Florida Artificial Reef Creation and Restoration

Biological Assessment

Draft: January 30, 2014

Action Agencies: NOAA-Restoration Center, Florida Fish and Wildlife Conservation Commission

Activity: Creating artificial reefs in Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties

Consulting Agency: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources

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Executive Summary

The proposed Florida Artificial Reef Creation and Restoration project involves emplacing artificial reef units at different depths in permitted areas in Gulf of Mexico waters across the participating counties. The proposed project locations include waters offshore of Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties. The objective of the proposed Florida Artificial Reef Creation and Restoration project is to enhance and/or increase the public's use and/or enjoyment of the natural resources by increasing the number of artificial reefs in state waters. The total estimated cost for this project is $11,463,587.

Gulf Sturgeon

The proposed project action area is used by the endangered Gulf sturgeon and occurs within Unit 11 (Florida Nearshore Gulf of Mexico) of designated critical habitat for the Gulf sturgeon. Gulf sturgeon mortality could occur from certain in-water activities including boat traffic, but it is unlikely. Gulf sturgeon are mobile and will likely avoid the area due to project activity and noise. Potential impacts from operations will also be mitigated by requiring compliance during all in-water activities with the *Sea turtle and Smalltooth Sawfish Construction Guidelines* (NOAA, 2006) and *Standard Manatee Conditions for In-water Work* (USFWS, 2011). Restoration operations associated with this project may have insignificant effects, but are not likely to adversely affect and will not jeopardize the continued existence of the species.

Sea Turtles

The proposed action was evaluated for impacts to 5 threatened or endangered sea turtles (Green, Loggerhead, Hawksbill, Leatherback, and Kemp's Ridley). The proposed project action area intersects proposed loggerhead critical nearshore reproductive habitat (LOGG-N-33) (DOI, 2013). In-water impacts to sea turtles using the proposed action area could occur, but the aquatic nature of the reef unit deployment means no nesting habitat would be affected. Sea turtle mortality may occur from certain in-water activities including boat traffic during the emplacement of reef units. However, sea turtles are mobile and will likely avoid the area due to project activity and noise. Potential impacts from operations will also be mitigated by requiring compliance during all in-water activities with the *Sea turtle and Smalltooth Sawfish Construction Guidelines* (NOAA, 2006) and *Standard Manatee Conditions for In-water Work* (USFWS, 2011). Therefore, restoration operations associated with this project may have insignificant effects, but are not likely to adversely affect and will not jeopardize the continued existence of these sea turtle species.

Smalltooth Sawfish

The 2009 recovery plan for *Smalltooth* sawfish (NMFS, 2009) notes "Currently, smalltooth sawfish can only be found with any regularity in south Florida between the Caloosahatchee River and the Florida Keys". However, there have been infrequent (i.e., less than one per year) reported sightings of Smalltooth sawfish in the proposed project areas, with the greatest number of reports in Apalachicola Bay (6 from 2001-2008). As a result, we conclude the likelihood of encountering a Smalltooth sawfish during the reef emplacement activities are very low and risk of impacts would be mitigated with adherence to the with *Sea turtle and Smalltooth Sawfish Construction Guidelines* (NOAA, 2006). As a result of these factors, combined with their mobility, impacts to Smalltooth sawfish are likely to be insignificant and not likely to adversely affect or jeopardize the continued existence of Smalltooth sawfish.

List of Project Sponsors and Partners

Florida Fish and Wildlife Conservation Commission

Project Summary

The proposed artificial reef projects are intended to provide marine fish habitat that would attract recreational users; this is to compensate for recreational opportunities that were lost due to the *Deepwater Horizon* oil spill. The project envisions placing different types of modules at different depths in areas currently permitted for artificial reefs in the following counties: Escambia, Santa Rosa, Okaloosa, Walton, and Bay. Reef units would be distinguished generally by their design and the water depth where the units are placed. The emplaced artificial reef units would support ecotourism and a range of recreational human uses, including snorkeling, fishing, kayaking, and scuba diving by providing a location where anglers and divers can access aggregated populations of marine species (Adams et al. 2011)**.** This project is consistent with the goals of Florida's artificial reef program. This program was created by the legislature in 1980. The program is described in §379.249 Florida Statutes, operates under Chapter 68E-9 Florida Administrative Code, and is staffed with personnel in the Florida Fish and Wildlife Conservation Commission's (FWC) Division of Marine Fisheries Management (see http://myfwc.com/conservation/saltwater/artificial-reefs/ar-program for program details). The total estimated cost for this project is $11,463,587.

Species Considered in Biological Assessment

Gulf Sturgeon, *Acipenser oxyrinchus desotoi*, Threatened
Green Sea Turtle, *Chelonia mydas*, Endangered
Loggerhead Sea Turtle, *Caretta caretta*, Threatened
Hawksbill Sea Turtle, *Eretmochelys imbricate*, Endangered
Leatherback Sea Turtle, *Dermochelys coriacea*, Endangered
Kemp's Ridley Sea Turtle, *Lepidochelys kempii*, Endangered

The 2009 recovery plan for Smalltooth sawfish (NMFS, 2009) notes "Currently, smalltooth sawfish can only be found with any regularity in south Florida between the Caloosahatchee River and the Florida Keys". However, there have been infrequent (i.e., less than one per year) reported sightings of smalltooth sawfish in the proposed project areas, with the greatest number of reports in Apalachicola Bay (6 from 2001-2008). As a result, we conclude the likelihood of encountering a Smalltooth sawfish during the emplacement activities over such a large area associated with this project are extremely unlikely. Further any potential impacts would be mitigated with adherence to the conditions within the *Sea turtle and Smalltooth Sawfish Construction Guidelines* (NOAA, 2006). As a result of this extremely low probability of exposure to the project activity combined with implementation of effective BMPs to reduce risk of harm, impacts to Smalltooth sawfish are likely to be discountable. As a result, additional consideration of impacts to Smalltooth sawfish is not undertaken in this assessment.

Consultation History

- March 19, 2013: FDEP developed and submitted an initial project description for early coordination with PRD.
- June 4, 2013: FDEP prepared an initial version of the "Southeast Region Intra-Service Section 7 Biological Evaluation Form" and submitted the form to U.S. Fish and Wildlife Service for review.

- July 19, 2013: FDEP prepared and submitted the initial "NMFS Endangered Species Act Section 7 Checklist for Federal Action Agencies" to the PRD. A preliminary evaluation of "Not Likely to Adversely Affect" was made for five species of turtle and Gulf sturgeon. The PRD requires that a Biological Assessment (BA) is prepared for any determination other than "no effect" for major construction activities; therefore, a request for a BA was confirmed in discussions on October 28, 2013.

Project Description

Location

Artificial reefs would be constructed in deepwater habitats of the Gulf of Mexico and in shallower water near the shorelines in the Gulf of Mexico waters off of Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties, Florida within designated areas permitted by the FDEP and U.S. Army Corps of Engineers (Figure 1). The project would place artificial reef units at multiple locations currently permitted by the USACE and the FDEP for artificial reefs: deeper water "nearshore reefs" would be located within 9 nautical miles of shore, in open water**:** shallower "snorkeling reefs" would be less than 20 feet deep and within 950 feet of shore. Figure 2 provides an aerial overview of the project area. Figure 1 and Table 1 identify placement locations for artificial reef structures in areas that have already been approved based on permits held by the respective counties.

