) presented the native beach grain size statistics for Lovers Key as part of the permit process for the 2014 nourishment event (Table 3-1).

For Lovers Key, the average mean grain size, shell content, and silt content were 0.26 mm, 1.94%, and 0.81%, respectively. Samples that were collected lie on transects at R-216 (elevation 0.3 feet National Geodetic Vertical Datum [NGVD]), and R-217 (Mean High Water, Mean Low Water, -3.0 feet NGVD, -6.0 feet NGVD offshore, -6.0 feet NGVD Inshore, and -9.0 feet NGVD).

For Bonita Beach, the average mean grain size, shell content, and silt content were 0.38 mm, 3.43%, and 0.46%, respectively (CTC, 2012).

Table 3-1. Lovers Key Native Beach Sediment Data Summary

Sieve Number	Sieve Size (mm)	% Weight Retained
5/8	16	0.00%
5/16	8	0.00%
5	4	1.94%
7	2.83	0.97%
10	2	2.17%
14	1.41	3.07%
18	1	3.14%
25	0.71	3.58%
35	0.5	3.74%
45	0.35	3.96%
60	0.25	12.87%
80	0.18	18.45%
120	0.13	31.81%
170	0.09	7.03%
200	0.07	5.59%
230	0.06	0.87%
Pan	Pan	0.81%
	% Shell	1.94%
	% Silt	0.81%
	Mean, mm	0.26

3.1.2.2 Borrow Areas

Twenty vibracores were collected within the offshore Borrow Area in 2020 and 2021 in support of the Project. Three of the vibracores were completed by jetting to a depth of 10 to 15 feet below the seabed, then recommencing coring to recover sequential sections from subsurface depths. The collected vibracores were logged, photographed, described, and sampled by GFA International, Inc. under subcontract with Amdrill. A total of sixty samples were analyzed. The individual core composite grain size summary of the sediments is presented in Table 3-2. Based upon the testing results and the subbottom profile data interpretation, the Borrow Area sediments were characterized by a sandy stratigraphic unit sitting on top of the upper surface of a limestone layer. The sandy stratigraphic unit meets and exceeds the requirements of 62B- 41.007(2)(j), Florida Administrative Code (F.A.C.) for beach compatible fill. The mean grain size, shell content, and silt content were 0.37 mm, 0.9%, and 1.6%, respectively (CEC, 2022).

Table 3-2. Offshore Borrow Area Individual Core Composite Grain Size Summary

Vibracore ID	Weighted Mean Gravel (#4)	Weighted % Fines (#230)	Weighted Mean Grain Size (mm)
VC21-1-04	2.69%	1.78%	0.55
VC21-1-05	1.77%	2.02%	0.44
VC21-1-06	0.48%	1.70%	0.35
VC21-1-07	1.49%	1.50%	0.40
VC21-1-08	0.71%	1.17%	0.35
VC21-1-09	0.39%	1.27%	0.33
VC21-1-10	0.58%	1.84%	0.29
VC21-1-11	0.46%	1.14%	0.35
VC21-1-12	0.29%	1.57%	0.32
VC21-1-13	0.36%	1.86%	0.34
VC21-1-14	1.87%	1.38%	0.44
VC21-1-15	0.82%	1.58%	0.38
VC21-1-16	0.69%	1.16%	0.43
VC21-1-17	0.94%	1.64%	0.38
VC21-1-18	0.74%	2.12%	0.33
VC21-1-19	0.45%	1.33%	0.32
VC21-1-20	0.77%	1.16%	0.41
VC21-1-21	1.46%	1.95%	0.34
VC21-1-22	1.22%	1.88%	0.37
VC21-1-23	0.69%	1.75%	0.38
Average	**0.90%**	**1.56%**	**0.37**

Seventeen vibracores were collected within the two nearshore Borrow Areas in 2012 in support of the 2014 nourishment event. The collected vibracores were logged, photographed, described, and sampled by Coastal Tech. A total of 66 samples were analyzed. Based upon the testing results and the subbottom profile data interpretation, the Borrow Area sediments were characterized by an upper layer of interbedded fine grained quartz sand and shelly sand overlying fine grained quartz sand that contains fines between 5-12% by weight. Below this was a layer of sand with silt content in excess of 12%, while a gravelly (shell), silty sand comprised the base layer. The sandy stratigraphic unit met and exceeded the requirements of 62B- 41.007(2)(j), F.A.C. for beach compatible fill. The average mean grain size, shell content, and silt content were 0.27 mm, 2.0%, and 0.6%, respectively (Coastal Tech, 2012).

3.1.3 Air Quality

Air quality is the degree to which the ambient air concentration is contaminated with any one or more pollutant that has been scientifically proven to be a health concern. Any number of air pollutant could potentially be damaging to the health; however, the Environmental Protection Agency (EPA) has identified six major air pollutants (carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulfur dioxide) as causing detrimental health effects when their concentrations in the ambient air are found above the thresholds that have been established at levels that are known to be safe. These pollutants are referred to as "criteria pollutants," and the

National Ambient Air Quality Standard has been established for each based on health-related criteria and data (EPA, 2019). According to AirNow.gov (2023), a collaborative effort between EPA and the National Oceanic and Atmospheric Administration (NOAA), the current status in the area is 37 Air Quality Index (AQI). 0 to 50 AQI is considered in the good range. Lee County, Florida is located in the southwestern part of Florida and is currently in attainment for all criteria pollutants (EPA, 2019).

Ozone formation and particulate matter are less likely to accumulate due to Lee County's favorable southeastern geographical position plus the addition of the near constant onshore tropical winds. As the result of vehicle emissions controls and local measures to reduce traffic congestion, Florida has not recorded a violation of the carbon monoxide standard since 1986.

Since gasoline has changed to unleaded only and with the exceptions of areas directly surrounding lead smelting facilities, Florida's ambient air concentrations of lead are nearly zero. Good air quality is expected within the three Borrow Areas which are located offshore in the Gulf of Mexico.

3.1.4 Water Quality

Nearshore waters and estuarine waters in embayments behind the barrier islands are the primary waterbodies within the ROI. Concentrations of non-point source pollutants carried by riverine and other discharges have had a negative impact upon the water quality of the Gulf of Mexico. Urban and agriculture discharge into the Gulf contribute high concentrations of nutrients, pesticides, and fecal coliform bacteria.

The population growth of Florida's southwest coast is a suspected contributor to the environmental degradation of water quality within the Gulf of Mexico. Urban and suburban areas have significant runoff from lawns, parking lots, rooftops, roads, and highways. Even so, these concentrations and fluxes of nutrients, specifically nitrogen and phosphorus, are generally low compared to non-point agricultural sources (USACE, 2020).

3.1.5 Noise

3.1.5.1 Beach Fills

Lovers Key is undeveloped and serves as a publicly accessible beach park. Bonita Beach is developed including single family and multi-family residents with limited commercial uses. Anthropogenic noises include traffic, typical noises associated with residential and commercial uses, and beach users.

3.1.5.2 Borrow Areas

Anthropogenic noises within the borrow areas include noises from boaters and boat traffic.

3.1.6 Water Resources

3.1.6.1 Beach Fills

Lee County Utilities is responsible for operating and maintaining the Water Treatment Plants and distributing potable and reclaimed water resources to the County. Other than the service distribution lines, there are no plants or facilities on Lovers Key or Bonita Beach.

3.1.6.2 Borrow Areas

As the Borrow Areas are located in the Gulf of Mexico, water resources are not applicable.

3.1.7 Climate

The ROI is considered humid and subtropical and its climate is characterized by warm, humid summers and cool, dry winters. The rainy season extends from late spring through the summer. Most of the rainfall during the summer rainy season is associated with the sea breeze, which develops along the coast. These winds result primarily from the differential heating rates of land and water, which cause the air over the land to rise. This rising air cools and travels coastward where it eventually reaches the dew point and results in rain showers.

The prevailing winds influencing the coast are from the east and average less than 10 miles per hour (mph) during most of the year. Strong winds, often exceeding 20 mph, are associated with the passage of cold fronts, which occur frequently during the winter months. The resulting northwesterly winds can heavily impact the coast by eroding and transporting large quantities of sediment.

The greatest impacts come from tropical storms and hurricanes. Strong winds, heavy rains, and storm surge associated with these systems can be responsible for completely rearranging the shoreline, including the opening of new inlets. Tropical storms and hurricanes generally occur from the late summer through fall when sea surface temperatures are at their maximum.

3.2 BIO-PHYSICAL ENVIRONMENT

3.2.1 Vegetation

3.2.1.1 Beach Fills

There are existing dunes along some sections of the Beach Fills. The most commonly observed species include sea oats (*Uniola paniculata*), sea purslane (*Sesuvium portulacastrum*), sea grape (*Coccoloba uvifera*), and salt-grass (*Distichlis spicata*). The dunes were significantly impacted by Hurricane Ian. There is no submerged aquatic vegetation (SAV) adjacent to the Beach Fills.

3.2.1.2 Borrow Areas

There is no SAV within or adjacent to the Borrow Areas.

3.2.2 Benthics

3.2.2.1 Beach Fills

Nearshore hardbottom habitat is not present along the Beach Fills (CEC, 2021b). The upper beach zone (supratidal) is dominated by talitrid and haustoriid amphipod species and ghost crabs (*Ocypode quadrata*). Macrofauna typically found in the lower intertidal zone (between mean high water and mean low water) include haustoriid amphipods, polychaetes, isopods, mollusks, and some larger crustacean species such as mole crabs and burrowing shrimp. (Williams, 1984)

There are a number of embayments in the ROI, these embayments contain significant SAV beds, which provide important foraging areas for green sea turtles and manatees. Another unique benthic habitat found in the embayments are oyster reefs. These reefs, which are formed of masses of oysters as they attach to hard substrate including each other can rise significantly off the bottom, thus creating a high-relief habitat in a more estuarine environment.

3.2.2.2 Borrow Areas

Previous surveys in the offshore waters of the eastern Gulf of Mexico have documented extensive epibenthic communities with low invertebrate diversity. The benthic communities in the Borrow Areas are most likely comprised of bacteria and other microbenthos, meiofauna, macrofauna, and megofauna. A study by Blake et al. (1996) sampled four sites located approximately 50 to 100 NM north of the offshore Borrow Area. At both dredged and undredged locations, the most dominant epibenthic community species included the iridescent swimming crab (*Portunus gibbesii*), sand dollar (*Mellita tenuis*), and pink shrimp (*Penaeus duorarum*). Benthic infaunal communities have

also been described at three previous borrow sites (Egmont Key, Sarasota, and Manasota Key). The major faunal groups included species of annelids (tubificid oligochaetes and dwarf sandworms, *Aglaophamus verrilli*), mollusks (many-line lucine, *Parvilucina multilineata*, and tranverse arks, *Anadara transversa*), and arthropods (amphipods and decapods). All of these groups are represented in bottom sediments throughout the entire Gulf, from the continental shelf to the deepest abyss at about 12,600 feet (USACE, 2020).

3.2.3 Fisheries

3.2.3.1 Introduction

The ROI includes all areas transited by dredging vessels/equipment, barges, and other vessels utilized including portions of the OCS, the offshore Borrow Area, nearshore Borrow Areas, and the waters in and around the barrier islands. The inlets separating the barrier islands give way to small bays and estuaries where SAV, mangroves, and wetlands provide forage, nursery, and habitat for various life stages of managed species and their prey.

In general, Habitat Areas of Particular Concern (HAPC) are high value habitats utilized by fish for migration, spawning, or nursery habitat. Based on the results from the Essential Fish Habitat (EFH) Mapper (NOAA, 2023a), there are no designated HAPCs for fish species in the ROI.

3.2.3.2 Managed Species

Of the species or species groups managed in the Gulf of Mexico, the following may occur within the ROI:

- Coastal Migratory Pelagics
- Penaeid Shrimp
- Coral Reef/Hardbottom
- Reef Fish
- Red Drum
- Spiny Lobster

<u>Coastal Migratory Pelagics</u>

Coastal migratory pelagic species within the ROI include cobia (*Rachycentron canadum*), Spanish mackerel (*Scombrus maculatus*), and king mackerel *(Scomberomorus cavalla*). The EFH for coastal migratory pelagic fishes includes *Phragmatopoma* reefs (worm reefs), sandy shoals, offshore bars, high profile rocky bottom, and barrier island ocean-side waters.

<u>Penaeid Shrimp</u>

Penaeid shrimp potentially found in the Project Area include brown shrimp (*Farfantepenaeus aztecus*), white shrimp (*Litopenaeus setiferus*), red royal shrimp (*Pleoticus robustus*), and pink

shrimp (*Farfantepenaeus duorarum*). For penaeid shrimp, EFH encompasses a series of habitats used throughout their life history with two basic phases: adult and juvenile benthic phase, and planktonic larval and post-larval phase. Benthic adults aggregate to spawn in shelf waters over coarse, calcareous sediments. Eggs attached to the females' abdomben hatch into planktonic larvae. These larvae and subsequent post-larval shrimp feed on zooplankton in the water column and make their way to inshore, estuarine waters where they settle to the bottom where they begin their lives in the benthos. Young penaeid shrimp prefer shallow-water habitats with nearby sources of organic detritus such as estuarine emergent wetlands, often dominated by the marsh grass Spartina alterniflora, or mangrove fringes (SAFMC, 2023).

Coral Reef/Hardbottom

The ROI falls within the 65-foot contour of the West Florida shelf, making the corals within this region largely shallow water species including the following. Black corals, recognized by their black skeleton, range from shallow to deep-water. Hermatypic stony corals are reef-building corals and can occur in both shallow and deep waters. Shallow water species contain symbiotic zooxanthellae, while deep water species contain zooxanthellae; some hydrozoan species, including fire corals are included in this group. They are no coral reefs or hardbottom within or immediately adjacent to the Beach Fills or Borrow Areas.