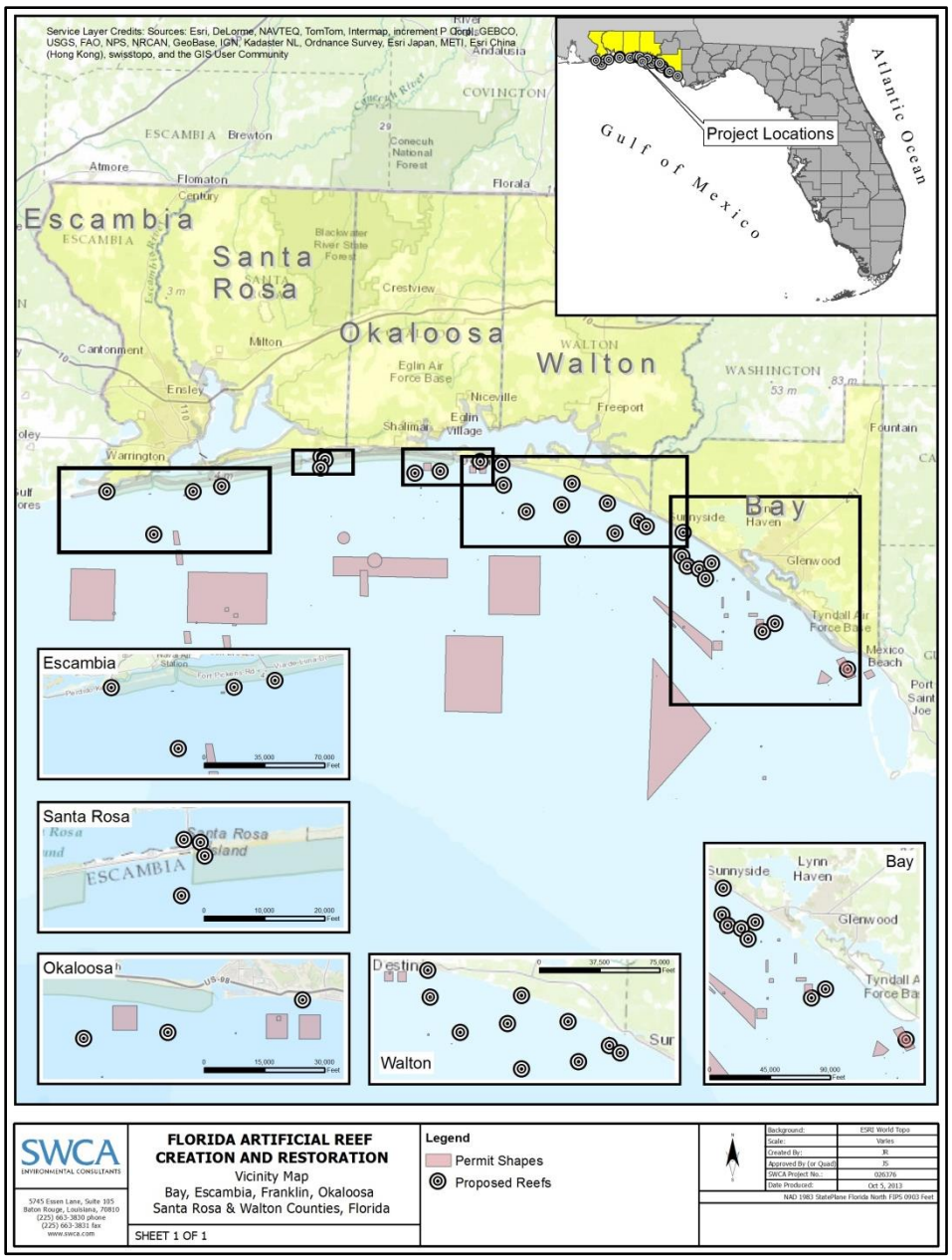

Figure 1. Map illustrating the areas where artificial reef structures may be deployed. (Note the indication of units being placed in Santa Rosa sound is misleading – all units would be placed in the Gulf of Mexico waters)

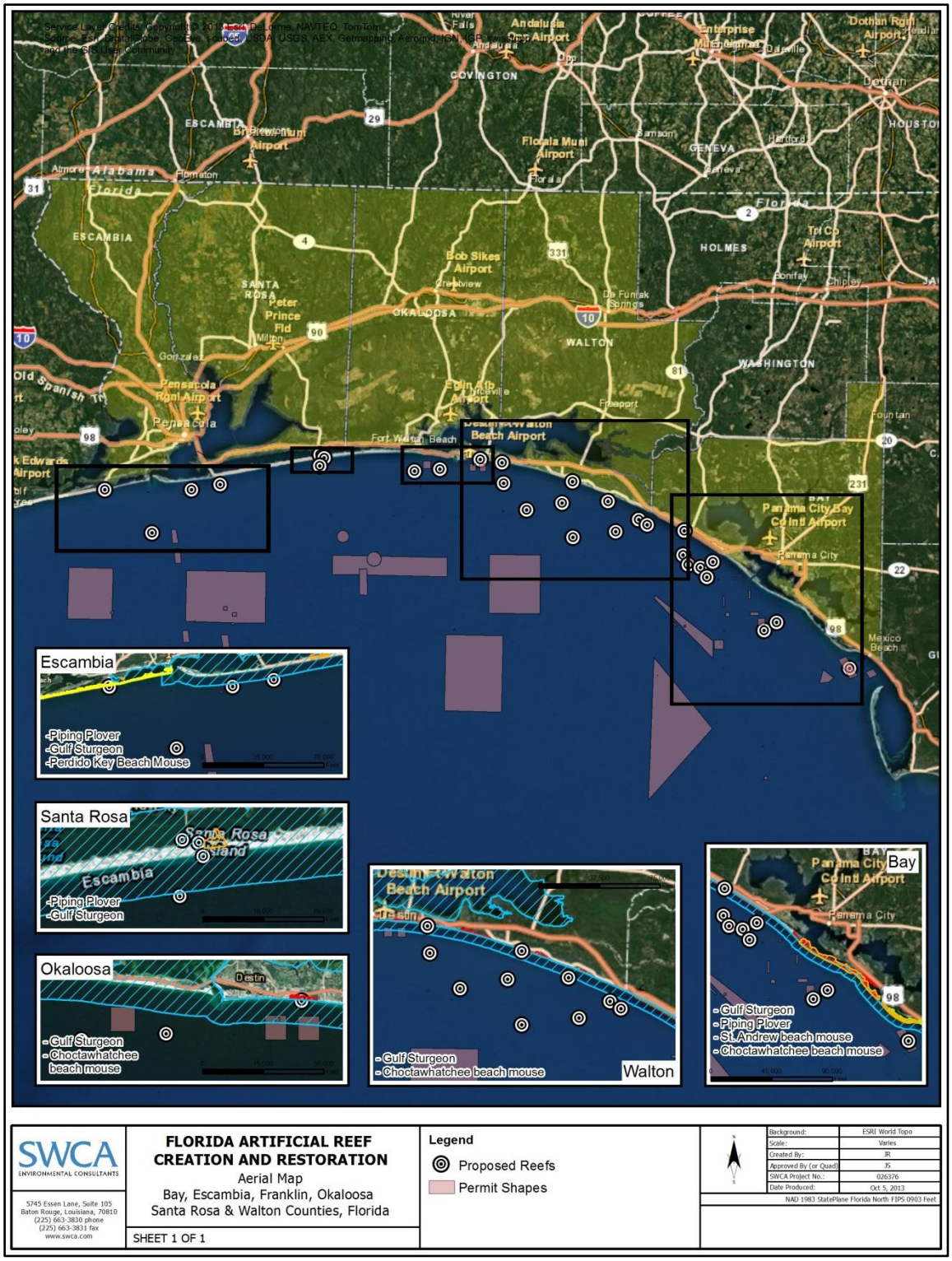

Figure 2. Aerial map of Florida artificial reef deployment locations in select counties throughout the Gulf of Mexico.

Table 1. Artificial Reef Installation Locations

COUNTY	LATITUDE, LONGITUDE, AND TYPE*
Escambia	30.30000, -87.20000 (N) 30.20000, -87.29833 (N) 30.28983, -87.42000 (S) 30.30983, -87.12000 (S)
Santa Rosa	30.38533, -86.85617 (S) 30.38633, -86.85983 (S) 30.37917, -86.85383 (S) 30.36050, -86.86533 (N)
Okaloosa	30.35817, -86.54983 (N) 30.35267, -86.61650 (N) 30.38200, -86.44417 (S)
Walton	30.25083, -86.02667 (N) 30.29067, -86.10817 (N) 30.32917, -86.38183 (N) 30.23883, -86.00467 (N) 30.28633, -86.22817 (N) 30.20883, -86.19883 (N) 30.22217, -86.08667 (N) 30.37517, -86.38750 (S) 30.33467, -86.20150 (S) 30.26950, -86.32133 (S))
Bay	30.17117, -85.90933 (N) 30.14933, -85.89617 (N) 30.14350, -85.86383 (N) 30.15717, -85.83100 (N) 30.12200, -85.84717 (N) 30.00200, -85.69533 (N) 30.02100, -85.66317 (N) 29.91817, -85.47117 (S) 30.22617, -85.90750 (S)

*The two types of reefs are denoted as (N) for nearshore reefs and (S) for snorkeling reefs.

Proposed Actions

Proposed Project Implementation Approach

Construction activities would include placement of linear structures consisting of concrete and stone rubble and pre-fabricated artificial reef modules in permitted areas. These areas (see Figure 1 for the location of these existing permitted artificial reef areas) are permitted after, among other requirements, completing a bottom survey demonstrating that the location does not have submerged grassbeds, shellfish, other hard bottom communities, or corals within the proposed permit boundaries. Deeper water "nearshore" reefs would likely have a single prefabricated, modular design (see Figure 3 for an example of such a design). Shallower "snorkeling" reefs would likely have a layered, piling-mounted design with spacers between the disk shaped layers (see Figure 4 for an example).

Figure 3. Modular artificial reef unit to be placed in deeper water.

Figure 4. Layered artificial reef unit that would be placed in shallower water.

Artificial reefs would be constructed on several sites using a similar process; however, the average water depth and substrate composition of the water bottom at each reef site may differ. A survey would be conducted to determine the placement, alignment, and boundaries of the artificial reefs. All artificial reef installation measures have yet to be finalized, but the following general installation process would likely be used during construction.

Modules would be fabricated and staged at the reef manufacturer's location and then transported to a contractor's staging area. For the pyramid type units shown in Figure 3, which have open bottoms, a modification would be made prior to deployment, where necessary, that would effectively remove the top of the pyramid so that there would be a minimum 3 foot opening at the top.

The shallower snorkel reef modules, as shown in Figure 3, consist of concrete disks into which are imbedded small limestone rocks of various shapes or in some cases oyster shells may also be imbedded. The purpose of the rock and shells is to increase rugosity and microhabitat. The vertical distance between the disks is controlled by spacers, which are collars slipped over the hollow center pipe. These multi-disk modules are also pre-fabricated and assembled on shore prior to deployment with the number of disks on the pilings varying depending on the water depth and design objective.

At the staging location, the reef modules for each deployment would be loaded onto a deployment vessel equipped with a crane for loading/offloading the prefabricated units. Deployment vessels would travel to the reef locations where boundaries would be marked by the county or their designee using a sub-meter accurate global positioning system.

For the deeper water pyramid type modules, see Figure 3, each module would be lifted separately, by crane, from the barge deck using a pelican hook and then lowered to the seafloor where the hook would be disengaged, modules will not be indiscriminately dumped. Modules would be deployed on either side of the vessel in a specific order and adjusted so each successive placement would be far enough from the previous one to prevent any two modules from touching.

For the shallower water disk-type reef modules, see Figure 4 for an example, typical deployment is slightly different. For these, each reef module is deployed from a tripod which is set in place adjacent to a barge which is in a fixed position. The top of the fully constructed disk reef with central piling is suspended by a hydraulic collar. Once the hollow center pipe is placed in position in contact with the sea floor, ambient saltwater is pumped through the center of the hollow pipe and the pipe subsides to the appropriate depth in the sand layer. The pump is then turned off, the positioning of the disk reef is double checked, the hydraulic collar and tripod are removed and the next disk module is similarly deployed. As a note, these disk modules have also been deployed in deeper water (50 ft. or greater) without pilings but with a large diameter concrete disk base plate below the lowest disk to provide some additional ballast.

Artificial reefs in the different locations would be constructed on several sites using a similar process; however, the average water depth and substrate composition of the water bottom at each reef site may differ. A survey would be conducted to determine the placement, alignment, and boundaries of the artificial reefs. The final engineering and design process would determine material needs for intertidal reef construction. If alternative materials are proposed, their suitability would first be evaluated against criteria in existing guidelines for reef materials (Atlantic and Gulf States Marine Fisheries Commissions, 2004). Equipment would be selected considering its draft and considering the specific project location. This would help avoid/minimize the risk of prop dredging or blowouts or impacts from grounding in shallow water locations. These concerns would not be present with the deeper water locations. The total area that would have materials emplaced is uncertain at this time and would reflect the nature of any existing permitted areas as well as the dimensions and price of existing commercial reef units that are available at the time funding is released for the project. The maximum allowable material height varies within and between sites based on ambient depth gradients and navigational clearances in the location, which are determined by the U.S. Coast Guard and referenced in their nautical charts.

Standard best management practices (BMPs) would be followed for emplacing artificial reef units. This includes adhering to the *2006 Sea Turtle and Smalltooth Sawfish Construction Conditions* (National Oceanic and Atmospheric Administration [NOAA] 2006) and *Standard Manatee Conditions for In-Water Work* (USFWS, 2011) that rely on boat/barge speed controls and use of observers to help minimize the risk of adverse impacts to manatees during transport and placement activities. Some temporary shading from workboats during construction periods may occur, but the degree of shading is unknown at this time because it would be a function of the number and type of equipment (e.g., barges, workboats) used at the time of emplacement. Seagrass generally is not present in the project areas; however, access over existing seagrass would be avoided to the extent practicable to minimize prop-scarring impacts. Efforts to reduce turbidity in the shallow water emplacement areas consistent with existing best practice guidelines would be followed. Turbidity associated with the placement of these units is generally minimal and dissipates quickly based on observations from individuals who have observed deployments.

Approach by County

Escambia County

Although solicitation regulations would apply, Escambia County's Marine Resources Division (MRD) would likely use a concrete, prefabricated pyramid type artificial reef module commonly deployed in the

northeastern Gulf of Mexico, like Florida Limestone or EcoSystem Reef modules from Walter Marine. The "Florida Limestone" module measures 10 feet along each base and is 8 feet in height, yielding a total volume (per module) of approximately 116 cubic feet. Each module covers approximately 43.3 square feet of seafloor area. Alternatively, Walter Marine EcoSystem Reef modules consist of discs made of concrete and limestone rock with a hole formed in the center to fit over a composite central support pipe. The conceptual proposal suggests various sizes of patch reefs, designed according to the ratio of potential open seafloor forage space Escambia County would likely require 1,333 modules for the 43.31-square-foot footprint of Escambia Nearshore East and West sites. Additional module numbers would be determined for other sites depending on the funding available to Escambia County.

Santa Rosa County

Artificial reef modules, such as Florida Limestone discussed above, would be deployed at two existing reef sites in Santa Rosa County, the SR-26 Reef Site and the SR-27 Reef Site. At the SR-26 Reef Site, 60 pole mounted circular disk modules like the EcoSystem Reef snorkel modules would be placed, with 19.6 square feet for each module and a total footprint for all modules of 1,177 square feet. At the SR-27 Reef Site, 703 Walter Marine Florida Limestone–type modules, with a 43.3 square foot footprint for each module, would be emplaced, creating a 30,448-square-foot total footprint for all modules combined. The total footprint for both SR-26 and SR-27 Reef Sites would be 31,625 square feet.

Okaloosa County

There are 52 individual modules that would be set in the project area, with a plan for three circular disks per piling, though the number of disks per piling could be doubled depending on further funding. The circular base footprint would be 19.62 square feet for each EcoSystem Reef snorkel module proposed to be used. The total footprint for 52 snorkel reef modules would be 1,020 square feet.

Walton County

An estimated 840 prefabricated concrete pyramid-type modules made with natural limestone, similar to Florida Limestone modules, each having a 43.3-square-foot base footprint, would be distributed among three existing artificial reef locations for an approximate total footprint of 36,372 square feet.

Bay County

Artificial reef installation sites within the waters of this county would likely require one of the following material types and amounts: (1) 260 pyramid-type modules similar to the Florida Limestone modules at 43.3 square feet per module, for a total footprint of 11,261 square feet; (2) 206 of the disk-type modules similar to the EcoSystem modules at 19.62 square feet for each circular EcoSystem snorkel reef module with a total footprint of 4,041 square feet; (3) 182 larger disk-type modules at 50 square feet for each circular EcoSystem snorkel reef module, with a resulting 9,100-square-foot total footprint; (4) 30 sculptures or alternative modules at 44.3 square feet for each unit, with a resulting 1,299-square-foot total footprint of all sculptures or alternative prefabricated units combined. These proposed reef structures would have a total estimated footprint of 30,296 square feet in Bay County.

<u>Anticipated Construction Schedule</u>

Artificial reef installation is expected to take 1 to 2 years once design plans are finalized. Estimates of in-water work are difficult to project as they would reflect conditions at the time of the successful bid (e.g., local conditions, available equipment, and nature of materials to be placed). Depending on module

design/size or use of concrete precast material, project placement could take a single day or take multiple days. Typically, a barge would carry one load of materials per day, return to the shore/staging area, reload (which might take a day), and then be deployed the next day. Cumulatively, the in-water work time is likely to be best measured in terms of weeks of effort. A general timeline would be as follows:

- Design Complete: Modules suitable for use have already been identified
- Permitting Complete: Fall 2014
- Contract Bid: post Final ERP, Spring 2014
- Construction Start: Summer 2014
- Construction Complete: Summer 2016, for final reef placement activity

Description of Species and Habitats

Gulf Sturgeon

Status of the Species and Critical Habitat

Historically, the Gulf sturgeon occurred from the Mississippi River east to Tampa Bay. Its present range extends from Lake Pontchartrain and the Pearl River system of Louisiana and Mississippi, east to the Suwannee River in Florida (Wooley and Crateau 1985), with infrequent sightings occurring west of the Mississippi River. In the late 19th century and early 20th century, the Gulf sturgeon supported an important commercial fishery, providing eggs for caviar, flesh for smoked fish, and swim bladders for isinglass, a gelatin used in food products and glues (Huff 1975; Carr 1983). Gulf sturgeon numbers declined due to over fishing throughout most of the 20th century. After 1950, the decline was exacerbated by habitat loss associated with the construction of water control structures, such as dams and sills (submerged ridges or vertical walls of relatively shallow depth separating two bodies of water). In several rivers throughout the species' range, dams have severely restricted sturgeon access to historic migration routes and spawning areas (Boschung 1976; Wooley and Crateau 1985). Gulf sturgeon exhibit a high degree of fidelity, with over 99 percent returning to spawn in the same river system in which they were hatched (USACE 2006).

Continuing and new or potential threats to the Gulf sturgeon include: construction of dams, modifications to habitat associated with dredging, dredged material disposal, de-snagging (removal of trees and their roots) and other navigation maintenance activities; incidental take by commercial fishermen; poor water quality associated with contamination by pesticides, heavy metals, and industrial contaminants; hurricanes, red tides, boat collisions, climate change, aquaculture and incidental or accidental introductions of non-native species; and the Gulf sturgeon's long maturation and limited ability to recolonize areas from which it is extirpated (USFWS 1991; USFWS and NMFS 2009).

These threats persist to varying degrees in different portions of the species range. In recent years, dredging for channel maintenance and beach nourishment has resulted in death and injury of some Gulf sturgeon in the marine environment. Trawling has also resulted in the capture of several Gulf sturgeon. Collisions with boats traveling at high speeds have occurred on numerous occasions in the Suwannee and Choctawhatchee rivers. A sturgeon colliding with a boat can occur when the fish leaps out of the water towards the boat or when the sturgeon is physically struck by the boat propellers. Shallow waters will increase the likelihood of a ship strike due to the lack of buffer space between boat and fish (USFWS and NMFS 2009).

U.S. FWS and NMFS designated critical habitat essential to the conservation of the Gulf sturgeon. In accordance with regulations, critical habitat determinations were based on the best scientific data available for those physical and biological features (Primary Constituent Elements) essential to the conservation of the species. Nearshore waters within one nautical mile of the mainland from Pensacola Pass to Apalachicola Bay and the Perdido Key area and the area north of Santa Rosa Island were designated as critical habitat, as they are believed to be important migratory pathways between Pensacola Bay and the Gulf of Mexico for winter feeding and genetic exchange (DOI and DOC 2003). The proposed project area is located in critical habitat Units 9 (Pensacola Bay) and11 (Florida Nearshore Gulf of Mexico). Critical habitat unit 9 provides juvenile, subadult, and adult feeding, resting, and passage habitat for Gulf sturgeon from the Escambia River and Blackwater/Yellow River subpopulations. Unit 11 provides habitat for winter feeding and migration for subpopulations from the Yellow River, Choctawatchee River, and Apalachicola River.