Reef Fish

There are 31 species of reef fish within the ROI. Early life stages of many species of reef fish utilize estuarine nursery habitat (sheltered bays, wetlands, SAV, mangrove), though some larvae are associated with sargassum or free floating. Late juveniles and adults generally inhabit pelagic and benthic areas, preferentially areas with moderate to high relief such as natural and artificial reef structures (BOEM, 2017).

The diverse assemblage of fishes found in and adjacent to the ROI is vital to the health of the marine ecosystem, which supports commercial and recreational fishing as well as various ecotourism activities. Recreational fishing, which occurs in multiple habitats in both inland bay or estuaries and ocean waters, target species including bonefish (*Albula vulpes*), snook (*Centropomus undecimalis*), tarpon (*Megalops atlanticus*), permit (*Trachinotus falcatus*), blue crabs (*Callinectes sapidus*), stone crabs (*Menippe mercenaria*), snappers (Lutjanidae), groupers (Serranidae), grunts (Haemulidae), wahoo (*Acanthocybium solandri*), and spadefish (*Chaetodipterus faber*).

Commercial and targets numerous species including invertebrates (lobster, blue crabs, stone crabs, and bait shrimp), food fish (typically snappers or groupers, concentrated on yellowtail snapper (*Ocyurus chrysurus*), and baitfish (e.g., ballyhoo (*Hemiramphus brasiliensis*), Spanish sardines (*Sardinella aurita*), thread herring (*Opisthonemoa oglinum*), and pilchard (*Harengula jaguana*)) (USACE, 2020).

Red Drum

EFH for the red drum management unit occurs throughout the Gulf of Mexico from estuaries to depths of approximately 130 feet and are capable of tolerating a wide range of salinity regimes. Eggs are found nearshore, while larvae are often found in warm estuarine waters in late summer and early fall. Spawning occurs in deeper nearshore waters near the mouths of coastal bays and inlets.

Spiny Lobster

EFH for the spiny lobster management unit, which includes the Spiny lobster (*Panulirus argus*) and Slipper lobster (*Scyllarides nodifer*) consists of a variety of habitats. These habitats include nearshore/shelf waters including hardbottom with sponges, coral reefs, crevices, cracks or other structured bottom; SAV beds; unconsolidated bottom; algal communities (*Laurencia* sp.); and mangrove prop roots.

3.2.3.3 Commercial Fisheries

Lee County's commercial fisheries are of significant value to the local economy; the number of people employed by the marine economy generally ranges from nearly 17,000 to 26,000, which comprises between 12 and 18 percent of total employment in Lee County. In 2016, businesses supporting the marine economy contributed approximately $954.4 million to the Lee County economy. For the years 2017 to 2019, the top commercial fisheries landings in Lee County included stone crab claws (*Menippe mercenaria*) and king mackerel. The estimated value of all commercial fisheries landings were $6,802,532 (2017), $7,058,964 (2018), and $6,509,379 (2019), indicating a stable and thriving industry in terms of estimated annual value (USACE, 2020).

3.2.3.4 Other Species of Interest

Tarpon

A large predatory fish growing up to 8 feet long and a maximum weight of 280 lbs., tarpon are considered a primitive fish, with a direct lineage that extends over 100 million years in the fossil record. They have large, shiny, silvery scales that cover most of their elongated bodies, and large mouths with a lower jaw that juts out farther than the upper jaw and forked tails. They are able to survive in a wide range of salinities and are able to tolerate low dissolved oxygen due to their ability to breathe air, which they must do periodically, or they will die. These fish are typically fished for sport, as their meat has many small bones, and they are most often released after capture on hook and line.

Bonefish

A smaller relative of the tarpon, its scales and body shape are somewhat similar, though it only grows up to 41 inches in length and 19 lbs. in weight. It has a small jaw, with the upper jaw jutting out past the lower jaw. It feeds on benthic invertebrates, moving into shallow mud and sand flats to feed with incoming tides. There is a popular recreational fly-fishery for the bonefish, and similar to its larger relative the tarpon, their flesh has many small bones in it. In Florida they are required to be released after being caught on hook and line.

Permit

Permit are larger fish, growing up to four feet in length and weighing up to 79 lbs., with elongated dorsal and anal fins, and a very laterally compressed body, making the fish seem tall and thin when viewed from the front, very similar in appearance to their smaller relative, the pompano. They are a popular sport fish and actively sought after in Biscayne Bay. They feed on crustaceans and mollusks. Although their flesh is edible, they are more often a catch-and release fish rather than kept for food.

Grouper

Groupers are a suite of mostly large, predatory fish that typically ambush their prey and swallow it whole, rather than bite it to pieces as a shark does. Some species, i.e., Warsaw groupers (*Epinephelus nigritus*) and Goliath groupers (*E. itajara*), can weigh well over 300 lbs; however, it is rare to find fishes of this size now-a-days due to overfishing. The life history characteristics of these slow-growing, late-maturing, and long-lived species increase their vulnerability to overexploitation with long-term sustainability a concern due to slow recovery times.

Snapper

Snapper include a number of species locally, all from the family *Lutjanidae*. They are predatory fishes with elongated bodies, sharp canine teeth, and blunt or forked tails. Most species are schooling. There are a number of snapper species in local waters, the red snapper (*Lutjanus campechanus*) is the most popular to fish, and is also the largest, reaching up to 50 lbs.

3.2.4 Upland Wildlife Resources

3.2.4.1 Herpetofauna (Amphibians and Reptiles)

Common amphibians known to occur within the ROI include various species of toads, frogs, and salamanders. Reptiles include alligator (*Alligator mississippiensis*), American crocodile (*Crocodylus acutus*), water snakes (*Nerodia* spp.) and other reptiles, to include various species of snakes, lizards, and terrapins.

3.2.4.2 Mammals

Mammals known to occur within the ROI include rodents (voles, mice, rats, squirrels, groundhogs, etc.), raccoons (*Procyon lotor*), black bears (*Ursus americanus*), opossum (*Didelphis virginiana*), armadillos (*Dasypus novemcinctus*), and whitetail deer (*Odocoileus virginianus*).

3.2.5 Avian Communities

Bird species include migratory shorebirds, wading birds, raptors, and songbirds, including whooping crane (*Gus americana*), brown pelican (*Pelecanus occidentalis*), and eastern bluebird (*Sialia sialis*). The T&E avian species found in the ROI are discussed fully in Section 3.4.5.

3.3 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act, as amended October 11, 1996, defines EFH as the "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802 (10)). The act applies to federally managed species and requires federal agencies to identify and describe EFH for fisheries that may be impacted by a potential project. Using the EFH Mapper (NOAA Fisheries, 2023a), EFH for 43 reef fish, pelagic mackerels, four (4) species of shrimp and four (4) species of sharks were identified to potentially occur within the ROI.

Amendments to the Magnuson-Stevens Fishery Conservation and Management Act, approved by Congress in 1996, defined EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802 (10)). In the marine waters of the Gulf of Mexico, EFH is defined as "all marine waters and substrates (mud, sand, shell, rock, hardbottom, and associated biological communities) from the shoreline to the seaward limit of the EEZ [Exclusive Economic Zone]" (GMFMC, 1998). In 2005 the Gulf of Mexico Fishery Management Council (GMFMC) proposed to amend the definition of EFH, removing EFH description and identification from waters between 100 fathoms (fm) and the seaward limit of the EEZ (GMFMC, 2005). The GMFMC has identified various estuarine and marine areas as EFH based on the life stages of designated managed species.

The ROI includes primarily marine EFH, although estuarine water column and sandy, unvegetated bottom are found at the entrances of the inlets located within the Project area. While SAV occurs within some bays and estuaries within Lee County, there are no SAV located within or adjacent to the Beach Fills and Borrow Areas. Marine EFH include the marine water column and non-vegetated bottoms in the Beach Fills and Borrow Areas. There is no hardbottom within or adjacent to the Beach Fills and Borrow Areas. Operational areas were surveyed and selected to avoid marine habitats.

There are Fishery Management Plans in the Gulf region for shrimp, red drum, reef fishes, stone crabs, spiny lobsters, coral and coral reefs, coastal migratory pelagics (CMP), and highly migratory species (e.g., billfish, swordfish, tuna, and sharks). In total, the GMFMC manages 55 species, not including species included in the coral complex (NMFS, 2008; GMFMC, 2004). In the Gulf of Mexico, highly migratory species such as Atlantic tunas, swordfish, sharks, and billfish are federally managed by the National Marine Fisheries Service (NMFS).

The rules set forth by the Magnuson-Stevens Act also direct the Fishery Management Councils to consider a second, more limited habitat designation for each species in addition to EFH. Habitat Areas of Particular Concern (HAPC) are subsets of identified EFH which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. In general, HAPCs include high-value intertidal and estuarine habitats, offshore areas of high habitat value or vertical relief, and habitats used for migration, spawning, and rearing of fish and shellfish (NMFS, 2008). No designated HAPC exists within the ROI.

3.4 THREATENED AND ENDANGERED SPECIES

3.4.1 General

The T&E species that inhabit the west coast of Florida, its adjacent waters, and the Gulf of Mexico within the ROI are listed in Table 3-3. T&E species that were considered but are not in the ROI or will not be affected by the Project are listed in Table 3-4. These species will not be considered further.

Table 3-3. Threatened and Endangered Species That May be Affected

Classification	Species	Scientific Name	Status	Jurisdiction	May Be Affected
Mammals	West Indian Manatee	*Trichechus manatus*	Threatened	USFWS	Y
Reptiles	Green Sea Turtle	*Chelonia mydas*	Endangered	NMFS	Y
	Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered	NMFS	Y
	Hawksbill Sea Turtle	*Eretmochelys imbricata*	Endangered	NMFS	Y
	Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered	NMFS	Y
	Loggerhead Sea Turtle	*Caretta caretta*	Endangered	NMFS	Y
Fish	Smalltooth Sawfish	*Pristis pectinata*	Endangered	NMFS	Y
	Giant Manta Ray	*Manta birostris*	Threatened	NMFS	Y
Birds	Piping Plover	*Charadrius melodus*	Threatened	USFWS	Y
	Red Knot	*Calidris canutus rufa*	Threatened	USFWS	Y
Plants	Aboriginal prickly apple	*Harrisia aboriginum*	Endangered	USFWS	Y

Table 3-4. Threatened and Endangered Species Not Affected

Classification	Species	Scientific Name	Status	Jurisdiction
Mammals	Sperm Whale	*Physeter catodon*	Endangered	NMFS
	Rice's Whale	*Balaenoptera edeni*	Protected	NMFS
	Humpback Whale	*Megaptera novangliae*	Endangered	NMFS
	Fin Whale	*Balaenoptera physalus*	Endangered	NMFS
	Blue Whale	*Balaenoptera musculus*	Endangered	NMFS
	Sei Whale	*Balaenoptera borealis*	Endangered	NMFS
	North Atlantic Right Whale	*Eubalaena glacialis*	Threatened	NMFS
	Florida Bonneted Bat	*Eumops floridanus*	Endangered	USFWS
Reptiles	American Crocodile	*Crocodylus acutus*	Threatened	USFWS
Fish	Gulf Sturgeon	*Acipenser oxyrinchus desotoi*	Threatened	NMFS
	Nassau Grouper	*Epinephelus triatus*	Threatened	NMFS
	Oceanic Whitetip Shark	*Carcharinus longimanus*	Threatened	NMFS
Birds	Black-capped petrel	*Pterodroma hasitata*	Proposed Threatened	USFWS
Insects	Monarch Butterfly	*Danaus plexippus plexippus*	Candidate	USFWS

3.4.2 Marine Mammals

3.4.2.1 Whales

The sperm whale, Rice's whale, Humpback whale, Fin whale, Blue whale, Sei Whale, and North Atlantic Right Whale are not known to frequent the waters within the ROI. There is no Designated Critical Habitat (DCH) for whales within the ROI. Thus whales are not considered further.

3.4.2.2 West Indian Manatee (*Trichechus manatus*)

The West Indian manatee is a large, fully aquatic mammal commonly found in Florida waters with a few individuals migrating seasonally as far north as Chesapeake Bay. Today, the range-wide population is estimated to be at least 13,000 manatees, with more than 6,500 in the southeastern U.S. and Puerto Rico. When aerial surveys began in 1991, there were an estimated 1,267 manatees in Florida. Today there are more than 6,300 in Florida, representing a significant increase over the past 25 years. West Indian manatees are Federally listed as threatened. Manatees are large, elongated marine mammals with one set of paired flippers and a large, spoon-shaped tail. They can reach lengths of over 14 feet and weights of over 3,000 pounds. Manatees are typically greyish brown in color. They have sparse hairs spread across their bodies, with bristles about the muzzle. They are herbivorous, eating a wide variety of SAV. Due to this, they are often found in shallow coastal and estuarine into fresh waters. Manatees and their habitat are found in the nearshore zone and back-bay habitats of Lee County.

3.4.3 Marine Turtles

3.4.3.1 General

Five species of marine turtles, all T&E, are commonly found within the ROI. All five species nest on sandy beaches and the hatchlings migrate offshore to spend lengthy periods as part of the Sargassum community, where they shelter in the floating vegetation and wrack, and feed on the community's varied infauna. As they grow the juveniles may be carried great distances by surface currents and their eddies, eventually abandoning the pelagic existence to become benthic foragers for crustaceans and other invertebrates over sandy, muddy, or reef-like substrates.

The species of sea turtles that occur in the action area and that might be affected by the proposed action are all highly migratory. The nearshore and inshore waters of the Gulf of Mexico may be used by these species as post-hatchling developmental habitat or foraging habitat. No individual members of any of the species are likely to be permanent residents, although some individuals may be present at any given time, with minimum local abundance in winter and maximum local abundance in summer. These same individuals will migrate into offshore waters, as well as other areas of the Gulf of Mexico, Caribbean Sea, and North Atlantic Ocean when water temperatures drop and thus be impacted by activities occurring there. Because they travel widely throughout the Atlantic, Gulf of Mexico, and Caribbean Sea, individuals in the action area are impacted by activities that occur in other areas within their geographic range.