Life History

The Gulf sturgeon is an anadromous fish; adults spawn in freshwater then migrate to feed and grow in estuarine/marine habitats (Table 2). After spawning in the upper river reaches, both adult and subadult Gulf sturgeon migrate from the estuaries, bays, and the Gulf of Mexico to the coastal rivers in early spring (i.e., March through May) when river water temperatures range from 16 to 23°C (Huff 1975, Carr 1983, Wooley and Crateau 1985, Odenkirk 1989, Clugston et al. 1995, Foster and Clugston 1997, Sulak and Clugston, 1999, Fox et al. 2000). Downstream migration from the river into the estuary/Gulf of Mexico begins in September (at water temperatures around 23°C) and continues through November (Huff 1975, Wooley and Crateau 1985, Foster and Clugston 1997). Most subadult and adult Gulf sturgeon spend cool months (October or November through March or April) in estuarine areas, bays, or in the Gulf of Mexico (Odenkirk 1989, Foster 1993, Clugston et al. 1995, and Fox et al. 2002).

Research indicates that in the estuary/marine environment both subadult and adult Gulf sturgeon show a preference for sandy shoreline habitats with water depths less than 3.5 meters (m) (approximately 12 feet) and salinity less than 6.3 parts per thousand (Fox et al. 2002). The majority of tagged fish have been located in areas lacking seagrass (Fox et al. 2002), in shallow shoals 1.5 to 2.1m and deep holes near passes (Craft et al. 2001), and in unvegetated, fine to medium-grain sand habitats, such as sandbars, and intertidal and subtidal energy zones (Abele and Kim 1986). These shifting, predominantly sandy, areas support a variety of potential prey items including estuarine crustaceans, small bivalve mollusks, ghost shrimp, small crabs, various polychaete worms, and lancelets (Abele and Kim 1986).

Generally, Gulf sturgeon prey are burrowing species (e.g., annelids: polychaetes and oligochaetes, amphipods, isopods, and lancelets) that feed on detritus and/or suspended particles, and inhabit sandy substrate. Their guts generally contain benthic marine invertebrates including amphipods, lancelets, polychaetes, gastropods, shrimp, isopods, mollusks, and crustaceans (Huff 1975, Mason and Clugston 1993, Carr et al. 1996, Fox et al. 2000, Fox et al. 2002). During the early fall and winter, immediately following downstream migration, Gulf sturgeon are most often located and presumed to be foraging in marine or estuarine areas that have depths less than 20 feet and contain sandy substrates that support burrowing macroinvertebrates (Craft et al. 2001, Ross et al. 2001b, Fox et al. 2002, Parauka et al. 2001, Ross et al. 2009).

Gulf sturgeon are long-lived, with some individuals reaching at least 42 years in age (Huff 1975). Age at sexual maturity for females ranges from 8 to 17 years, and for males from 7 to 21 years (Huff 1975). Chapman et al. (1993) estimated that mature female Gulf sturgeon weighing between 29 and 51 kg produce an average of400, 000 eggs. Based on the fact that male Gulf sturgeon are capable of annual spawning, and females require more than one year between spawning events (Huff 1975, Fox et al. 2000),

it is assumed that the Gulf sturgeon are similar to Atlantic sturgeon (*A. o. oxyrhinchus*); that is, they exhibit a long inter-spawning period, with females spawning at intervals ranging from every 3 to 5 years, and males every 1 to 5 years (DOI and DOC 2003). Spawning occurs in the upper river reaches in the spring when water temperature is around 15° to 20°Celcius (approximately 60° to 70° Fahrenheit). Fertilization is external; females deposit their eggs on the river bottom and males fertilize them. Gulf sturgeon eggs are demersal (they sink to the bottom), adhesive, and vary in color from gray to brown to black (Huff 1975, Parauka et al. 1991).

Genetic studies conclude that Gulf sturgeon exhibit river-specific fidelity. Five regional or river-specific stocks (from west to east) have been identified: (1) Lake Pontchartrain and Pearl River, (2) Pascagoula River, (3) Escambia and Yellow Rivers, (4) Choctawhatchee River, and (5) Apalachicola, Ochlockonee, and Suwannee Rivers (Stabile et al. 1996).

Table 2: General Life Stage Movements of Gulf sturgeon

Life Stage	Where	When
All ages except YOY	Lower, middle, upper reaches of main part of rivers	Spring-Fall
Spawning adults	Upper river reaches	March-April
Eggs and larvae	Upper river reaches	March-April
Juveniles 1-6 yrs	Close to river mouth, nearshore, or within estuary	Winter
Large juveniles >6 yrs	Gulf of Mexico both near and offshore of bays and estuaries	Winter
Spring stage (migrating upstream)	Lower, tidally influenced river reaches	Early March
Fall stage (migrating downstream)	Transitioning from marine to freshwater conditions	October-November

Population Dynamics

There is limited information about the abundance of Gulf sturgeon, especially in Pensacola Bay. The FWS Panama City Field Office has annually monitored one or more of the four Florida Panhandle rivers (Escambia, Yellow, Choctawhatchee, and Apalachicola) since 2003 (fiscal year annual reports USFWS 2003-2008). USGS researchers completed the first assessment of the Yellow River population in 2007 (Berg 2004, Berg et al. 2007).

Most subadult and adult Gulf sturgeon spend cool months (October or November through March or April) in estuarine areas, bays, or in the Gulf of Mexico near unvegetated sandy shorelines, shallow shoals, and other areas containing mostly sand with benthic prey items (such as barrier islands) at depths ranging from 1.5 m to 6 m deep (Odenkirk 1989; Foster 1993; Clugston et al. 1995; Parauka et al. 2001; Ross et al. 2001a; Fox et al. 2002; Harris et al. 2005; Craft et al. 2001; Rogillio et al. 2001). Gulf sturgeon will migrate along barrier islands and are often found in passes between islands or in deep holes near the passes (Ross et al. 2001a; Rogillio et al. 2001). Studies of subadult Gulf sturgeon (ages 4 to 7) in Choctawhatchee Bay found that 78 percent of tagged fish remained in the bay the entire winter, while 13 percent ventured into a connecting bay. Possibly the remaining 9 percent overwintered in the Gulf of

Mexico; while, adult Gulf sturgeon were more likely to overwinter or spend extended periods of time in the Gulf of Mexico (DOI and DOC 2003, Fox and Hightower 1998; Fox et al. 2002). Subadults from the Suwannee River subpopulation remain in the mouth of the Suwannee River over winter while adults are known to migrate into the nearshore waters, where they remain for up to two months and then depart to unknown feeding locations in the open Gulf of Mexico (Carr et al. 1996; Edwards et al. 2003). Sonic-tracking evidence suggests that Gulf sturgeon target and share certain wintering grounds. A summary of Gulf sturgeon subpopulations and wintering habitat is presented in Table 3 and Table 4, respectively.

Table 3. Estimated size of known reproducing subpopulations of Gulf sturgeon

River System	**States**	**Estimated Subpopulation Size*** (95% Confidence Interval)	**Source**
Pascagoula	MS	216 (124-429)	Ross et al. 2001b
Pearl	LA, MS	430 (323-605)	Rogillio et al. 2001
Escambia	AL, FL	451 (338-656)	USFWS 2007
Yellow	AL, FL	1,036 (724-1348)	Herrington and Kaeser 2013
Choctawhatchee	AL, FL	3,314**	Herrington and Kaeser 2013
Apalachicola	FL	1,292 (525-1,968)	Herrington and Kaeser 2013
Suwannee	FL	14,000**	Sulak et al. 2009

Estimates refer to numbers of individuals greater than a certain size, which varies between sources depending on sampling gear, and in some cases, to numbers of individuals that use a particular portion of the river (e.g., a summer holding area or one migratory pathway among several). Estimates are not necessarily comparable between researchers due to key differences in methods and assumptions. ** Confidence interval not reported.

Table 4. Summary of known Gulf sturgeon wintering areas

Subpopulation	**Wintering sites**	**Source**
Pascagoula	Barrier Islands, Mississippi Sound, Pascagoula Estuary	Ross et al. (2009)
Pearl	The Rigolets, Barrier Islands, Mississippi Sound	Ross et al. (2009)
Choctawhatchee	Choctawhatchee Bay, Escambia Bay, nearshore Gulf of Mexico, Santa Rosa Sound, Pensacola Bay	Fox et al. (2002); Duncan et al. (2011)
Escambia	Pensacola Bay, Santa Rosa Sound, nearshore Gulf of Mexico	Parauka et al. (2011); Duncan et al. (2011)
Yellow	Pensacola Bay, Santa Rosa Sound, nearshore Gulf of Mexico	Parauka et al. (2011); Duncan et al. (2011)
Apalachicola	Apalachicola Bay, nearshore Gulf of Mexico, Saint Vincent Sound	Parauka et al. (2011); Sulak et al. (2009)
Suwannee	Suwannee Sound, nearshore Gulf of Mexico	Sulak et al. (2009)

Species Occurrence in Action Area

The proposed action occurs in Gulf sturgeon critical habitat unit 11 Unit 11 (Figure 5) consists of nearshore waters from Pensacola Bay to St. Josephs Bay in the Gulf of Mexico. The western boundary is the line of longitude 87º20.0'W from its intersection with the shore to the intersection with the souther boundary, which is 1 nm (1.9 km) offshore of the northern boundary. The northern boundary is the MHW of the mainland shoreline and the 72 COLREGS line at passes defined at 30 CFR 80.810 (a-g). The

eastern boundary is 85 º 17.0'W from its intersection with the shore to its intersection with the southern boundary.