The status of the species for hatchling and adult female sea turtles on the dry beach includes the following threats: beach erosion, tidal inundation, sand accretion, in-water alterations, armoring and nourishment, coastal development, disorientation caused by artificial lighting, beach cleaning,

increased human presence, recreational beach equipment, beach driving, fishing piers, exotic dune and beach vegetation, disease, predation, and poaching. An increased human presence at some nesting beaches or adjacent to nesting beaches has led to secondary threats such as the introduction of exotic species and an increased presence of native species, which raid nests and feed on turtle eggs.

3.4.3.2 Green Sea Turtle (*Chelonia mydas*)

The green sea turtle is the largest hard-shelled sea turtle. They are unique among sea turtles in that they are herbivores, eating mostly seagrasses and algae. Florida hosts one of the largest grouping of green turtle nests in the western Atlantic. More than 37,000 green sea turtle nests were documented in Florida in 2015, a record number. During the day, green turtles occupy shallow flats and seagrass meadows. In the evening, they return to their sleeping quarters of rock ledges, oyster bars and coral reefs. Green turtle nesting in Florida occurs primarily from June through late September on the beaches in the ROI. Every two to three years, a female will return to the nesting beach and lay an average of 3.6 clutches in a season (FWC, 2019b).

3.4.3.3 Leatherback Sea Turtle (*Dermochelys coriacea*)

The Leatherback sea turtle is the largest turtle in the world. They are the only species of sea turtle that lack scales and a hard shell. They are named for their tough rubbery skin and have existed in their current form since the age of the dinosaurs. Leatherbacks are highly migratory, some swimming over 10,000 NM a year between nesting and foraging grounds. With the exception of a few nests on the west coast each year, Leatherbacks nest primarily on the east coast of Florida. Notably, fewer than 50 percent of Leatherback sea turtle nesting occur on the beaches in the ROI (FWC, 2019d).

3.4.3.4 Hawksbill Sea Turtle (*Eretmochelys imbricate*)

The Hawksbill sea turtle inhabits tropical and sub-tropical waters of the world's major oceans. Hawksbills get their name from their unique beak-like mouth, which resembles that of a hawk and is perfect for finding food sources in hard-to-reach cracks and crevices. They are the only species of sea turtle that can survive on a diet consisting mainly of sponges. Hawksbills feed on sponges and other benthic invertebrates that inhabit reef and hardbottom environments. Hawksbill sea turtles have been observed nesting and foraging on the beaches in the ROI (FWC, 2019c).

3.4.3.5 Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)

The Kemp's ridley sea turtle is the smallest species of sea turtle and is the most endangered turtle in the world. It is recognized by its olive-gray circular shaped carapace and large head with a beak similar to a parrot. Kemp's ridley usually has 12 pairs of marginal scutes, five costal scutes, five vertebral scutes, and one nuchal scute. Kemp's Ridley sea turtles have been reported from the coastal shallows along the Western Florida Coast. Although rare, nesting females can be found nesting and foraging on the beaches in the ROI.

3.4.3.6 Loggerhead Sea Turtle (*Caretta caretta*)

The Loggerhead sea turtle is the most commonly observed sea turtle in Florida coastal waters and nesting on Florida beaches. Loggerheads are encountered in a range of habitats including the beaches, nearshore zone, and offshore waters within the ROI. Loggerheads were named for their relatively large heads. They have powerful jaws that enable them to feed on hard-shelled prey.

On July 10, 2014, NMFS published a Final Rule designating critical habitat for the Northwest Atlantic Ocean (NWA) Loggerhead sea turtle Distinct Population Segment (DPS) (79 FR 39856). The Final Critical Habitat Rule, effective August 11, 2014, designates 38 marine areas (critical habitat units) within the Atlantic Ocean and Gulf of Mexico, which contain the physical or biological features essential for the conservation of the loggerhead sea turtle, as critical habitat. Unit LOGG-N-28, Sanibel Island, occurs in the ROI, specifically in the nearshore zone along Bonita Beach.

3.4.3.7 American Crocodile *(Crocodylus acutus)*

American crocodiles live in coastal areas throughout the Caribbean and occur at the northern end of their range in south Florida and the Keys. They occur in brackish or saltwater areas and can be found in ponds, coves, and creeks in mangrove swamps. They are occasionally encountered inland in freshwater areas of the southeast Florida coast as a result of the extensive canal system. Currently, researchers estimate the Florida population size to consist of between 100 to 500 individuals. American crocodiles are not known to frequent the beaches and waters within the ROI (FWC, 2019a). Thus crocodiles are not considered further.

3.4.4 Fish Communities

3.4.4.1 Smalltooth Sawfish (*Pristis pectinata*)

The smalltooth sawfish is one of five species of sawfish. All sawfish belong to a group of fish called elasmobranchs that includes rays, skates, and sharks. Elasmobranchs have no bones and

their skeletons are instead made of cartilage, a firm tissue more flexible than bone. Although shark-like in appearance, sawfish are actually rays, as their gills and mouths are found on the underside of their bodies. Sawfish get their name from their distinct rostrum—a long, flat snout edged with teeth—that looks like a saw.

Smalltooth sawfish live in tropical seas and estuaries (semi-enclosed areas where rivers meet the sea). They are mostly at home in shallow, coastal waters, and sometimes enter the lower reaches of freshwater river systems. In the United States, they can be found in Florida's coastal waters. Adult and juvenile smalltooth sawfish may be found in or near the ROI including the nearshore zone along the Beach Fills and the Borrow Areas.

The smalltooth sawfish is also listed as a migratory species threatened with extinction under the United Nations Environment Programme Convention on the Conservation of Migratory Species of Wild Animals (NOAA, 2022).

3.4.4.2 Giant Manta Ray (*Manta birostris*)

The giant manta ray is the world's largest ray with a wingspan of up to 29 feet. They are filter feeders and eat large quantities of zooplankton. Giant manta rays are slow-growing, migratory animals with small, highly fragmented populations that are sparsely distributed across the world.

The main threat to the giant manta ray is commercial fishing, with the species both targeted and caught as bycatch in a number of global fisheries throughout its range. Manta rays are particularly valued for their gill rakers, which are traded internationally. In 2018, NOAA Fisheries listed the species as threatened under the Endangered Species Act.

The giant manta ray is found worldwide in tropical, subtropical, and temperate bodies of water and is commonly found offshore, in oceanic waters, and in productive coastal areas. The species has also been observed in estuarine waters, oceanic inlets, and within bays and intercoastal waterways. As such, giant manta rays can be found in cool water, as low as 19°C, although temperature preference appears to vary by region (NOAA, 2023b).

3.4.4.3 Gulf Sturgeon *(Acipenser oxyrinchus desotoi)*

The Gulf sturgeon is a sub-species of the Atlantic sturgeon that can be found from Lake Pontchartrain and the Pearl River system in Louisiana and Mississippi to the Suwannee River in Florida. Hatched in the freshwater of rivers, Gulf sturgeon head out to sea as juveniles, and return to the rivers to over summer or spawn when they reach adulthood. Gulf sturgeon are not known to frequent the waters within the ROI. There is no DCH for Gulf sturgeon within the ROI. Thus, Gulf sturgeon are not considered further (NOAA, 2023c).

3.4.4.4 Nassau Grouper *(Epinephelus triatus)*

Nassau grouper are found in tropical and subtropical waters of the western North Atlantic. This includes Bermuda, Florida, Bahamas, the Yucatan Peninsula, and throughout the Caribbean to southern Brazil. There has been one verified report of Nassau grouper in the Gulf of Mexico at Flower Gardens Bank. They generally live among shallow reefs but can be found in depths to 426 feet. Nassau grouper are not known to frequent the waters within the ROI (NOAA, 2023d). Thus, Nassau grouper are not considered further.

3.4.4.5 Oceanic Whitetip Shark *(Carcharinus longimanus)*

Oceanic whitetip sharks are large, pelagic sharks found in tropical and subtropical oceans throughout the world. They live offshore in deep water but spend most of their time in the upper part of the water column near the surface. Oceanic whitetip sharks are long-lived, late maturing, and have low to moderate productivity. Oceanic whitetip sharks are not known to frequent the waters within the ROI (NOAA, 2023e). Thus, Oceanic whitetip sharks are not considered further.

3.4.5 Avian Communities

3.4.5.1 Piping plover (Charadrius melodus)

Piping plovers are small, migratory shorebirds that breed in only three geographic regions of North America: on sandy beaches along the Atlantic Ocean, on sandy shorelines throughout the Great Lakes region, and on the river-bank systems and prairie wetlands of the Northern Great Plains (Haig, 1992). Although this species does not breed in Florida, individuals winter in Florida. Wintering habitat has been proven a key factor in survival for piping plovers since they may spend 7 to 8 months per year away from breeding areas. Piping plovers are considered threatened throughout their wintering range (USFWS, 2009).

Critical habitat for the wintering grounds of the piping plover was designated under Federal Register (66 FR 36038). There is no Federally designated piping plover critical habitat within the ROI. The closest critical habitat units for wintering piping plovers are Units FL-26 and FL-27. Unit FL-26 is located on Estero Island in Lee County, approximately 1 mile north of the Project Area and FL-27 is located on Tigertail Beach, at the entrance to Big Marco Pass, approximately 11 miles south of the Project Area. If present, they may be found on sparsely vegetated beaches, overwash fans and sand and mud flats.

3.4.5.2 Red Knot (Calidris canutus)

The U.S. Fish and Wildlife Service (USFWS) designated the red knot a candidate for ESA protection on September 12, 2006. On December 11, 2014, USFWS determined threatened species status for the *rufa* subspecies (*Calidris canutus rufa*) under the ESA (79 FR 73706) and the rule became effective on January 12, 2015. *Rufa* red knots are also federally protected under the Migratory Bird Treaty Act (USFWS, 2023).

The red knot is a medium-sized shorebird with a circumpolar breeding season distribution and migrates to coasts around the world, traveling up to 9,000 mi. It has one of the longest migrations of any bird. The declining population of the red knot is directly related to the increased harvest of horseshoe crabs as bait for the conch pot and eel fisheries in the mid-Atlantic. Red knots are dependent upon horseshoe crab eggs on their stopovers to sustain them through the 3,000-mile migration to summer breeding grounds in the arctic, as well as to ensure their survival once they arrive.

There are six subspecies of the red knot, two of which are known to winter and/or pass through the United States. The *rufa* subspecies of the red knot breeds in the central Canadian arctic and mainly winters in Tierra del Fuego. Two other wintering populations, found in Maranhão in northern Brazil and Florida, have uncertain subspecific status. Current scientific opinion is that the Florida and Maranhão populations are *C. c. rufa* (Niles et al., 2008). Florida is known overwintering habitat for the red knot, and the west coast of Florida is an important stopover for the Tierra del Fuego population. Preservation of any habitat used by the red knot while they remain vulnerable may be critical to their survival (BOEM, 2017).

3.4.5.3 Black-capped Petrel *(Pterodroma hasitata)*

The Black-capped petrel is a pelagic seabird that breeds on Caribbean islands and travels long distances to foraging areas in the western Atlantic and southern Caribbean basins, and perhaps the northern Gulf of Mexico. Black-capped petrels are not known to frequent the nearshore waters or beaches within the ROI. Thus Black-capped petrels are not considered further.

3.4.6 Insects

3.4.6.1 Monarch Butterfly *(Danaus plexippus plexippus)*

With its iconic orange and black markings, the monarch butterfly is one of the most recognizable species in North America. Monarchs are particularly remarkable because they migrate each year, flying from as far as Canada and across the United States to congregate at a few forested overwintering sites in the mountains of central Mexico and coastal California. Over the past two

decades, monarch numbers in North America have declined, prompting the U.S. Fish and Wildlife Service (USFWS) to join state agencies, tribes, other federal agencies, and non-government groups to identify threats to the monarch and take steps to conserve monarchs throughout their range. While not specifically listed as a T&E species, USFWS has identified the monarch butterfly as a listing candidate. While monarch butterflies may be found on the beaches within the ROI, as they are a mobile species, the proposed action on the uplands will not have a measurable effect on them (USFWS, 2020). Thus monarch butterflies are not considered further.

3.4.7 Upland Mammals

3.4.7.1 Florida Bonneted Bat (*Eumops floridanus*)

The Florida bonneted bat is the largest species of bat in Florida. This bat species can reach a length of 6.5 inches with a wingspan of 20 inches. The pelage color varies from black to brown to grayish or cinnamon brown. The Florida bonneted bat uses forests, wetlands, and other natural habitats, and it roosts in cliff crevices, tree cavities, and buildings. It is present in rural as well as residential and urban areas. Florida bonneted bats are thought to have a low reproductive capacity, only giving birth to one offspring per breeding season. However, the female has the capability of going into heat many times during the year. This species may have two breeding seasons each year. Reproduction has been documented during the summer and also during January and February (Timm and Genoways, 2004).

Due to the species' small range, the greatest threats to Florida bonneted bats are loss of habitat, including the destruction of natural roost sites, and natural disasters such as hurricanes since the impact could occur throughout its entire range. Additionally, pesticide use also could threaten the bonneted bat population by affecting its food source, although this has not been proven (USFWS, 2008). Because its habitat does not include the beach and dune system within the ROI, the Florida bonneted bat will not be considered further.

3.4.8 Plants

3.4.8.1 Aboriginal Prickly Apple (*Harrisia aboriginum*)

The Aboriginal prickly apple is an erect to reclining cactus with simple or branching, cylindrical, spiny stems to 20 feet tall but more often around 10 feet, with 9-11 longitudinal ribs, often leaning on nearby vegetation (Chafin, 2000). It has scented, white flowers up to 5 inches long, and yellow, round seed-bearing fruit during the months between June and October. The cactus occurs in coastal strand vegetation, tropical coastal hammocks with trees including gumbo limbo, wild lime or live oak. Populations are likely to be on shell mounds created by pre-European local residents, or at

least on sites with shelly substrates. Plants may be quite close to the mangrove zone, but not in it (CBD, 2023).