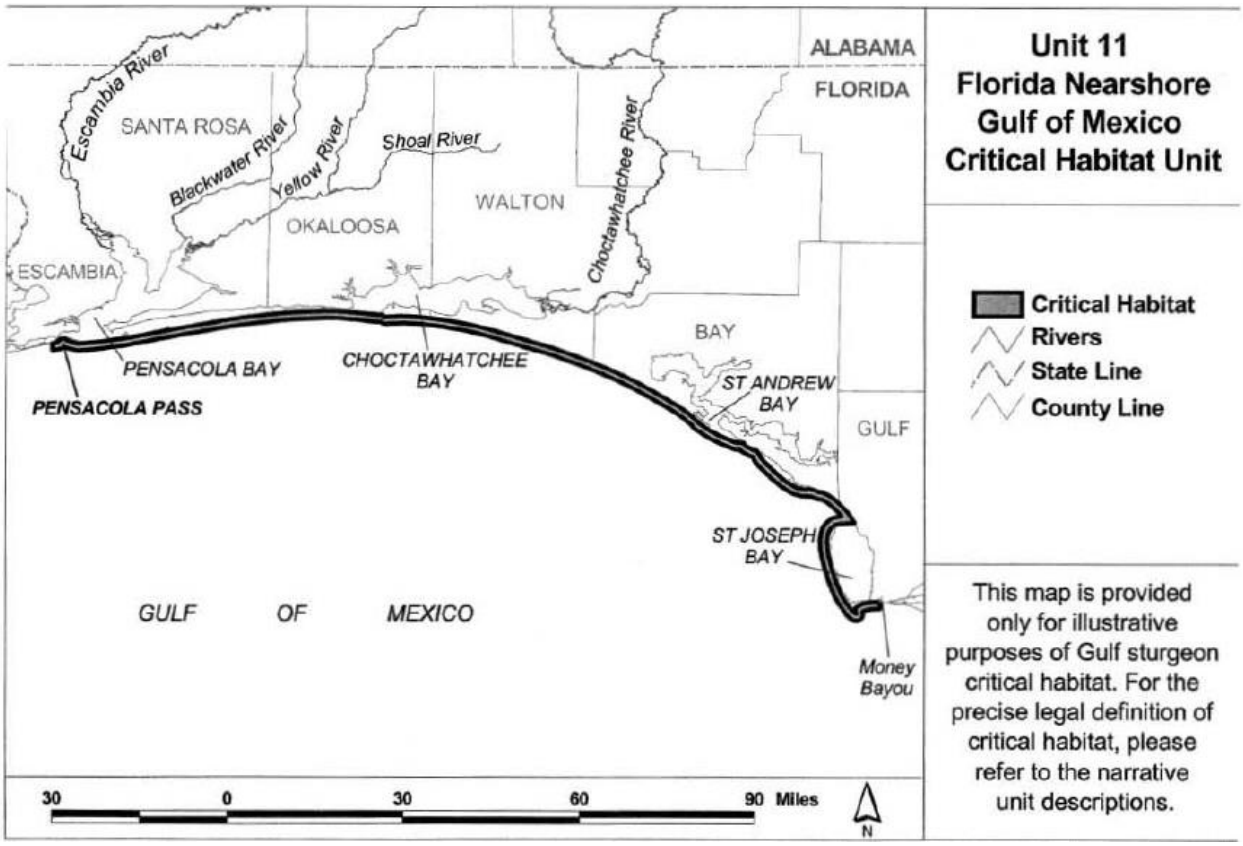

Figure 5. Gulf Sturgeon Critical Habitat Unit 11.

Three rivers that support genetically distinct subpopulations of Gulf Sturgeon flow into Pensacola Bay (Escambia, Yellow, and Choctawhatchee). The Pensacola Bay system provides winter feeding and migration habitat for Gulf sturgeon from the Escambia River and Yellow River subpopulations. However, the likely migratory pathway into the Choctawhatchee River is not within Pensacola Bay, but through the Choctawhatchee Bay. Gulf sturgeon are known to use Pensacola Bay as migratory path to these rivers from March to May and from these rivers to Gulf waters from September to November (DOI and DOC 2003).

Studies have identified specific areas where Gulf sturgeon collect or migrate through Pensacola Bay to the Escambia and Yellow Rivers. Researchers found that Gulf sturgeon showed a preference Redfish Point, Fort Dickens, and Escribano Point, near Catfish Basin (USFWS, 1998; and Craft et al., 2001). Habitats preferred at this sites were sandy shoal areas located along the south and east side of Garcon Point, south shore of East Bay (Redfish Point area) and near Fair Point, especially in the fall and early spring. During midwinter, sturgeon are commonly found in deep holes located north of the barrier island at Ft. Pickens, south of the Pensacola Naval Air Station, and at the entrance of Pensacola Pass. The depth in these areas ranges from 6 to 12.1 m (20 to 40 ft). Other areas where tagged fish were frequently located include Escribano Point, near Catfish Basin, and the mouth of the Yellow River. These areas are outside the proposed project action area and would not be affected by the proposed activities. Although it is

important to note that incidental captures of Gulf sturgeon have been recorded in other areas such as Pensacola Bay, Big Lagoon, and Bayou Grande (Reynolds, 1993; and Lorio, 2000).

Sea Turtles

There are five species of sea turtles that are found within the Gulf of Mexico: green sea turtle, hawksbill sea turtle, loggerhead sea turtle, Kemp's ridley sea turtle, and leatherback sea turtle. All five species of sea turtles found in the Gulf of Mexico are listed under the ESA. The Gulf populations of green (breeding populations in Florida), hawksbill, Kemp's ridley, and leatherback sea turtles are listed as endangered. Loggerhead (northwest Atlantic distinct population segment) and green (except the Florida breeding population) sea turtles are listed as threatened.

Green Sea Turtle

Status of the Species and Critical Habitat

The green sea turtle was federally listed on July 28, 1978 (43 FR 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico are listed as endangered and all other populations are listed as threatened. The green sea turtle has a worldwide distribution in tropical and subtropical waters. Within the U.S., green turtles nest in small numbers in the U.S. Virgin Islands and Puerto Rico, and in larger numbers along the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (NMFS and USFWS 1991). Nesting has also been documented by the Florida Sea Turtle Nesting Beach Monitoring Program in Lee, Charlotte, Sarasota, Manatee, Franklin, Walton, and Escambia counties on Florida's west coast (FWC 2013a).

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys.

Life History

The green sea turtle grows to a maximum size of about three feet and a weight of 350 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. The carapace is smooth and colored gray, green, brown and black. Hatchlings are black on top and white on the bottom (NMFS and FWS 1991). Hatchling green turtles eat a variety of plants and animals, but adults feed almost exclusively on seagrasses and marine algae. Green sea turtles are generally found in fairly shallow waters inside reefs, bays, and inlets except when they are migrating. The green turtle is attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting. Green turtle nesting in Florida occurs from June through late September. Every two or three years, a female will return to the same nesting location. Green sea turtles deposit from one to nine clutches within a nesting season, but the overall average is about 3.3 nests. The interval between nesting events within a season varies around a mean of about 13 days (Hirth 1997). Mean clutch size varies widely among populations. Only occasionally do females produce clutches in successive years. Usually two or more years intervene between breeding seasons (NMFS and FWS 1991). Age at sexual maturity is believed to be 20 to 50 years (Hirth 1997).

Population Dynamics

The green sea turtle is a circum-global species found in tropical and sub-tropical waters. The worldwide distribution of green turtles has been described by Groombridge (1982). In the U.S., green turtles are

found around the U.S. Virgin Islands and Puerto Rico, and in the continental U.S. from Texas to Massachusetts. Adult females migrate from foraging areas to mainland or island nesting beaches and may travel hundreds or thousands of kilometers each way. After emerging from the nest, hatchlings swim to offshore areas, where they are believed to live for several years, feeding close to the surface on a variety of pelagic plants and animals. Once the juveniles reach a certain age/size range, they leave the pelagic habitat and travel to nearshore foraging grounds. Once they move to these nearshore benthic habitats, adult green turtles are almost exclusively herbivores, feeding on sea grasses and algae. Areas that are known as important feeding areas for green turtles in Florida include: Indian River Lagoon, the Florida Keys, Florida Bay, Homosassa River, Crystal River and Cedar Key.

Species Occurrence in Action Area

Although nesting activity has been recorded in almost every coastal county in Florida, most green turtle nesting is concentrated along the southeast coast of Florida. Florida nest counts show that Green turtle nests have increased approximately one hundredfold since counts began in 1989, with 2013 counts more than twice the count from the next highest year. This increase was observed in Escambia county with 4 nests observed in 2011 and 5 in 2012, whereas no nest were observed in either 2009 or 2010 (FWC 2013b). Compared with counties located in the southeast coast of Florida, which have ranged between 100 and 7,500 nests per county, the nesting occurrences in counties within the action area are much lower, with 0-7 nests annually between 2008 and 2012 (FWC 2013b). Green turtles have increased in population between 11-13% per year over the past 25 years (FWC 2013g)

Figure 6 illustrates the locations where green sea turtles have been observed nesting in the project area. Nesting occurs on the beaches and shorelines, and project work will take place primarily in open water habitat, thus, project work is not expected to directly affect nesting habitat. Green sea turtles are not present throughout approximately half of the shoreline in the project area. The remaining half of the shoreline has green sea turtle nesting densities of medium (25%-75%) and low (less than 25%) densities.