This species is endemic to just four counties in southwest Florida including Charlotte, Lee, Sarasota, and Manatee, and nowhere else on earth. The Aboriginal prickly apple continues to decline across its range because of human development, erosion, and invasive species dominance in its preferred coastal habitats. Following a public review, USFWS listed the species on the Federal Register of Endangered Species in 2013 and critical habitat was designated in 2015 (McCourt, 2023). Hurricane Ian destroyed the dune systems and vegetation within the Beach Fills. There is little if any Aboriginal prickly apple remaining within the ROI.

3.5 CULTURAL RESOURCES

3.5.1 Beach Fills

There are two archaeological sites adjacent to the Lovers Key Beach Fill (Figure 3-1). The first site, LL2017, is located on the southern end of the barrier island and contains human remains. This site was documented by the Florida Department of State, Division of Historical Resources (DHR) as part of the permitting for the New Pass Dredging Project (FDEP, 2015). The second site, LL01924, is a modern wreck located adjacent to the northern interior channel of New Pass. A determination of eligibility to the National Register of Historic Places has not been conducted by DHR for either site.

3.5.2 Borrow Areas, Pipeline Corridors, and Pump-Out Areas

Review of standard databases that chart locations of submerged cultural resources identified during hydrographic surveys or reported by independent private firms or individuals indicated that no shipwrecks or obstructions have been identified within the Borrow Areas, Pipeline Corridors, and Pump-Out Areas. However, any activities related to the execution of the Project that deviate outside of these currently defined limits could encounter submerged cultural resources (RCG, 2022).

NOAA descriptive hydrographic survey reports, sourced at the National Centers for Environmental Information were compared to existing items charted on Raster Navigation Charts and Electronic Navigation Charts (ENC) specific to the Beach Fills and Borrow Areas. A review of these datasets revealed no charted wrecks or archaeological sites within the limits of the Project features. Seven field surveys conducted across portions of the Lovers Key Pipeline Corridor were reviewed in detail. The Charlotte Harbor Shipwreck Survey is associated with ENC Wreck 159, plotted approximately 530 feet north/northwest of the Lovers Key Pipeline Corridor (RCG, 2022).

Five vessel wrecks were identified in the general vicinity of Bonita Beach. Of these, two are in close proximity to the Project features (RCG, 2022). The first, #1494, is a wreck located approximately 0.5 NM north of the Lovers Key Pipeline Corridor in 13 feet of water. The second, #1523, is a wreck located approximately 0.9 NM south of the Bonita Beach Pipeline Corridor in 22 feet of water. A determination of eligibility to the National Register of Historic Places is unknown.

The 2021 surveys of the Project Area collected a total of 140 NM of trackline HRG data. Water depths in the Project Area ranged from 6 to 56 feet. A total of 69 side scan sonar contacts, 50 magnetic anomalies, and 20 geotechnical cores were collected. The resulting characterization of the seabed and subsurface supports planning of future geophysical, geotechnical, and engineering activities by assisting in identifying the preferred planning/layout, installation, and operational right-of-way for the Project. A determination of "No Historic Properties Affected" (36 CFR 800.4) was recommended. Review of seismic data revealed a relatively featureless bottom with the exception of numerous U-shaped depressions throughout the offshore Borrow Area. There was no evidence within the seismic data of these depressions being associated with preserved landforms with the potential for cultural resources. No evidence was found of submerged cultural resources that could possess the qualities of significance and integrity as defined in the National Register Criteria for Evaluation (36 CFR 60.4 [a-d]) within the ROI. As a result of these investigations, a determination of "No historic properties affected" (36 CFR 800.4) was recommended and concurrence was obtained from the FL DHR (RCG, 2022).

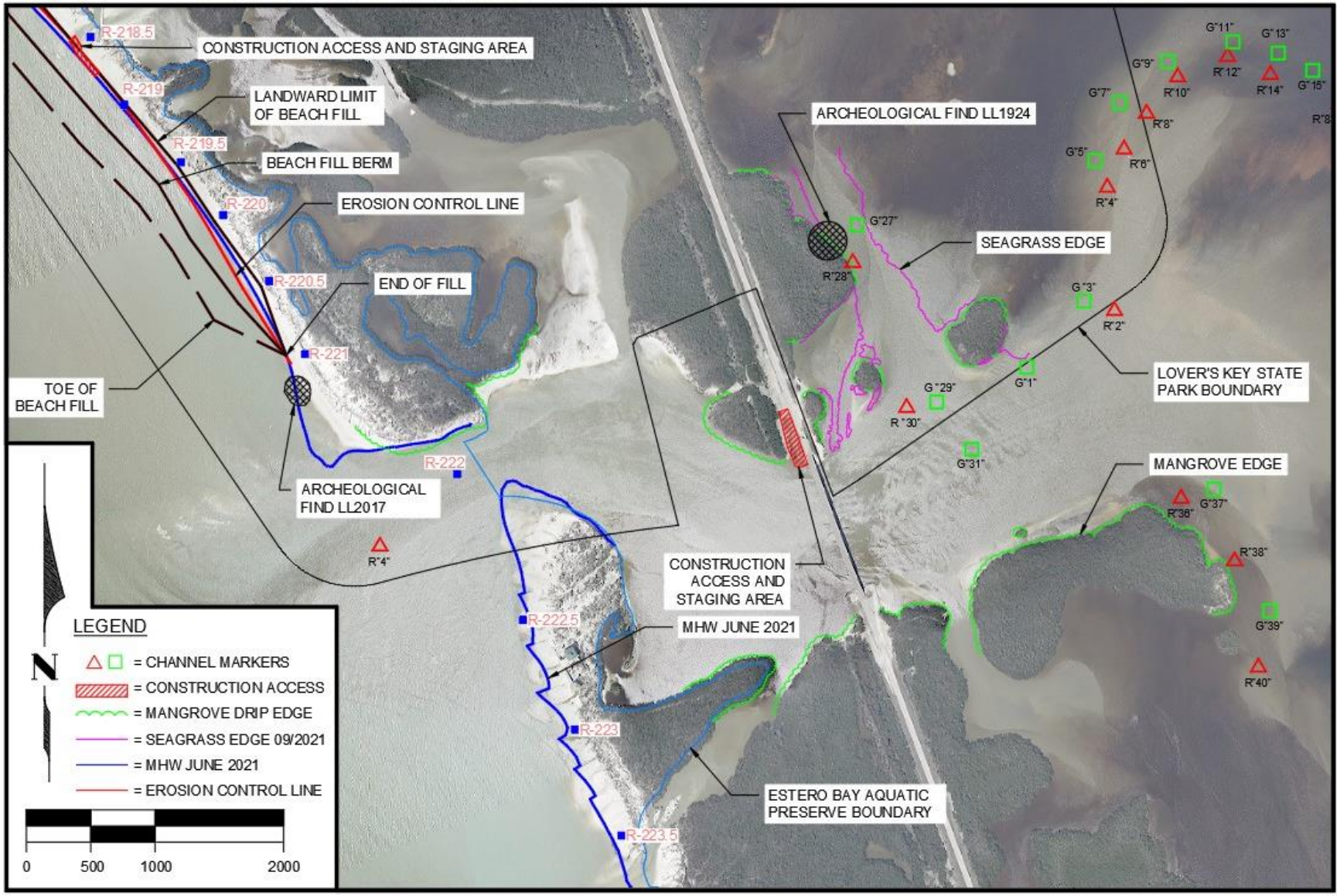

Figure 3-1: Cultural Resource Sites on Lovers Key

3.6 SOCIOECONOMIC AND HUMAN RESOURCES

Lee County's beaches anchor a major tourism industry for the area. Public beach access and parking are provided at strategic points along the shoreline. In addition, tourists and residents enjoy water related activities such as fishing, sailing, kayaking, snorkeling, and recreational diving. In Lee County, listed dive shops and dive boat operations are concentrated in the Fort Myers and Bonita Beach area. There are at least 16 artificial reefs in Lee County. On average, organized dive trips range up to 25 NM offshore and last five to seven hours. Also, local fishing guides provide full-day or half-day fishing tours.

The recreational fishery in Lee County is a strong industry. Recreational fisheries land more jack, snapper and sport fish than commercial fisheries. In 2003, the recreational fisherman brought into Lee County about 50,000 pounds of red drum, 100,000 pounds of grouper and a quarter million pounds of mackerel and kingfish. The County accounts for five percent to 20 percent of the total west Florida landings, depending on species (NMFS 2004). The value of recreational fisheries extends beyond the value of the fish alone, and includes transportation, dining, hotels, gear, souvenirs, guides, and party boats.

There are no Federal parks or wildlife refuges in or adjacent to the Project Area. There is one State Park, Lovers Key State Park, located within the Project Area.

3.7 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)

3.7.1 General

Hazardous materials include, but are not limited to, hazardous and toxic substances (biological, chemical, and/or physical) and waste, and any materials that pose a potential hazard to human health and the environment due to their quantity, concentration, or physical and chemical properties. Hazardous wastes are characterized by their ignitability, corrosivity, reactivity, and toxicity. Hazardous materials and wastes, if not controlled, may either (1) cause or significantly contribute to an increase in mortality, serious irreversible illness, or incapacitating reversible illness, or (2) pose a substantial threat to human health or the environment. The primary relevant Federal regulations include those promulgated under the Resource Conservation and Recovery Act of 1974 and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

3.7.2 HTRW Sites

The FDEP Division of Waste Management (FDEP, 2023) indicates there are no generators nor sites of HTRW within the Project Area.

3.7.2.1 Brownfields Sites

Brownfields is a term used to describe tracts of land formerly used for industrial or commercial purposes. They may contain construction debris and contaminants, but not to the degree of a Superfund site. The EPA has a grant program for the rehabilitation of brownfields sites. Lee County has one brownfield area, in the Immokalee area, well inland of the ROI.

3.7.2.2 CERCLA Sites

The EPA National Priorities List indicates that there are no CERCLA sites within Lee County (EPA, 2019).

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 PHYSICAL RESOURCES

4.1.1 Oceanographic and Coastal Processes

4.1.1.1 No-action Alternative – Beach Fills

The No-action Alternative would involve no additional action from current or planned future actions to mitigate against coastal storm risk. Significant loss of beach and dune habitat would occur exposing back bay habitats to increased coastal forcing functions. Increased flooding of infrastructure would be expected to increase as well as the barrier island serve as the first line of defense from storm surge, inundation, and wave attack. Coastal storms, when they strike would be expected to cause increasing damage over time due to higher water levels, less beach habitat, lower dunes.

4.1.1.2 No-action Alternative – Borrow Areas

This Alternative will have no impact on the oceanographic and coastal processes at the Borrow Areas.

4.1.1.3 Nourishment Alternative – Beach Fills

Nearshore bathymetry would be slightly altered due to the placement of sand. Beach berms and dunes will be restored and raised in elevation. Existing (post-Ian) beach berms are nearly non-existent with berm height ranges from approximately +2 to +5 feet NAVD88 and minimally discernible widths seaward from the vegetation/development lines. While the increased berm would result in changes in the local bathymetry, hydrology, and tidal processes, it is not anticipated to be significant. Longshore transport should not be significantly altered by this widening of the beaches, this process should continue as it has, but occur slightly offshore of the present shoreline due to the proposed widening. The dunes proposed, while increased in elevation, are supra-tidal and would not have any impacts to local bathymetry, hydrology or tidal processes. They would provide more protection from storm surge to inland areas and infrastructure during major storm events more effectively than present conditions.

4.1.1.4 Nourishment Alternative – Borrow Areas

Offshore Borrow Area

Due to the depth of and nature of the offshore Borrow Area, there would be no significant impacts from the borrowing activity itself on bathymetry, hydrology or tidal processes resulting from mining sand at the offshore Borrow Area. Similar sand dredging activities have been evaluated in the recent past and found that dredging at the offshore Borrow Area resulted in the following finding: "considering the small size of the offshore Borrow Area in comparison to the surrounding geology, dredging of the offshore Borrow Area is not expected to have any significant effect on local currents or sedimentation." Regarding waves and resultant wave energy, BOEM found: "Because inner shelf currents are large scale oceanographic phenomena that respond to equally large-scale barometric gradients that generate surface winds, and by astronomical tidal forcing, it is unlikely that localized, relatively small disturbances such as the dredging of the offshore Borrow Area will have any significant effect in the current field of the area". Regarding waves moving from the offshore Borrow Area to the shores of Lee County, BOEM concluded due to significant distance between the offshore Borrow Area and the shorelines, changes to the nearshore waves will not occur during either storms or average conditions, and it is expected likewise regarding the proposed dredging of the offshore Borrow Area (USACE, 2020).

Nearshore Borrow Area

Due to the close proximity of the nearshore Borrow Areas to the adjacent shorelines, monitoring was required after the excavation of the borrow areas to determine if potentially higher wave energy could pass over the excavated areas and impact the adjacent beaches. The effect of excavating the nearshore Borrow Areas was observed to be insubstantial. Additional excavation in the future could allow for higher wave energy to be transmitted to the beaches. The coastal process analysis was presented in the Joint Coastal Permit Application. This information indicates the excavation of the proposed borrow areas will not adversely affect the inlet and adjacent beaches. However, as part of the typical monitoring program to determine the performance of beach nourishment, the effects of excavating the borrow areas on the adjacent shorelines will continue to be monitored (FDEP, 2013).

4.1.2 Geology and Soils

4.1.2.1 No-action Alternative – Beach Fills

The No-action Alternative would involve no additional action from current or planned future actions and would result in no direct alternation to the geology or soils in the ROI. Due to the synergistic effects of a combination of factors including an increase in the frequency and strength

of storms and the risk from coastal inundation, it is anticipated the topography would be altered by continued shoreline erosion and adverse impacts from storm surge and wave attack on the landscape that would be anticipated to worsen over time. As sea level rises, the natural morphological processes of erosion and siltation would continue and worsen over time.

4.1.2.2 No-action Alternative – Borrow Areas

This Alternative will have no impact on the geology and soils in the Borrow Areas.

4.1.2.3 Nourishment Alternative – Beach Fills

Nourishment and restoration of the beaches and dunes with beach compatible sediment will improve the ability of the islands to resist shoreline erosion, wave overtopping, and breach formation. Dune vegetation will be installed providing a mechanism for future Aeolian sand transport and dune enhancement for additional shoreline protection. Placement of sand within the Beach Fills will not have a measurable impact on the geology and soils of the Project Area. An indirect impact on the geology and soils of the beaches within the ROI includes a benefit of deposition and natural redistribution of sediment to the downdrift shorelines.

4.1.2.4 Nourishment Alternative – Borrow Areas

The proposed action includes excavation of approximately 35% of the total available volume within the offshore Borrow Area over a 15-year period. It is noted the offshore Borrow Area is part of a significant submerged shoal that contains millions of cubic yards of sediment. Thus there will be no measurable impact to the geology and soils of the borrow areas from mining them at intervals on the order of eight (8) to ten (10) years.

4.1.3 Air Quality

4.1.3.1 No-action Alternative

This Alternative will have no impact on air quality at the Beach Fills or the Borrow Areas.

4.1.3.2 Nourishment Alternative

Air quality at both nearshore and offshore borrow areas as well as at the beach fill sites will be temporarily affected by exhaust discharges from the internal combustion engines on construction machinery, work boats and crew boats, quarters barge generators, yellow equipment, and miscellaneous vehicles. This level of activity will persist throughout the duration of construction

and return to pre-construction conditions shortly after completion of construction activities; thus, the impacts will be minor and temporary.

Table 4-1 presents a summary of total carbon dioxide emissions predicted throughout the estimated construction duration. Results are presented in a categorized fashion, broken down by location, type, and operation mode. Calculations were done using the EPA Dredging Projects Emission Calculator using the assumption of a 20-hour workday for the hopper dredges, and 12-hour workdays for all shore equipment and auxiliary vessels. Calculations utilized the emissions factors for the anticipated equipment and vessels included with the EPA greenhouse gas estimation tool (BOEM, 2013). The estimated total carbon dioxide release equaled approximately 12,900 tons. Based on information available from the EPA's 2020 eGRID database for the Florida subregion, this number represents 0.012% of the total carbon dioxide (100,795,433 tons) emissions for the entire year (EPA, 2022).

Table 4-1. Estimated Greenhouse Gas Emissions

Inside State Waters?	Name	Subtype	Mode	Quantity	CO_2 Tons
Y	Crew Boat	Crew Boat		2	1,899.9
Y	Bulldozer	Crawler Tractor		1	85.3
Y	Bulldozer	Crawler Tractor		1	85.3
Y	Bulldozer	Crawler Tractor		1	85.3
Y	Bulldozer	Crawler Tractor		1	85.3
Y	Excavator	Excavators		1	86.2
Y	Handler	Other		1	33.5
Y	Loader	Rough Terrain Forklifts		1	78.9
Y	Generator 1A	Vessel-mounted	Transit	2	82.4
Y	Generator 1B	Propulsion	Transit	2	1,240.5
Y	Generator 2A	Vessel-mounted	Pumping	2	93.8
Y	Generator 2B	Propulsion	Pumping	2	1,411.7
Y	Generator 1A	Vessel-mounted	Transit	2	82.4
Y	Generator 1B	Propulsion	Transit	2	1,240.5
Y	Generator 2A	Vessel-mounted	Pumping	2	93.8
Y	Generator 2B	Propulsion	Pumping	2	1,411.7
N	Generator 1A	Vessel-mounted	Dredging	2	140.7
N	Generator 1B	Propulsion	Dredging	2	2,117.5
N	Generator 2A	Vessel-mounted	Transit	2	9.2
N	Generator 2B	Propulsion	Transit	2	137.8
N	Generator 1A	Vessel-mounted	Dredging	2	140.7
N	Generator 1B	Propulsion	Dredging	2	2,117.5
N	Generator 2A	Vessel-mounted	Transit	2	9.2
N	Generator 2B	Propulsion	Transit	2	137.8
Estimated Project Total CO2 Emissions (tons)					12,907

4.1.4 Water Quality

4.1.4.1 No-action Alternative

This Alternative will have no impact on water quality in the Project Area.

4.1.4.2 Nourishment Alternative

Water quality will be impacted by the sediment and slurry discharged across the beach and into the nearshore zone during construction at the Beach Fills, and at the dredge site in the Borrow Areas. The nature of this impact will be in the form of turbidity at the excavator, pump-out areas, discharge sites, and locations where dewatering effluent is released. As the sediment has less than 3% silt content, generated turbidity will be minimal.

Best management practices shall be required in the contract documents of the construction contractor to control turbidity and minimize impacts to water quality in the Project Area. This level of activity will persist throughout the duration of construction and return to pre-construction conditions shortly after completion of construction activities, thus the impacts will be minor and temporary.

4.1.5 Noise

4.1.5.1 No-action Alternative

The No-action Alternative will have no impact on noise.

4.1.5.2 Nourishment Alternative

Construction activities would result in temporary and localized increases to noise levels at the dredge and booster pumps in both the nearshore and offshore Borrow Areas, and from the equipment employed during construction within the beach fill sites. The level of noise that is generated by construction equipment can be controlled. During the construction period, localized and temporary noise impacts would likely result in noise-sensitive wildlife and fishery resources being temporarily displaced. In some instances, noise impacts may directly impact fish and wildlife species. Depth sounding and other submerged acoustic devices use a range of frequencies that may be detected by marine organisms. If disturbed, these organisms would generally avoid the construction area. However, tolerance of unnatural disturbance varies among wildlife.

Best management practices shall be required in the contract documents of the construction contractor to control noise and minimize temporary impacts.

4.1.6 Water Resources

Neither Lovers Key, Bonita Beach, or the Borrow Areas provide water resources. The former because the groundwater beneath the Islands is salty; the latter because they are submerged in the Gulf of Mexico. Thus, there will not be any impacts to water resources from any of the alternatives.

4.1.7 Climate

Neither the No-action Alternative nor the Nourishment Alternative would impact the local climate within the ROI.

4.2 BIO-PHYSICAL ENVIRONMENT

4.2.1 Vegetation

4.2.1.1 No-action Alternative – Beach Fills

With this alternative, continued erosion and overwash of sand from the beach berm into the backbay are expected to occur resulting in losses to vegetative resources. The No-action Alternative would have no direct causal effect on wetlands or SAV resources. However, it can be expected that, due to natural causes such as climate change and sea level rise, erosion would continue to occur, and shoreline and back bay habitats will therefore be eroded away. It also can be expected that as a result of sea level rise, deeper, warmer waters and increased acidification of tidal waters due to increased absorption of carbon dioxide, SAV beds will be impacted.

4.2.1.2 No-action Alternative – Borrow Areas

There are no SAV resources within or adjacent to the Borrow Areas thus, this alternative will have no impact.

4.2.1.3 Nourishment Alternative – Beach Fills

There are no wetland or SAV resources within or adjacent to the Beach Fills. Project construction will result in conditions significantly more conducive to healthy barrier island vegetative communities noting the devastation Hurricane Ian caused to the existing dunes and vegetation. Dune habitats destroyed by recent hurricanes shall be restored through sand placement and new plantings.

4.2.1.4 Nourishment Alternative – Borrow Areas

There are no SAV resources within or adjacent to the Borrow Areas thus, this alternative will have no impact.

4.2.2 Benthics

4.2.2.1 No-action Alternative – Beach Fills

The No-action Alternative would have no immediate impact on benthic resources. Eventual erosion of the beaches and their associated loss of back bay wetland habitats would reduce and ultimately eliminate the ecological benefits provided to the estuarine faunal community. The loss of the barrier shoreline and estuarine habitats would lead to the conversion of primarily estuarine-dependent benthic species assemblages to more marine-dominated and open water benthic species assemblages.

4.2.2.2 No-action Alternative – Borrow Areas

The No-action Alternative will have no impact on benthic resources in the Borrow Areas.

4.2.2.3 Nourishment Alternative – Beach Fills

Placement of beach fill buries benthic organisms in the nearshore marine environment as the beach is widened. Effects of burial are dependent on the sediment type, depth of sediment, and size and behavior of benthic organisms. Direct burial results in mortality to sessile or attached animals, while some motile species can survive by moving either horizontally outside the placement area, or vertically to the surface of the placement fill (NRC, 1995; Blake et al., 1996). Fill placement can also result in increases in sedimentation and turbidity which can cause impacts to benthic resources. In some cases, increased turbidity may cause sublethal impacts to sessile invertebrates that may include withdrawal into crevices or body cavities, and possibly termination of feeding. Similarly, motile invertebrates such as small crabs and shrimp may retreat into crevices, which would functionally prohibit them from seeking food (CSA International, 2009).

A review of studies revealed that invertebrate recovery following placement of dredged material in relatively stable, unstressed marine environments generally takes between one and four years, while recovery in more naturally stressed areas is faster, often achieved within nine months (Bolam and Rees, 2003). Most studies that did find impacts to nearshore infaunal communities generally found only limited or short-term alterations in the abundance, diversity, and species composition (NRC, 1995). The quality of the dredged material in the offshore Borrow Area is similar to that of the beaches in the Project Area, and therefore, similar to the subtidal marine environment. The

similarity of the dredged sediment to the native sediment will aid in the recovery of the benthic communities impacted by the placement of the fill material.

Temporary effects of the placement of material on the beach include some loss of beach organisms by burial. However, liquefaction of indigenous sediments often occurs during deposition, which could allow for motile benthic species to escape burial. In general, the beach benthic community would repopulate relatively quickly. Several environmental studies of beach nourishment indicate that there are no detrimental long-term changes in the beach fauna as a result of beach nourishment (Burlas et al., 2001).

4.2.2.4 Nourishment Alternative – Borrow Areas

Removal of sediment from borrow areas has a direct biological impact by removing benthic communities found within and on the surficial sediments (Greene, 2002; Diaz et al., 2004). A reduction of biomass resulting from sediment removal could have an indirect effect on the distribution of certain demersal fishes and other epibenthic predators by interrupting established energy pathways to the higher trophic levels represented by these foraging taxa. The benthic community is critical to the health of higher trophic levels and serves as an important indicator of the effects of dredging (Gulland, 1970). However, impacts to benthic fauna and the resulting indirect impacts to fishes which prey on these species will likely be temporary. Studies have shown that though recovery rates are variable, the abundance and diversity of benthic fauna within the borrow areas frequently returns to pre-nourishment levels relatively quickly, often within one year post-dredging (NRC, 1995; Greene, 2002). Most studies indicate that dredging had only temporary effects on the benthic communities, and in some studies, differences in communities were attributed to seasonal variability or to hurricanes rather than to dredging (Posey and Alphin, 2000).

4.2.3 Fisheries

4.2.3.1 No-action Alternative – Beach Fills

The No-action Alternative would have no immediate impact on fisheries and fish species. Eventual erosion of the beaches and their associated loss of back bay wetland habitats would reduce and ultimately eliminate the ecological benefits provided to the estuarine faunal community. The loss of the barrier shoreline and estuarine habitats would lead to the conversion of primarily estuarine-dependent species to more marine-dominated and open water species.

4.2.3.2 No-action Alternative – Borrow Areas

The No-action Alternative will have no impact on fisheries at the Borrow Areas.

4.2.3.3 Nourishment Alternative – Beach Fills

Between beach nourishment and dune creation, the turbidity plumes will temporarily displace both fishes and their motile prey organisms. The beach fill template will result in burial of benthic prey for fishes that forage in the sandy intertidal and subtidal zones. Those prey organisms will recolonize the area timely thus impacts will be temporary.

4.2.3.4 Nourishment Alternative – Borrow Areas

Mining of sand from the Borrow Areas will affect their topography but should not have a negative effect on pelagic commercial fishing, such as purse-seining. Commercial trawling may prove unproductive until the Borrow Areas attain an equilibrium shape and their infauna is reestablished. Considering the modest area disturbed, this should not interfere with overall utilization of the Gulf bottom.

4.2.4 Upland Wildlife Resources

4.2.4.1 No-action Alternative – Beach Fills

The No-action Alternative would have no direct impact to upland species. The loss of beach habitat due to ongoing erosion will eliminate foraging and shelter habitats of upland species.

4.2.4.2 No-action Alternative – Borrow Areas

The No-action Alternative will have no impact on upland species at the Borrow Areas.

4.2.4.3 Nourishment Alternatives – Beach Fills

Nourishing the beaches with compatible sand will restore approximately 83 acres of sandy beach and dune which will protect interior wetlands and maintain ecologically important breeding and nesting habitats for upland species. The restored beach and dune systems would provide a beneficial effect on wildlife and their habitats. Restoring the dunes will also increase the buffer distance between the shoreline and urban environment, which could potentially reduce light pollution to the natural beach environment.

4.2.4.4 Nourishment Alternative – Borrow Areas

The Nourishment Alternatives will have no impact to upland species at the Borrow Areas.

4.2.5 Avian Communities

4.2.5.1 No-action Alternative – Beach Fills

The No-action Alternative would have no direct impact to avian species. The loss of beach habitat due to ongoing erosion will eliminate foraging and loafing habitats which will impact various avian species in the future.

4.2.5.2 No-action Alternative – Borrow Areas

The No-action Alternative will not have a direct impact on avian species at the Borrow Areas.

4.2.5.3 Nourishment Alternative – Beach Fills

Nourishing the beaches with compatible sand will restore approximately 83 acres of sandy beach and dune which will protect interior wetlands and maintain ecologically important breeding and nesting habitats for avian species. The restored beach and dune systems would provide a beneficial effect on wildlife and their habitats.