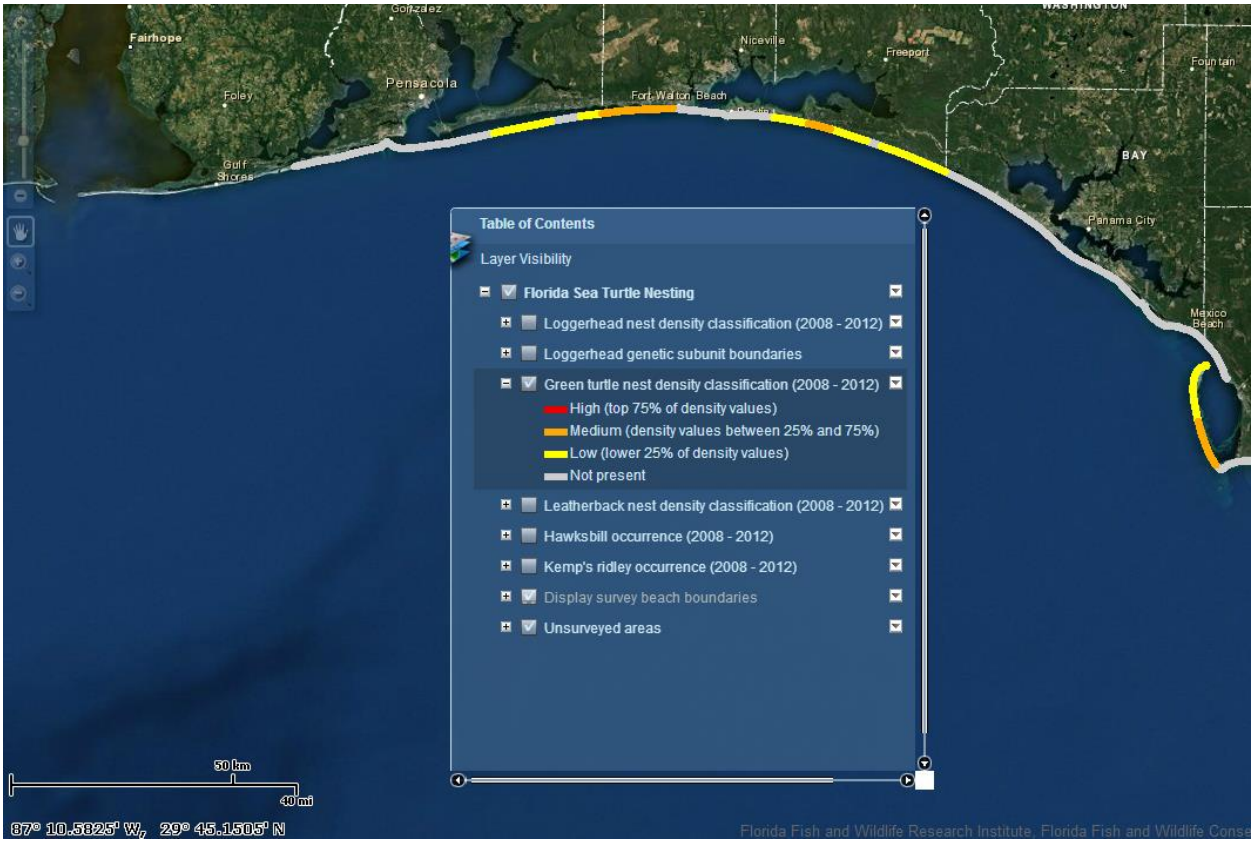

Figure 6. Map illustrating the observed nesting density of green sea turtles in the project area.
Source: FWC, 2013d

Loggerhead Sea Turtle

Status of the Species and Critical Habitat

The loggerhead sea turtle was federally listed as a threatened species on July 28, 1978 (43 Federal Register [FR] 32800). On September 22, 2011, the listing was revised from a single global threatened species to a listing of nine Distinct Population Segments (DPS); four listed as threatened (Northwest Atlantic Ocean, South Atlantic Ocean, Southwest Indian Ocean, Southeast Indo-Pacific Ocean, and South Atlantic Ocean DPSs) and five listed as endangered (Northeast Atlantic Ocean, Mediterranean Sea, North Pacific Ocean, South Pacific Ocean, and North Indian Ocean DPSs). Five recovery units have been identified in the Northwest Atlantic Ocean DPS based on genetic differences and a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries. Recovery units are individually necessary to conserve genetic robustness, demographic robustness, important life history stages, or some other feature necessary for long-term sustainability of the species.

The proposed project area is within the Northern Gulf of Mexico Recovery Unit, defined as loggerheads originating from nesting beaches from Franklin County on the northwest Gulf coast of Florida through Texas. Annual nest totals for this recovery unit averaged 906 nests from 1995-2007. Evaluation of long-term nesting trends for the Northern Gulf of Mexico Recovery Unit is difficult because of changed and expanded beach coverage in survey efforts. However, there are 12 years of Florida index nesting beach

survey data for the Northern Gulf of Mexico Recovery Unit. A log-linear regression showed a significant declining trend of 4.7% annually (NMFS and USFWS 2008).

Estuarine waters such as large open sounds and the numerous embayments fringing the Gulf of Mexico comprise important inshore habitat (NMFS 2008). In addition to providing critically important habitat for juveniles, the neritic zone provides crucial foraging habitat, inter-nesting habitat, and migratory habitat for adult loggerheads in the western North Atlantic. However, habitat preferences of non-nesting adult loggerheads in the neritic zone differ from the juvenile stage during which they less frequently use enclosed, shallow water estuarine habitats with limited ocean access (NMFS 2013a).

In July 2013, the NMFS proposed (78 FR 43005) designation of 36 marine areas within the Northwest Atlantic Ocean DPS as critical habitat. Public comments on the proposed critical habitat areas are requested through November 2013. In addition, the U.S. Fish and Wildlife Service (USFWS) proposed terrestrial critical habitat (nesting beaches) in a separate rulemaking on March 25, 2013 (78 FR 18000). The Northern Gulf Recovery Unit in Florida includes proposed critical habitat units on Perdido Key in Escambia County and several areas in Gulf and Franklin Counties. Specifically, potential artificial reef emplacement sites in Escambia County could occur within the proposed loggerhead critical habitat unit LOGG-N-33. This unit contains nearshore reproductive habitat only. The boundaries of the unit are nearshore areas from the west boundary of Gulf State Park to the Pensacola Pass (crossing Perdido Pass and the Alabama-Florida border) from the MHW line and seaward to 1.6 km (NOAA, 2013).

Life History

The loggerhead occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. The loggerhead sea turtle grows to an average weight of about 200 pounds and is characterized by a large head with blunt jaws. Adults and subadults have a reddish-brown carapace. Scales on the top of the head and top of the flippers are also reddish-brown with yellow on the borders. Hatchlings are brown to dark gray in color. The loggerhead feeds on mollusks, crustaceans, fish, and other marine animals. The loggerhead may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas (NMFS 2013a).

Females nest during the night and normally lay approximately 110 eggs per nest. Eggs take approximately 50 to 65 days to hatch depending on the incubation temperature in the nest. The gender of hatchlings is determined by the incubation temperature in the nest. Hatchlings emerge, proceed to the surf, and continue swimming away from land for approximately 20 to 30 hours. As post-hatchlings, loggerheads are pelagic and are best known from neritic waters along the continental shelf. This neritic posthatchling stage is weeks or months long (Witherington 2002) and may be a transition to the oceanic stage that loggerheads enter as they grow and are carried within ocean currents (Bolten 2003). During pelagic existence, loggerhead turtles are often associated with floating sargassum rafts or debris, which collect in areas where surface waters converge (Magnuson et al. 1990).

Somewhere between 7-12 years old, oceanic juveniles migrate to nearshore coastal areas (neritic zone) and continue maturing until adulthood. Growth rates vary widely, and age to maturity in the wild has been estimated to vary from 12 to 30 years. During spring, adults migrate from foraging to breeding and nesting areas where mating often occurs. Females mate and then nest multiple times (one to seven times per season; average approximately four nests per season) at approximately 14-day intervals (Magnuson et al. 1990, Ernst et al. 1994). Typically, females will nest every other, or every third year. Within the Northwest Atlantic, the majority of nesting activity occurs from April through September, with a peak in June and July (Williams-Walls et al. 1983, Dodd 1988, Weishampel et al. 2006). Nesting occurs within

the Northwest Atlantic along the coasts of North America, Central America, northern South America, the Antilles, Bahamas, and Bermuda, but is concentrated in the southeastern U.S. and the Yucatán Peninsula in Mexico on open beaches or along narrow bays having suitable sand (Sternberg 1981, Ehrhart 1989, Ehrhart et al. 2003, NMFS and FWS 2008).

Population Dynamics

The loggerhead is commonly found throughout the North Atlantic including the Gulf of Mexico, the northern Caribbean, the Bahamas archipelago, and eastward to West Africa, the western Mediterranean, and the west coast of Europe. Florida beaches are of worldwide importance to loggerhead sea turtles. Approximately 80 percent of the global loggerhead population nests either on Florida beaches or in Oman, a country on the Arabian Peninsula.

Florida accounts for more than 90 percent of U.S. loggerhead nesting. However, loggerheads nest from Texas to Virginia, with total estimated nesting in the U.S. fluctuating between 47,000 and 90,000 nests per year over the past decade (NMFS and FWS 2008). About 80 percent of loggerhead nesting in the southeast U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties) ((NMFS and FWS 2008)). Adult loggerheads are known to make considerable migrations between foraging areas and nesting beaches (Schroeder et al. 2003, Foley et al. 2008). During non-nesting years, adult females from U.S. beaches are distributed in waters off the eastern U.S. and throughout the Gulf of Mexico, Bahamas, Greater Antilles, and Yucatán (NMFS and FWS 2008).