As observed on similar dredging projects, an increase in avian presence by certain species could be expected during the discharge of the slurry. After completion, as the vegetation efforts take root and their infauna assemblages are reestablished, the avifauna will gradually become reestablished, and its population numbers will increase because of the increase in available habitat. Recovery of the forage base of beach, intertidal, and subtidal invertebrates that support many of the avian species is anticipated to occur timely thus impacts will be temporary.

4.2.5.4 Nourishment Alternative – Borrow Areas

The Nourishment Alternative will have no impact on avian species at the Borrow Areas.

4.3 ESSENTIAL FISH HABITAT

4.3.1 No-action Alternative – Beach Fills

The quality of EFH is expected to continue decreasing as the island erodes and back bay habitats are converted to open water habitat.

4.3.2 No-action Alternative – Borrow Areas

The No-action Alternative will have no impact on EFH in the Borrow Areas.

4.3.3 Nourishment Alternative – Beach Fills

Beach fill construction would result in temporary impacts to EFH because of the turbidity from fill placement and burial of nearshore habitat. Slow moving fish and benthic prey may be entrapped and smothered in the intertidal areas during sediment deposition. These impacts, however, are anticipated to be temporary and minor, and would be limited to the immediate vicinity for the duration of construction.

4.3.4 Nourishment Alternative – Borrow Areas

Dredging would impact up to 330 acres of sandy Gulf bottom surface area within the offshore Borrow Area. This area is utilized by various life stages of penaeid shrimp complex, red drum, reef fish (e.g. snapper/grouper complex), stone crab, spiny lobster, and migratory/pelagic fish. Dredging will temporarily increase noise and turbidity, remove benthic infauna and has the potential of entrainment of biota in the borrow area. Fill placement will also cause a temporary increase in noise and turbidity and burial of benthic infauna. Impacts to benthic fauna/infauna from dredging and fill placement are discussed further in Section 4.2.2. Operational areas were surveyed and selected to avoid marine habitat. The offloading, or pump-out, operation produces negligible turbidity, since the sand is kept within the scow barges, hopper and pipeline. Turbidity will be monitored per the FDEP permit conditions. The proposed action is not expected to have a substantial adverse impact on EFH or federally managed fisheries in the Gulf of Mexico.

Effects to benthic resources and consequentially to managed species or managed species prey sources are also expected to be short-term. The offshore Borrow Area is located on a sand ridge within the Captiva sand ridge field which is a vast complex of well-developed sand ridges that contain potentially beach compatible material. The ridges vary in size and have average surface area of approximately 890 acres per ridge (BOEM, 2017). The proposed action is anticipated to impact the surface sediments of approximately 330 acres, which is approximately 35% of the available sand volume within the offshore Borrow Area, and equal to a small fraction of the total surface area of the entire Captiva ridge field. While the entire field has not been delineated, review of nautical charts depicts numerous ridges thus the surface area impact to the entire ridge field is minor. With the availability of adjacent undisturbed areas and temporary effects within the ROI, indirect effects to managed species regarding prey loss and disturbance are expected to be short-lived and minimal. Adverse effects to managed species from the relatively small, affected area are not anticipated.

4.4 THREATENED AND ENDANGERED SPECIES

4.4.1 West Indian Manatee

4.4.1.1 No-action Alternative

The No-action Alternative will have no impact on the West Indian manatee.

4.4.1.2 Nourishment Alternative

Manatees may avoid the Project Area during construction due to increased disturbances in the nearshore zone, elevated turbidity during discharges at the Beach Fills, and noise. There is always the potential of a strike by watercraft as vessels transit between the Borrow Areas and pump-out areas, as well as back and forth to floating stages areas or port. Dredge vessels operate at slower speeds, reducing the risk of interaction. It is generally thought that hopper dredges move slow enough to minimize the risk of a strike with a manatee. Best management practices shall be required in the contract documents of the construction contractor including but not limited to the USACE Standard Manatee Conditions for In-Water Work and the reasonable and prudent measures, as well as the terms and conditions, of the State Programmatic Biological Opinion (SPBO) (USFWS, 2015) to protect manatees during construction.

4.4.2 Marine Turtles

4.4.2.1 General

This section covers all five T&E marine turtles including the green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricate*), Kemp's ridley (*Lepidochelys kempii*), and Loggerhead (*Caretta caretta*) sea turtles.

4.4.2.1.1 No-action Alternative – Beach Fills

The No-action Alternative would have no direct impact to marine turtles. The loss of beach habitat due to ongoing erosion will eliminate nesting habitats which will impact marine turtles. The quality of essential nesting habitat is expected to continue decreasing as the island erodes and back bay habitats are converted to open water habitat. This loss of nesting habitat poses a threat to marine turtles in the future.

4.4.2.1.2 No-action Alternative – Borrow Areas

The No-action Alternative will have no impact on sea turtles at the Borrow Areas.

4.4.2.1.3 Nourishment Alternative – Beach Fills

Sea turtle nesting season in Lee County is defined as May 1 through October 31. Direct impacts may result from construction including use of artificial lighting, increased noise, and temporary alterations of beach topography. Threats to adult nesting female sea turtles and hatchlings due to nourishing the beaches include loss of nesting habitat, missed nests, and a temporary reduction in nesting activity post-sand placement activities. Construction during nesting season will involve greater potential for the direct mechanical destruction or burial of nests, and increased false crawls due to adult turtles encountering equipment or pipes on the beach during nesting activities. These effects would be mitigated over time by the increased quantity and quality of essential nesting habitat created and sustained by the Project. Nesting sea turtles approaching the beach and hatchlings leaving the beach may be affected by construction activities including exhibiting avoidance behaviors which could disrupt their normal activities. Best management practices shall be required in the contract documents of the construction contractor including but not limited to the USFWS Reasonable and Prudent Measures and Terms and Conditions, SPBO (USFWS, 2015) to protect nesting marine turtles during construction.

Nourishing the critically eroding beaches, especially in the wake of Hurricane Ian, will be beneficial in restoring and sustaining marine turtle nesting habitats.

4.4.2.1.4 Nourishment Alternative – Borrow Areas

Dredging operations may pose a threat to swimming sea turtles. Because sea turtles are strong swimmers, it is believed that they actively avoid hydraulic dredges. Stranding data suggests that cold-stunned turtles may be taken by cutterhead dredges while they are lethargic or dying; however, these occurrences are rare. Hopper dredging occasionally results in sea turtle entrainment and death. Swimming sea turtles may also experience temporary impacts from increased turbidity. Water column turbidity impacts on marine life from dredging operations in sandy substrates are temporary and localized to the dredge and disposal sites, thus impacts are minimal. Noise impacts to swimming sea turtles will be localized and temporary in nature. Best management practices shall be required in the contract documents of the construction contractor including but not limited to the NMFS Protected Species Construction Conditions (NMFS, 2021) and NMFS Gulf of Mexico Regional Biological Opinion (NMFS, 2003, 2005 and 2007) to protect swimming sea turtles during construction.

4.4.2.2 Green Sea Turtle (NA and SA DPSs)

The North Atlantic (NA) and South Atlantic (SA) distinct population segments (DPSs) of green sea turtles were listed in April 2016 thus they are being discussed separately in this section.

4.4.2.2.1 Physical Effects

For the No-action and Nourishment Alternatives, the physical effects to the green sea turtle NA and SA DPS are the same as the physical effects described in Section 4.4.2.1.

4.4.2.2.2 Habitat Effects

Sand removed from the Borrow Areas will also remove existing benthic resources. The proposed nourishment cycle is eight (8) to ten (10) years. The time frame between events will allow for natural recolonization of benthic resources. The borrow area contains over 7 MCY. The proposed sand needs equate to 2.45 MCY or less than 35% of the available quantity. The proposed action will not have an adverse effect on the habitat in the Borrow Areas.

4.4.2.2.3 Noise Effects

The vessels will be traveling slowly while working. It is highly unlikely that vessels associated with the proposed action will result in any noise effect while working or while transiting.

4.4.2.3 Loggerhead Sea Turtle (NWA DPS) DCH

DCH for the Loggerhead sea turtle (NWA) Northwest Atlantic DPS was listed July 2014 thus it is being discussed separately in this section.

Within the ROI, DCH for the Loggerhead sea turtle (NWA DPS) is located in the nearshore zone along Bonita Beach. Placement of beach-quality sand on Bonita Beach will sporadically disturb the nearshore zone during the life of the Project. Beach-quality sand is ubiquitous through the nearshore zone and the Borrow Area's sediments are homogenous with the sediments that will remain. Therefore, no alteration of sediment composition will occur. Further, the placement of sand of similar quality from the Borrow Areas to nourish the beach is not likely to change the overall benthic communities. However, temporary adverse effects are likely before the areas are recolonized. Temporary effects of the placement of sediment within the nearshore zone include some loss of organisms by burial and by increased turbidity effects. However, liquefaction of indigenous sediments often occurs during deposition, which could allow for motile benthic species to escape burial. In general, the benthic communities will repopulate relatively quickly. There are no SAV or hardbottom habitats within or adjacent to Bonita Beach. The Project is not likely to adversely affect the DCH.

4.4.3 Fish Communities

4.4.3.1 General

4.4.3.1.1 No-action Alternative

The No-action Alternative will have no impact on fish communities at the Beach Fills or the Borrow Areas.

4.4.3.1.2 Nourishment Alternative

Nourishing the beaches would result in temporary loss of prey and foraging habitat around the Project Area because of the turbidity from fill placement and burial of nearshore habitat. Slow moving fish and benthic prey may be entrapped and smothered in the intertidal areas during sediment deposition. Slow moving fish and benthic prey may also be impacted during dredging within the borrow areas. These impacts are anticipated to be minor and would be localized to the immediate vicinity of the dredge and discharge sites for the duration of construction.

4.4.3.2 Smalltooth Sawfish

4.4.3.2.1 No-action Alternative

The No-action Alternative will have no impact on smalltooth sawfish at the Beach Fills or the Borrow Areas.

4.4.3.2.2 Nourishment Alternative

The ROI lies between the Charlotte Harbor Estuary DCH Unit and the Ten Thousand Islands/Everglades DCH Unit. Smalltooth sawfish would have the potential to occur in the back bay habitats adjacent to the ROI that they could use for breeding, nursery, and foraging. Adult and juvenile smalltooth sawfish have the potential to occur in the nearshore zone along the Beach Fills. Adult smalltooth sawfish live in deeper waters and have the potential to occur within the Borrow Areas. The ROI is located outside of the DCH and therefore, there would be no impact. Best management practices shall be required in the contract documents of the construction contractor including but not limited to the NMFS Protected Species Construction Conditions (NMFS, 2021) to protect smalltooth sawfish during construction. Overall impacts to smalltooth sawfish from the proposed action would be temporary and minor.

4.4.3.3 Giant Manta Ray

The giant manta ray was listed in January 2018 thus they are being discussed separately in this section.

4.4.3.3.1 Physical Effects

The potential effects on giant manta rays from the proposed action include injury from potential interactions with a cutterhead or hopper dredge vessel while dredging or in transit; a relocation trawler while trawling or in transit; or with tugs, scow barges, and other support vessels while in transit, as well as temporary avoidance of the action area during offshore operations including dredging and relocation trawling. Vessel collisions with giant manta rays are highly unlikely due to the slow speed of the dredge (e.g., 3.5 kt or less while dredging); relocation trawlers; and tugs, scow barges, and other support vessels; the avoidance behavior of giant manta rays to slow moving vessels; and the presence of NMFS-approved Protected Species Observers (PSOs) required to be on board the dredge and relocation trawler to watch for ESA-listed species and handle any that are captured during trawling. Further, giant manta rays are a pelagic species and would not be on the Gulf bottom and therefore highly unlikely to have an encounter with a cutterhead or hopper dredge while dredging. Trawling shall be conducted a minimum of twelve hours per day, daily throughout construction when hopper dredging is taking place unless environmental conditions are unsafe for the trawler to operate. Giant manta rays captured pursuant to trawling shall be handled by PSOs in a manner designed to ensure their safety and viability and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position. Lastly, giant manta rays are not present in abundance in the ROI and therefore highly unlikely to have an encounter with a trawler while trawling.

4.4.3.3.2 Habitat Effects

Giant manta rays may be affected by being temporarily unable to access the Project Area for foraging, due to their avoidance of the proposed action. It is possible that disturbance of sea floor sediment could indirectly affect foraging animals. These indirect effects to benthic invertebrates are expected to be “insignificant” considering the short-term impact and recoverable nature of these resources, giant manta rays feed on planktonic organisms in the water column, and giant mantas are not direct benthic foragers. The temporary and indirect effects will be insignificant as this is an open-water area with similar surrounding habitat.

4.4.3.3.3 Noise Effects

Giant manta rays are a mobile species, and the vessels will be traveling slowly while working thus they will be able to move out of the way or avoid the slow-moving equipment. It is highly unlikely

that vessels associated with the proposed action will result in any noise effect to giant manta rays while working or while transiting.

4.4.4 Piping Plovers and Red Knots

4.4.4.1 No-action Alternative – Beach Fills

The No-action Alternative will have no direct impact on piping plovers (*Charadrius melodus*) and red knots (*Calidris canutus*). The loss of beach and dune habitats due to ongoing erosion will eliminate foraging and loafing habitats thus impacting these wintering birds in the future.

4.4.4.2 No-action Alternative – Borrow Areas

The No-action Alternative will have no impact on piping plovers (*Charadrius melodus*) and red knots (*Calidris canutus*) at the Borrow Areas.

4.4.4.3 Nourishment Alternative – Beach Fills

Potential effects to piping plovers and red knots from the proposed action include increased disturbances from humans and equipment to the birds' visual and auditory senses during construction, disruption to roosting and foraging from construction activities, causing birds to expend energy resources to seek habitats on adjacent beaches, and decreased foraging capability due to depletion of food sources in the nearshore zones during dredging and filling activities. Best management practices shall be required in the contract documents of the construction contractor to implement a shorebird protection plan and minimize disturbance during construction including but not limited to the USFWS Reasonable and Prudent Measures and Terms and Conditions, Programmatic Piping Plover Biological Opinion (USFWS, 2013). The County will have experienced monitors conduct surveys and establish corridors following State and Federal permit conditions.

The red knot and piping plover habitats within the ROI are specific for foraging, resting, and overwintering. These habitats are vulnerable to the effects of increasing sea levels, higher tidal surges, increased coastal and inland flooding and saltwater intrusion. Without the proposed action, these effects will decrease, fragment, and/or degrade foraging habitats. Further, Hurricane Ian struck the Southwest Florida coastline in September 2022 and devastated these habitats.

Threats to these habitats from the proposed action include modification to the existing beaches within the ROI. The applicant has demonstrated the proposed Action will utilize beach compatible sand to nourish the beaches within the ROI, thus increasing foraging and resting habitats and

making the habitats more resilient in the face of the coastal and geomorphic processes listed above. Thus the proposed action will be a net benefit to red knot and piping plover habitats.

4.4.4.4 Nourishment Alternative – Borrow Areas

The Nourishment Alternative will have no impact on piping plovers and red knots at the Borrow Areas.

4.4.5 Aboriginal Prickly Apple

4.4.5.1 No-Action Alternative – Beach Fills

The No-action Alternative will have no impact on the Aboriginal prickly at the Beach Fills. The increasing loss of beach and dune habitats due to ongoing post-storm erosion will eliminate additional suitable coastal habitat thus further threatening this species' continued survival.

4.4.5.2 No-Action Alternative – Borrow Areas

The No-action Alternative will have no impact on the Aboriginal prickly apple at the Borrow Areas.

4.4.5.3 Nourishment Alternative – Beach Fills

The Nourishment Alternative will have a long-term positive impact on the Aboriginal prickly apple. Nourishing the beach and dune system will recreate and sustain the habitat to support the Aboriginal prickly apple.

4.4.5.4 Nourishment Alternative – Borrow Areas

The Nourishment Alternative will have no impact on the Aboriginal prickly apple at the Borrow Areas.

4.5 CULTURAL RESOURCES

4.5.1 No-Action Alternative

The No-action Alternative will have no direct impact on cultural resources located adjacent to the Beach Fills. As the beach erodes and loss of habitat occurs, the existing cultural resources may become exposed and impacted by coastal processes and forcing functions. The Borrow Areas do not include any known cultural resources.

4.5.2 Nourishment Alternative

The Lovers Key Beach Fill has been designed with buffers from the adjacent cultural resource sites and will have no direct impact. As sand is transported alongshore, the sediment will continue to aid in keeping the resources buried. The Borrow Areas do not include any known cultural resources. There are no impacts to cultural resources from the proposed action.

Disturbance of the seafloor during construction activities has the potential to encounter and cause significant, long-term, and adverse effects to unidentified submerged cultural resources. Although remote sensing surveys conducted in accordance with current professional standards for cultural resource identification are expected to be highly effective in enabling recognizing submerged cultural resources, the possibility of encountering an unidentified and unanticipated submerged cultural resource always is present during dredging and construction activities. As a result, implementation of an Unanticipated Discovery Plan (RCG, 2022) shall be implemented during construction.

4.6 Socioeconomic and Human Resources

4.6.1 No-action Alternative

The No-action Alternative will have no direct impact on socioeconomic and human resources. The continued erosion of the beaches will eventually render them unusable for recreation and/or tourism, resulting in future socioeconomic impacts to the surrounding communities.

4.6.2 Nourishment Alternative

Nourishing the beaches will have a direct positive long-term impact on socioeconomic and human resources. The primary goal of Lee County's beach management program is to preserve and enhance beaches and shorelines while promoting tourism that provides direct benefits to visitors and residents alike. The County's beach nourishment projects have successfully promoted tourism. For example, the visitor count at Lovers Key increased more than 138% in the first year after the completion of the Lovers Key project. Since then, the numbers have reflected an amazing increase with almost a million visitors each year, making it one of the most popular state parks in Florida. Lovers Key State Park had a direct impact on the local economy of more than $130 million dollars in 2021 (Lee County Visitor and Convention Bureau, 2022).

Nourishing the beaches and mining sand from the Borrow Areas would temporarily disrupt recreational fishing while construction is underway and for a period after construction ceased. Fishing in the exact locations of the Borrow Areas may prove unproductive until the Borrow Areas

attain an equilibrium shape and their infauna is reestablished, but the large adjacent undisturbed areas within the Project Area will be available.

4.7 HAZARDOUS, TOXIC AND RADIOACTIVE WASTE IMPACTS

4.7.1 No-action Alternative

The No-action Alternative would have no impacts on the Beach Fills or Borrow Areas with respect to HTRW.

4.7.2 Nourishment Alternative

There are no known HTRW sites at the Beach Fills and Borrow Areas. Potential HTRW exposure would be managed to reduce risk and not impact the Beach Fills and Borrow Areas. During construction, accidental spills and releases of hazardous or toxic wastes are possible. Best management practices shall be required in the contract documents of the construction contractor to prevent oil, fuel, or other hazardous substances from entering the air or water; and, for the construction contractor to have a spill contingency plan for hazardous, toxic, or petroleum products in place, to be implemented in the unlikely event of an occurrence.

4.8 SUMMARY OF ENVIRONMENTAL IMPACTS

Table 4-1 summarizes the impacts from the proposed action for the No-action and Nourishment Alternatives. By comparing the two alternatives, the Nourishment Alternative has more long-term beneficial impacts and thus is recommended for implementation. If there are short-term negative impacts with long term positive impacts specific to the parameters, the long-term positive impact is listed in the table.

Table 4-2. Summary of No-action and Nourishment Alternatives on Affected Environment

Affected Environment	No-action Alternative		Nourishment Alternative	
	BA	BF	BA	BF
4.1.1 Oceanographic and Coastal Processes				
4.1.2 Geology and Soils				
4.1.3 Air Quality				
4.1.4 Water Quality				
4.1.5 Noise				
4.1.6 Water Resources				
4.1.7 Climate				
4.2.1 Vegetation				
4.2.2 Benthics				
4.2.3 Fisheries				
4.2.4 Upland Wildlife Resources				
4.2.5 Avian Communities				
4.3 EFH				
4.4 T&E Species				
4.5 Cultural Resources				
4.6 Socioeconomic and Human Resources				
4.7 HTRW				

BA = Borrow Area

BF – Beach Fills

Clear boxes = No Impact

Red boxes = Long-term Adverse Impacts

Yellow boxes = Short-term Adverse Impacts

Green boxes = Long-term Beneficial Impacts.

4.9 CUMULATIVE IMPACTS

4.9.1 No-action Alternative – Beach Fills

Without the protective buffer provided by barrier islands, back bay habitats would be at increased risk of severe damage from storm events. The No-action Alternative will result in cumulative adverse impacts including the loss of pelagic and benthic estuarine productivity, habitat for migratory birds, and habitat for T&E Species.

4.9.2 No-action Alternative – Borrow Areas

The No-Action Alternative will have no cumulative impacts on the Borrow Areas.

4.9.3 Nourishment Alternative – Beach Fills

Implementing the proposed action will enhance the geologic form and function of Lovers Key and Bonita Beach. The cumulative benefit will be seen as the islands retain their form and ecological benefits including pelagic and benthic estuarine productivity, habitat for migratory birds, habitat for T&E Species, and protection of adjacent back bay habitats into the future. The proposed action will bolster the barrier shoreline's ability to resist beach erosion, storm surge overwash, and breach formation. As neighboring islands are similarly restored, the synergy should be a cumulative benefit to the entire Lee County barrier island system.

4.9.4 Nourishment Alternative – Borrow Areas

The Town of Ft. Myers Beach (Town) has applied for a Department of the Army permit pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act to restore and nourish the beaches of Estero Island to address both background and storm related erosion. Estero Island is located adjacent to Lovers Key. The Town is also proposing to use the offshore Borrow Area for their next nourishment event scheduled for late 2023-early 2024. The volume proposed for their event is 1.11 MCY. The total volume proposed for their projects over the 15-year period including subsequent nourishment equals 1.81 MCY. Assuming a 20% cut to fill ratio, the required Borrow Area volume equates to 2.18 MCY which is approximately 31% of the total available volume. To accommodate future needs greater than the estimate, for example, to address additional severe storms or needs outside of the anticipated nourishment cycles, a maximum volume for the Town's projects of 2.70 MCY is included in the assessment. Combined, the County's and Town's required sand needs for the offshore Borrow Area total approximately 5.70 MCY equal to approximately 81% of the total available volume in the offshore Borrow Area. As the offshore Borrow Area is part of a significant submerged shoal complex in the Captiva ridge field, the cumulative impacts of the Town's and County's proposed actions are minor.

5.0 PERMITS AND AUTHORIZATIONS

5.1 REQUIRED PERMITS AND AUTHORIZATIONS

The following is a list of permits and authorizations that are required to implement the Project:

- FDEP Permit #0311811-001-JC (expires June 24, 2028)
- FDEP Permit Modification #0311811-004-JM (expires June 24, 2028)
- FDEP Permit Modification #0311811-005-JN: Pending
- USACE Permit #SAJ-2012-00198(IP-MJD) (expires Sept 3, 2028)
- USACE Permit Modification #SAJ-2012-00198(SP-SJF): Pending
- USFWS Biological Opinion: Pending
- NMFS Biological Opinion: Pending
- BOEM OCS Noncompetitive Negotiated Agreement (Lease): Issued prior to dredging

5.2 OUTSTANDING PERMITS

The BOEM reviewed and approved a joint public notice (PN), NMFS consultation, and USFWS consultation in order to consolidate and align Federal processes.

The USACE issued the PN. The USACE initiated consultation with USFWS and requested an expedited review. The USFWS consultation is in process.

The FDEP issued a minor modification to their permit to authorize the one-time sand placement on South Bonita Beach.

The USACE and BOEM requested an expedited formal stacked consultation under Section 7 of the Endangered Species Act with NMFS. The NMFS consultation was concluded and the NMFS issued their Biological Opinion.

5.3 ENVIRONMENTAL PROTECTION PLAN

The County commits to avoiding and minimizing adverse effects during construction activities. The County will comply with the FDEP and USACE Permit Requirements and the special terms and conditions of the USFWS and NMFS Biological Opinions and BOEM OCS Lease. The permits and authorizations will be appended to this document upon issuance.

6.0 LIST OF PREPARERS

Name	*Organization*	*Role in Preparation*
Jennifer Steele	BOEM	Document Preparation
Brian Cameron	BOEM	Document Preparation
Jessica Mallindine	BOEM	Document Preparation
Michael Poff	CEC	Document Preparation
Steve Dartez	CEC	Document Preparation
Ken Gaines	CEC	Document Preparation

7.0 REFERENCES

Applin, P.L. and Applin, E.R. 1965. The Comanche Series and Associated Rocks in the Subsurface in Central and South Florida: U.S. Geological Survey, Prof. Paper No. 447 pp.

Brooks, G.R., Doyle, L J., Suthard, B. C., Locker, S. D., and Hine, A. C. 2003. Patterns and Controls of Surface Sediment Distribution: West-Central Florida Inner-shelf, in A Linked Coastal/Inner Shelf Depositional System: West-Central Florida, edited by G. R. Brooks, Marine Geology Special Publication, Elsevier, Amsterdam.

Blake, N.J., L.J. Doyle and J.J. Culter. 1996. Impacts and Direct Effects of Sand Dredging for Beach Renourishment on the Benthic Organisms and Geology of the West Florida Shelf, Final Report. Herndon, VA: U.S. Department of the Interior, Minerals Management Service, Office of International Activities and Marine Minerals, OCS Report MMS 95-0005.

Bolam, S.G. and H.L.Rees. 2003. Minimizing impacts of maintenance dredged material disposal in the coastal environment: a habitat approach. Environmental Management 32(2):171-188.

Brooks, G.R., Doyle, L J., Suthard, B. C., Locker, S. D., and Hine, A. C. 2003. Patterns and Controls of Surface Sediment Distribution: West-Central Florida Inner-shelf, in A Linked Coastal/Inner Shelf Depositional System: West-Central Florida, edited by G. R. Brooks, Marine Geology Special Publication, Elsevier, Amsterdam.

Bureau of Ocean Energy Management (BOEM). 2005. Minerals Management Service Management Service Environmental Assessment. Issuance of a Noncompetitive Lease for Collier County Beach Renourishment Borrow Area (Borrow Area T1) Collier County Beach Renourishment Project Collier County, Florida.

Bureau of Ocean Energy Management (BOEM). 2013. User's Manual for Dredging Projects Emission Calculator. OCS Report BOEM 2013-1128. Prepared under BOEM Contract M10PC00088 By ENVIRON International Corporation.

Bureau of Ocean Energy Management (BOEM). 2017. Issuance of a Negotiated Agreement for Use of Outer Continental Shelf Sand from Borrow Area T1 in the Collier County Beach Renourishment Project, Final Environmental Assessment.

Burlas, M., D.G. Clarke, G.L. Ray, and D.H. Wilber. 2002. Biological monitoring of beach nourishment operations in northern New Jersey, USA: Linkages between benthic infauna and higher trophic levels. Dredging '02: Key Technologies for Global Prosperity. Proceedings of 3rd

Specialty Conference on Dredging and Dredged Material, May 5-8, 2002, Orlando, FL. American Society of Civil Engineers.

Center for Biological Diversity (CBD). 2023. Natural history for Aboriginal Prickly Apple Cactus. https://www.biologicaldiversity.org/species/plants/Florida_plants/natural_history_aboriginal_prickly_apple.html.

Chafin, L. G. 2000. Field Guide to the Rare Plants of Florida. Florida Natural Areas Inventory, Tallahassee, Florida.