Species Occurrence in Action Area

Figure 7 illustrates the locations where loggerhead sea turtles have been observed nesting in the project area. Nesting occurs on the beaches and shorelines, and project work will take place primarily in open water habitat, thus, project work is not expected to directly affect nesting habitat. Most of the project area has medium density nesting (25%-75%), with some smaller areas of high density (greater than 75%) and low density (25%). A majority of Loggerhead nesting occurs in the southeastern counties in Florida, with some counties recording over 20,000 nests per year between 2008-2012 (FWC 2013c). The counties in the action area ranged between 5 to 118 nests per year for the same time period (FWC 2013c)

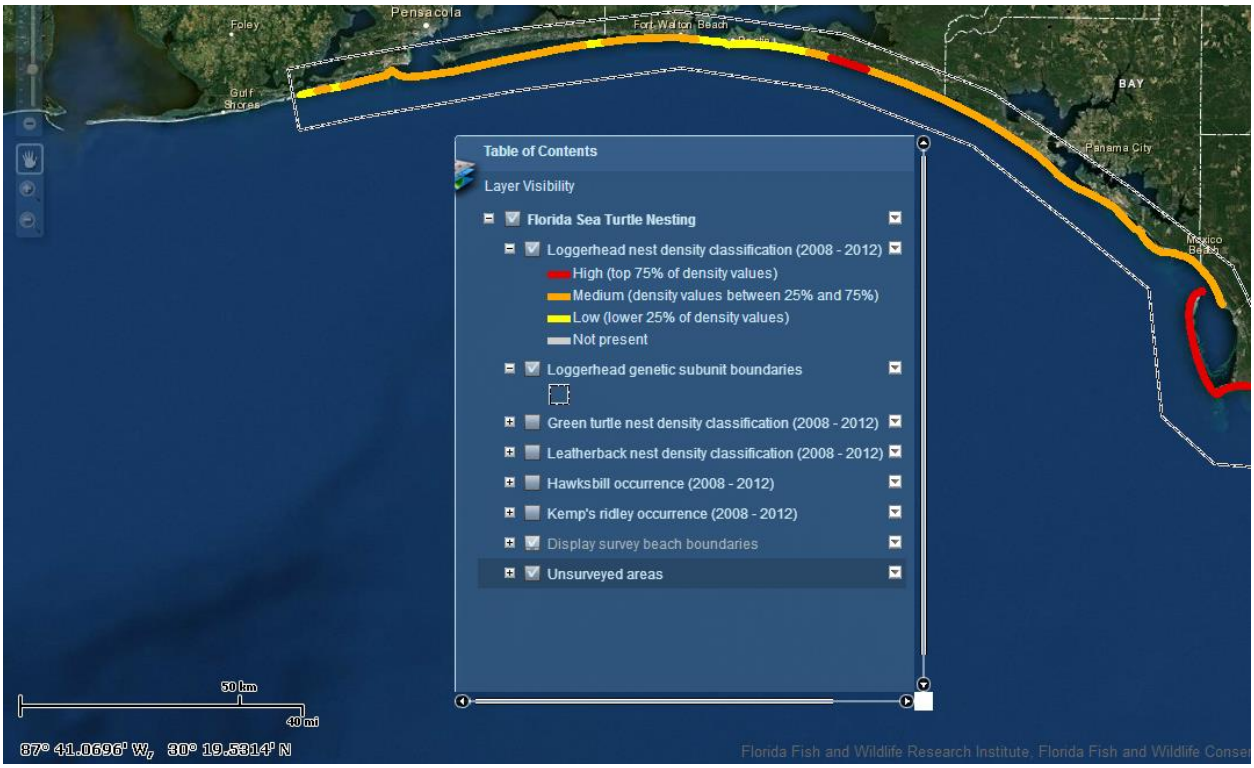

Figure 7. Map illustrating the loggerhead turtle nesting density observed in the project area.
Source: FWC, 2013d

Hawksbill Sea Turtle

Status of the Species and Critical Habitat

The hawksbill sea turtle was federally listed as an endangered species on June 2, 1970 (35 FR 8491). The hawksbill is found in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean. On average, adult Hawksbill turtles weigh 100-150 pounds, but can grow as large as 200 pounds, and are between 25-35 inches in length The top scutes are often patterned with streaks of orange, red, or black. The head is elongated and tapers sharply to a point with a beak-like mouth (NMFS 2013b).

Within the continental U.S., hawksbill sea turtle nesting is rare and is restricted to the southeastern coast of Florida (Volusia through Miami-Dade Counties) and the Florida Keys (Monroe County)

(Meylan 1992, Meylan et al. 1995); however, in sand, hawksbill tracks are difficult to differentiate from those of loggerheads and may not be recognized by surveyors. Therefore, surveys in Florida likely underestimate actual hawksbill nesting numbers (Meylan et al. 1995). In the U.S. Caribbean, hawksbill nesting occurs on beaches throughout Puerto Rico and the U.S. Virgin Islands (NMFS and FWS 1993). In Florida waters, hawksbills are observed on the reefs off Palm Beach, Broward, Miami-Dade, and Monroe Counties. Most sightings involve post-hatchlings and juveniles. These small turtles are believed to originate from nesting beaches in Mexico.

Critical habitat for the hawksbill sea turtle has been designated for selected beaches and/or waters of Mona, Monito, Culebrita, and Culebra Islands, Puerto Rico.

Life History

Hawksbills generally inhabit coastal reefs, bays, rocky areas, passes, estuaries and lagoons, in water depths of less than 70 feet. Similar to green sea turtles, hatchlings are believed to occupy the pelagic environment, taking shelter in Sargassum, floating algal mats, and drift lines of flotsam and jetsam. When they reach a carapace length of approximately 20 to 25 centimeters, hawksbill juveniles reenter coastal waters (NMFS 2013b). Coral reefs are widely recognized as the resident foraging habitat of juveniles, sub-adults, and adults. This habitat association is likely related to their diet of sponges, which need solid substrate for attachment. Hawksbills are omnivorous and prefer invertebrates, especially encrusting organisms, and will feed on plant material such as algae, seagrasses and mangroves (Carr 1952; Rebel 1974; Pritchard 1977; Musick 1979; Mortimer 1982). Hawksbills also occur around rocky outcrops and high energy shoals, which are also optimum sites for sponge growth (NMFS and USFWS 1993).

Hawksbills nest on average about 4.5 times per season at intervals of approximately 14 days (Corliss et al. 1989). In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest (NMFS and FWS 1993). On the basis of limited information, nesting migration intervals of two to three years appear to predominate. Hawksbills are recruited into the reef environment at about 14 inches in length and are believed to begin breeding about 30 years later. However, the time required to reach 14 inches in length is unknown and growth rates vary geographically. As a result, actual age at sexual maturity is unknown.

Population Dynamics

There has been a global population decline of over 80% during the last three generations (105 years) (Meylan and Donnelly 1999). In the Western Atlantic, the largest hawksbill nesting population occurs in the Yucatan Peninsula of Mexico, where several thousand nests are recorded annually in the states of Campeche, Yucatan, and Quintana Roo (Garduño-Andrade et al. 1999). Important, but significantly smaller nesting aggregations, are documented elsewhere in the region in Puerto Rico, the U.S. Virgin Islands, Antigua, Barbados, Costa Rica, Cuba, and Jamaica (Meylan 1999). Estimates of the annual number of nests for each of these areas are on the order of hundreds to a few thousand. Nesting within the southeastern U.S. and U.S. Caribbean is restricted to Puerto Rico, the U.S. Virgin Islands, and, rarely, Florida (Eckert 1995, Meylan 1999). At the two principal nesting beaches in the U.S. Caribbean where long-term monitoring has been carried out, populations appear to be increasing (Mona Island, Puerto Rico) or stable (Buck Island Reef National Monument, St. Croix, USVI) (Meylan 1999).

Species Occurrence in Action Area

From 2008 to 2012, the Florida Sea Turtle Nesting Beach Monitoring Program did not find Hawksbill present at surveyed beach sites in the Florida panhandle (FWC 2013d). Figure 8 illustrates the locations where hawksbill sea turtles have been observed in the project area. No hawksbill sea turtles have been observed in the general project area.

Figure 8. Map illustrating occurrence of hawksbill sea turtles in the project area between 2008 and 2012. Source: FWC, 2013d

Leatherback Sea Turtle

Status of the Species and Critical Habitat

The leatherback sea turtle was federally listed as an endangered species on June 2, 1970 (35 FR 8491). Leatherbacks have the widest distribution of the sea turtles with nonbreeding animals having been recorded as far north as the British Isles and the Maritime Provinces of Canada and as far south as Argentina and the Cape of Good Hope (Pritchard 1992). Excursions of foraging leatherbacks have been documented into higher-latitude, subpolar waters. They have evolved physiological and anatomical adaptations (Frair et al. 1972, Greer et al. 1973) that allow them to exploit waters far colder than any other sea turtle species.

Leatherbacks are the largest and deepest diving of all sea turtle species. Most adult leatherbacks average 6 feet in length and weigh from 500 to 1,500 pounds, but can reach up to 2,000 pounds. The carapace is distinguished by a leathery, oil-saturated connective tissue overlaying interlocking dermal bones. Hatchlings are dorsally mostly black and are covered with tiny scales. Jellyfish are the main staple of the leatherback diet, but they are also known to feed on other soft-bodied animals (NMFS 2013c).

Critical habitat has been designated for the Leatherback sea turtle in the U.S. Virgin Islands, Puerto Rico, and the U.S. West Coast (NMFS 2013c).

Life History

Leatherbacks nest an average of five to seven times within a nesting season, with an observed maximum of 11 nests (NMFS and FWS 1992). The interval between nesting events within a season is about nine to 10 days. Clutch size averages 80 to 85 yolked eggs, with the addition of usually a few dozen smaller, yolkless eggs, mostly laid toward the end of the clutch (Pritchard 1992). Nesting migration intervals of two to three years were observed in leatherbacks nesting on the Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands (McDonald et al. 1991). Leatherbacks are believed to reach sexual maturity in six to 10 years (Zug and Parham 1996).

Adult females require sandy nesting beaches backed with vegetation and sloped sufficiently so the distance to dry sand is limited. Their preferred beaches have proximity to deep water and generally rough seas. Leatherback turtle nesting grounds are distributed worldwide in the Atlantic, Pacific, and Indian Oceans on beaches in the tropics and sub-tropics. The Pacific Coast of Mexico historically supported the world's largest known concentration of nesting leatherbacks. The leatherback turtle regularly nests in the U.S. Caribbean in Puerto Rico and the U.S. Virgin Islands. With the exception of a few nests on the west coast, leatherbacks nest almost exclusively on the east coast of Florida. In fact, about 50 percent of leatherback nesting occurs in Palm Beach County. Leatherback nesting in Florida occurs from April through July (FWC 2013e).