Coastal Engineering Consultants, Inc. (CEC). 2021a. Bonita Beach Nourishment Project Performance Evaluation.

Coastal Engineering Consultants, Inc. (CEC). 2021b. Lee County Lovers Key Beach Nourishment Project Joint Coastal Permit Application Submittal.

Coastal Engineering Consultants, Inc. (CEC). 2022. Lee County Lovers Key Beach Nourishment Project Offshore Borrow Area Final Design Report.

Coastal Technology Corporation (CTC). 2012. Bonita Beach and Lovers Key Combined Beach Project Sand Search Investigation", Final Geotechnical Report.

CSA International, Inc. 2009. Ecological functions of nearshore hardbottom habitat in east Florida: A literature synthesis. Prepared for the Florida Department of Environmental Protection Bureau of Beaches and Coastal Systems, Tallahassee, FL.

Davis, R.A. 1997. Geology of the Florida Coast. In: Randazzo, A.F. and Jones, D.S. (eds.), Geology of Florida. Gainesville: University Press of Florida.

Davis, R.A. and B.J. Kuhn. 1985. Origin and development of Anclote Key, west-peninsular Florida. Marine Geology 63:153-171.

Diaz, R.J., G.R. Cutter, Jr., and C.H. Hobbs, III. 2004. Potential impacts of sand mining offshore of Maryland and Delaware: Part 2—biological considerations. Journal of Coastal Research 20(1):61–69.

Edwards, J.H., Harrison, S.E., Locker, S.D., Hine, A.C., and Twichell, D. 2003. Stratigraphic Framework of Sediment-starved Sand Ridges on a Mixed Siliciclastic/Carbonate: West-Central Florida, in A Linked Coastal/Inner Shelf Depositional System: West-Central Florida, edited by G.R. Brooks, Marine Geology Special Publication, Elsevier, Amsterdam.

Florida Department of Environmental Protection (FDEP). 2013. Bonita Beach and Lovers Key Beach Nourishment: Consolidated Notice of Intent to Issue, Joint Coastal Permit, Variance and Authorization to Use Sovereign Submerged Lands.

Florida Department of Environmental Protection (FDEP). 2015. New Pass Navigational Dredging and Beach Disposal: Consolidated Joint Coastal Permit and Authorization to Use Sovereign Submerged Lands.

Florida Department of Environmental Protection (FDEP). 2023. Hazardous Waste Program Map. https://geodata.dep.state.fl.us/maps/FDEP::hazardous-waste-program-map/about

Florida Fish and Wildlife Commission (FWC). 2019a. American crocodile (*Crocodylus acutus*). Retrieved from: https://myfwc.com/wildlifehabitats/wildlife/american-crocodile/

Florida Fish and Wildlife Commission (FWC). 2019b. Green Sea Turtle (*Caretta caretta*). Retrieved from: https://myfwc.com/wildlifehabitats/profiles/reptiles/sea-turtles/green-sea-turtle/

Florida Fish and Wildlife Commission (FWC). 2019c. Hawksbill Sea Turtle (*Eretmochelys imbricate*). Retrieved from: https://myfwc.com/wildlifehabitats/profiles/reptiles/sea-turtles/hawksbill/

Florida Fish and Wildlife Commission (FWC). 2019d. Leatherback Sea Turtle (*Dermochelys coriacea*). Retrieved from: https://myfwc.com/research/wildlife/sea-turtles/nesting/leatherback/

Greene, K. 2002. Beach Nourishment: A Review of the Biological and Physical Impacts. Atlantic States Marine Fisheries Commission. Washington D.C.

Gulf of Mexico Fishery Management Council (GMFMC). 1998. Generic Amendment for Addressing Essential Fish Habitat Requirements in the following Fishery Management Plans of the Gulf of Mexico: Shrimp Fishery of the Gulf of Mexico, United States Waters, Red Drum Fishery of the Gulf of Mexico, Reef Fish Fishery of the Gulf of Mexico, Coastal Migratory Pelagic Resources (Mackerels) in the Gulf of Mexico and South Atlantic, Stone Crab Fishery of the Gulf of Mexico, Spiny Lobster in the Gulf of Mexico and the South Atlantic, Coral and Coral Reefs of the Gulf of Mexico. Gulf of Mexico Fishery Management Council, National Oceanic and Atmospheric Administration.

Gulf of Mexico Fishery Management Council (GMFMC). 2004. Final Environmental Impact Statement for the Generic Essential Fish Habitat Amendment to the following fishery management plans of the Gulf of Mexico (GOM): Shrimp Fishery of the Gulf of Mexico; Red Drum Fishery of the Gulf of Mexico; Reef Fish Fishery of the Gulf of Mexico; Stone Crab Fishery of the Gulf of

Mexico; Coral and Coral Reef Fishery of the Gulf of Mexico; Spiny Lobster Fishery of the Gulf of Mexico and South Atlantic; Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic. Gulf of Mexico Fishery Management Council. Tampa, FL. March 2004.

Gulf of Mexico Fishery Management Council (GMFMC). 2005. Final Generic Amendment Number 3 For Addressing Essential Fish Habitat Requirements, Habitat Areas of Particular Concern, and Adverse Effects of Fishing in the following Fishery Management Plans of the Gulf of Mexico: Shrimp Fishery of the Gulf of Mexico, United States Waters; Red Drum Fishery of the Gulf of Mexico; Reef Fish Fishery of the Gulf of Mexico; Coastal Migratory Pelagic Resources (Mackerels) in the Gulf of Mexico and South Atlantic; Stone Crab Fishery of the Gulf of Mexico; Spiny Lobster in the Gulf of Mexico and South Atlantic; Coral and Coral Reefs of the Gulf of Mexico. Gulf of Mexico Fishery Management Council. Tampa, FL

Gulland, J.A. 1970. Food chain studies and some problems in world fisheries. In: J.H. Steels, Marine food chains. Oliver and Boyd, Edinburgh, England.

Haig, S.M. 1992. Piping Plover. No. 2. The Birds of North America. In: A. Pools, P. Stettenheim, and F. Gill (eds.), Philadelphia: The Academy of Natural Sciences. The American Ornithologists' Union, Washington, D.C.

Harrison, S.E., Locker, S.D., Hine, A.C., Edwards, J.H., Naar, D.F., Twichell, D.C., and Mallison, D.J. 2003 Seafloor Characteristic and Process-Response Relationships of Sediment Starved Sand Ridges on a Mixed Siliciclastic/Carbonate: West-Central Florida. In A Linked Coastal/Inner Shelf Depositional System: West-Central Florida. Marine Geology Special Publication, Elsevier, Amsterdam, G.R. Brooks (editor).

Lee County Visitor and Convention Bureau. 2022. Website: https://www.visitfortmyers.com/lee-vcb/funding-programs/beach-and-shoreline.

Lee County Division of Natural Resources. 2008. Lovers Key Restoration Second Year Post Construction Monitoring Report.

Marx, Robert 1987. Shipwrecks in the Americas. Dover Publications, New York.

McCourt, Shawn. 2023. Botanical Spotlight: Aboriginal Prickly Apple Cactus – January. Retrieved from: https://selby.org/botanical-spotlight-aboriginal-prickly-apple-cactus/.

Newell, R.C. and L.J. Seiderer. 2003. Ecological Impacts of Marine Aggregate Dredging on Seabed Resources. Prepared for Baird & Associates. October 2003.

National Marine Fisheries Service (NMFS). 2003. Dredging of Gulf of Mexico Navigation Channels and Sand Mining Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts. Consultation Number F/SER/2000/01287. St. Petersburg, Florida. Endangered Species Act – Section 7 Consultation Biological Opinion.

National Marine Fisheries Service (NMFS). 2005. Dredging of Gulf of Mexico Navigation Channels and Sand Mining Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts. Consultation Number F/SER/2000/01287. St. Petersburg, Florida. Endangered Species Act – Section 7 Consultation Biological Opinion-Revision 1.

National Marine Fisheries Service (NMFS). 2007. Dredging of Gulf of Mexico Navigation Channels and Sand Mining Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts. Consultation Number F/SER/2000/01287. St. Petersburg, Florida. Endangered Species Act – Section 7 Consultation Biological Opinion-Revision 2.

National Marine Fisheries Service (NMFS). 2008. Essential Fish Habitat: A Marine Fish Habitat Conservation Mandate for Federal Agencies, Gulf of Mexico Region. National Marine Fisheries Service, National Oceanic and Atmospheric Administration.

National Marine Fisheries Service (NMFS). 2021. Protected Species Construction Conditions, NOAA Fisheries Southeast Regional Office.

National Oceanic and Atmospheric Administration (NOAA). 2022. Smalltooth Sawfish. Retrieved from https://www.fisheries.noaa.gov/species/smalltooth-sawfish

National Oceanic and Atmospheric Administration (NOAA).. 2023a. Essential Fish Habitat Mapper. https://www.habitat.noaa.gov/apps/efhmapper/.

National Oceanic and Atmospheric Administration (NOAA). 2023b. Giant Manta Ray. Retrieved from https://www.fisheries.noaa.gov/species/giant-manta-ray.

National Oceanic and Atmospheric Administration (NOAA). 2023c. Gulf Sturgeon. Retrieved from https://www.fisheries.noaa.gov/species/gulf-sturgeon.

National Oceanic and Atmospheric Administration (NOAA). 2023d. Nassau Grouper. Retrieved from https://www.fisheries.noaa.gov/species/nassau-grouper.

National Oceanic and Atmospheric Administration (NOAA). 2023e. Oceanic Whitetip Shark. Retrieved from https://www.fisheries.noaa.gov/species/ oceanic-whitetip-shark.

National Research Council (NRC). 1995. Beach Nourishment and Protection. National Academy Press, Washington, D.C.

Obrachta, S.P., Duncan, D.S., and Brooks, G.R. 2003. Hardbottom Development and Significance to the Sediment Starved West-Central Florida Inner Continental Shelf, in A Linked Coastal/Inner Shelf Depositional System: West-Central Florida, edited by G. R. Brooks, Marine Geology Special Publication, Elsevier, Amsterdam.

Ocean Surveys, Inc. (OSI). 2021. Lee County Lovers Key Beach Nourishment Project: Detailed Level Cultural Resources and Geophysical Survey Drawing Set.

Posey, M.H. and T.D. Alphin. 2000. Monitoring of Benthic Faunal Responses to Sediment Removal Associated with the Carolina Beach and Vicinity – Area South Project. Wilmington, N.C.: Center of Marine Science, University of North Carolina at Wilmington. Final Report, CMS Report No. 01-01.

R. Christopher Goodwin & Associates, Inc. 2022, Phase I Submerged Cultural Resources Analysis for the Lovers Key Beach Nourishment Sand Search. Lee County, Florida.

Read, J.F. 1985. Carbonate Platform Facies Models. American Association of Petroleum Geologists, Bulletin 66:860-878.

South Atlantic Fishery Management Council (SAFMC). 2023. Protected Resources, NOAA Fisheries Jurisdiction, ESA Listed Species. https://safmc.net/species/shrimp-penaeid/

South Carolina Department of Natural Resources (SCDNR), 1995. A Review of the Potential Impacts of Mechanical Harvesting on Subtidal and Intertidal Shellfish Resources.

Singer, Steven D. 1998. Shipwrecks of Florida: A Comprehensive Listing. Second Edition, Pineapple Press, Inc., Sarasota.

Tanner, W.F. 1960. Florida Coastal Classification. Gulf Coast Association of Geological Societies, Transactions 10:259-266.

Timm, R.M., and H.H. Genoways. 2004. The Florida bonneted bat, Eumops floridanus (Chiroptera:Molossidae): distribution, morphometrics, systematics, and ecology. Journal of Mammalogy 85:852-865.

Twichell, D., Brooks, G.R., Gelfenbaum, G., Paskevich, V., and Donahue, B. 2003. Sand Ridges off Sarasota, Florida: A Complex Facies Boundary on a Low-Energy Inner Shelf Environment, in

A Linked Coastal/Inner Shelf Depositional System; West-Central Florida, edited by G.R. Brooks, Marine Geology Special Publication, Elsevier, Amsterdam.

U.S. Army Corps of Engineers (USACE). 2020. Collier County. Florida Coastal Storm Risk Management. Draft Integrated Feasibility Study and Environmental Impact Statement.

U.S. Environmental Protection Agency (USEPA). 2019. EJSCREEN: Environmental Justice Screening and Mapping Tool. Retrieved from: https://www.epa.gov/ejscreen.

U.S. Environmental Protection Agency (EPA). 2022. Emissions & Generation Resource Integrated Database (eGRID). Retrieved from https://www.epa.gov/egrid/maps.

U.S. Fish and Wildlife Service (USFWS). 2008. U.S. Fish and Wildlife Service Species Assessment and Listing Priority Assignment.

U.S. Fish and Wildlife Service (USFWS). 2009. Piping plover (Charadrius melodus), 5-year review: summary and evaluation. U.S. Fish and Wildlife Service, Northeast Region, Hadley, Massachusetts.

U.S. Fish and Wildlife Service (USFWS). 2013. Programmatic Piping Plover Biological Opinion.

U.S. Fish and Wildlife Service (USFWS). 2015. Statewide Programmatic Biological Opinion.

U.S. Fish and Wildlife Service (USFWS). 2018. Species Status Assessment Report for the Black-capped petrel (*Pterodroma hasitata*). Retrieved from https://ecos.fws.gov/ServCat/DownloadFile/156429.

U.S. Fish and Wildlife Service (USFWS). 2020. Monarchs. Retrieved from: https://www.fws.gov/initiative/pollinators/monarchs.

U.S. Fish and Wildlife Service (USFWS). 2023. Birds protected by the Migratory Bird Treaty Act. Retrieved from: https://www.fws.gov/law/migratory-bird-treaty-act-1918.

Williams, A.B. 1984. Shrimps, lobsters, and crabs of the Atlantic coast of the eastern United States, Maine to Florida. Washington, D.C.: Smithsonian Institution Press.