Population Dynamics

Leatherbacks have the widest geographic range of any sea turtle, and possibly any reptile (Ernst et al. 1994). They can be found worldwide in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans. They appear to be one of the most migratory sea turtles and are well adapted for open ocean existence. Small numbers of leatherbacks travel as far north as British Columbia and Newfoundland, and as far south as the Cape of Good Hope, Tasmania, and Argentina. Leatherbacks can also be found along the Atlantic and Pacific Coasts of the continental U.S., and occur throughout the Gulf of Mexico. The most recent population size estimate for the North Atlantic alone is a range of 34,000 to 94,000 adult leatherbacks (TEWG 2007).

Species Occurrence in Action Area

Figure 9 illustrates the locations where leatherback sea turtles have been observed nesting in the project area. Nesting occurs on the beaches and shorelines, and project work will take place primarily in open water habitat, thus, project work is not expected to directly affect nesting habitat. Leatherback sea turtles have been observed nesting at low density (less than 25% of density values) in approximately half of the shorelines in the project area. Leatherback sea turtles are not present throughout approximately half of the project area. Out of 1,712 nests recorded in the state of Florida in 2012, only 4 nests occurred on the shoreline of the proposed action area (FWC 2013a). The mean annual nests in the proposed action area between 2008 and 2012 was less than 0.18/km (FWC 2013e, FWC 2013f)

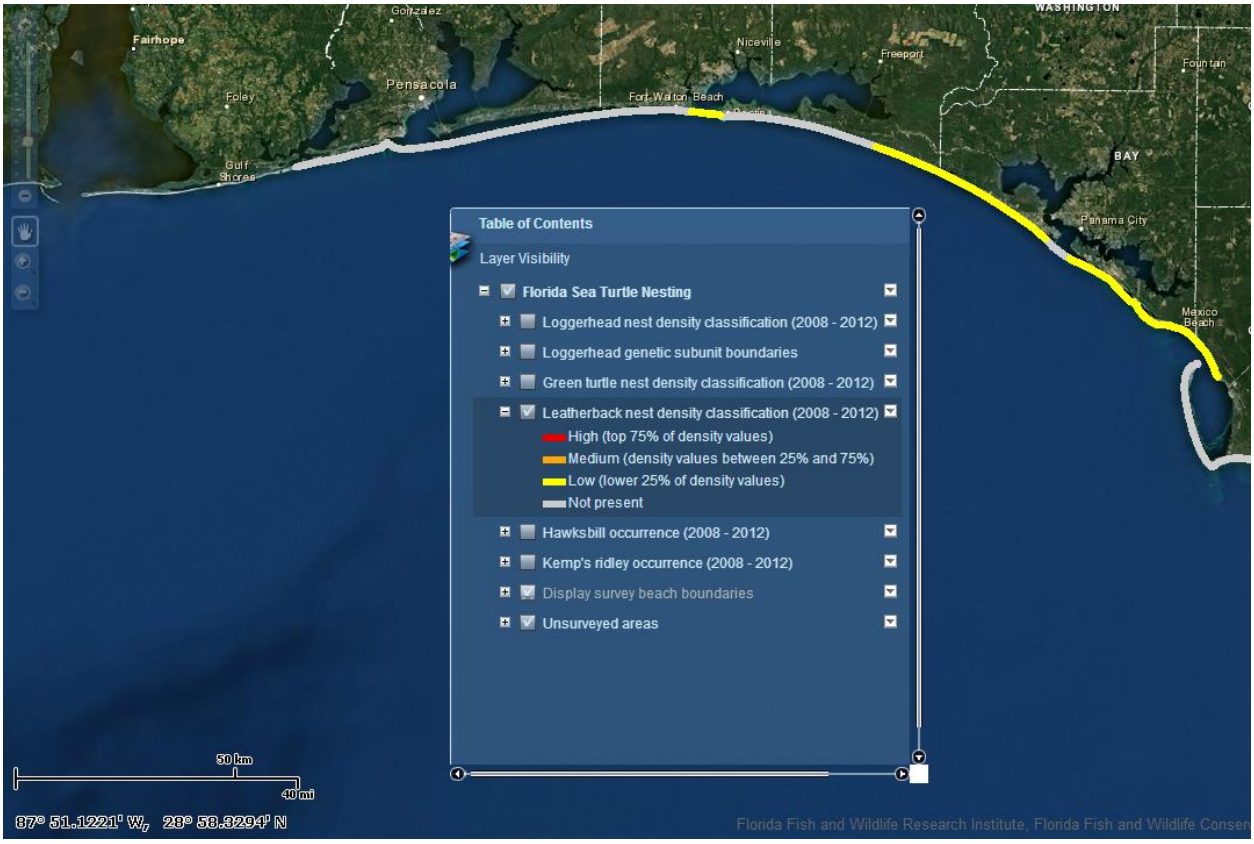

Figure 9. Map illustrating the observed nesting density of leatherback sea turtles in the project area. Source: FWC, 2013d

Kemp's Ridley Sea Turtle

Status of the Species and Critical Habitat

The Kemp's ridley sea turtle was federally listed as endangered on December 2, 1970 (35 FR 18320). The Kemp's ridley has the most geographically restricted distribution of any sea turtle species. The range of the Kemp's ridley includes the Gulf coasts of Mexico and the U.S. and the Atlantic coast of North America as far north as Nova Scotia and Newfoundland. Adult Kemp's ridleys, considered the smallest sea turtle in the world, weigh an average of 100 pounds with a carapace measuring between 24-28 inches in length. The almost circular carapace has a grayish green color while the plastron is pale yellowish to cream in color. The carapace is often as wide as it is long. Their diet consists mainly of swimming crabs, but may also include fish, jellyfish, and an array of mollusks.

The majority of nesting for the entire species occurs on the primary nesting beach at Rancho Nuevo, Mexico (Marquez-Millan 1994). Hatchlings, after leaving the nesting beach, are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 7.9 inches in length, at which size they enter coastal shallow water habitats (Ogren 1989). Adult Kemp's ridleys are believed to spend most of their time in the Gulf of Mexico, while juveniles and subadults also regularly occur along the eastern seaboard of the U.S. (USFWS and NMFS 1992). There have been rare instances when immature ridleys have been documented making transatlantic movements (USFWS and NMFS 1992).

No critical habitat has been designated for the Kemp's ridley sea turtle.

Life History

Nesting occurs from April into July during which time the turtles appear off the Tamaulipas and Veracruz coasts of Mexico. Precipitated by strong winds, the females swarm to mass nesting emergences, known as "arribadas or arribazones," to nest during daylight hours. The period between Kemp's ridley arribadas averages approximately 25 days (Rostal et al. 1997), but the precise timing of the arribadas is highly variable and unpredictable (Bernardo and Plotkin 2007). Some females breed annually and nest an average of one to four times in a season at intervals of 10 to 28 days. Analysis by Rostal (2007) suggested that ridley females lay approximately 3.1 nests per nesting season. Interannual remigration rate for female ridleys is estimated to be approximately 1.8 (Rostal 2007) to 2.0 years (Marquez-Millan et al. 1989). Age at sexual maturity is believed to be between 10 to 17 years (Snover et al. 2007).

Adult Kemp's primarily occupy "neritic" habitats. Neritic zones typically contain muddy or sandy bottoms where prey can be found. Their diet consists mainly of swimming crabs, but may also include fish, jellyfish, and an array of mollusks. Depending on their breeding strategy, male Kemp's ridleys appear to occupy many different areas within the Gulf of Mexico. Some males migrate annually between feeding and breeding grounds, yet others may not migrate at all, mating with females opportunistically encountered. Female Kemp's have been tracked migrating to and from nesting beaches in Mexico. Females leave breeding and nesting areas and continue on to foraging zones ranging from the Yucatán Peninsula to southern Florida. Some females take up residence in specific foraging grounds for months at a time (NMFS 2013d).

Population Dynamics

Most Kemp's ridleys nest on the coastal beaches of the Mexican states of Tamaulipas and Veracruz, although a small number of Kemp's ridleys nest consistently along the Texas coast (TEWG 1998). In addition, rare nesting events have been reported in Alabama, Florida, Georgia, South Carolina, and North Carolina. Historical information indicates that tens of thousands of ridleys nested near Rancho Nuevo, Mexico, during the late 1940s. The Kemp's ridley population experienced a devastating decline between the late 1940s and the mid-1980s.

The total number of nests per nesting season at Rancho Nuevo remained below 1,000 throughout the 1980s, but gradually began to increase in the 1990s. In 2009, 16,273 nests were documented along the 18.6 miles of coastline patrolled at Rancho Nuevo, and the total number of nests documented for all the monitored beaches in Mexico was 21,144 (USFWS 2009). In 2010, a total of 13,302 nests were documented in Mexico (USFWS 2010). In addition, 207 and 153 nests were recorded during 2009 and 2010, respectively, in the U.S., primarily in Texas.

Species Occurrence in Action Area

Kemp's ridley nests were found to be present along surveyed beaches near the proposed project areas from 2008 to 2012 by the Florida Sea Turtle Nesting Beach Monitoring Program (FWC 2013d). Figure 10 illustrates the locations where Kemp's Ridley sea turtles have been observed nesting in the project area. Nesting occurs on the beaches and shorelines, and project work will take place primarily in open water habitat, thus, project work is not expected to directly affect nesting habitat. Kemp's ridley sea turtles have been observed in less than half of the shorelines in the project area and are not present throughout the rest of the area.

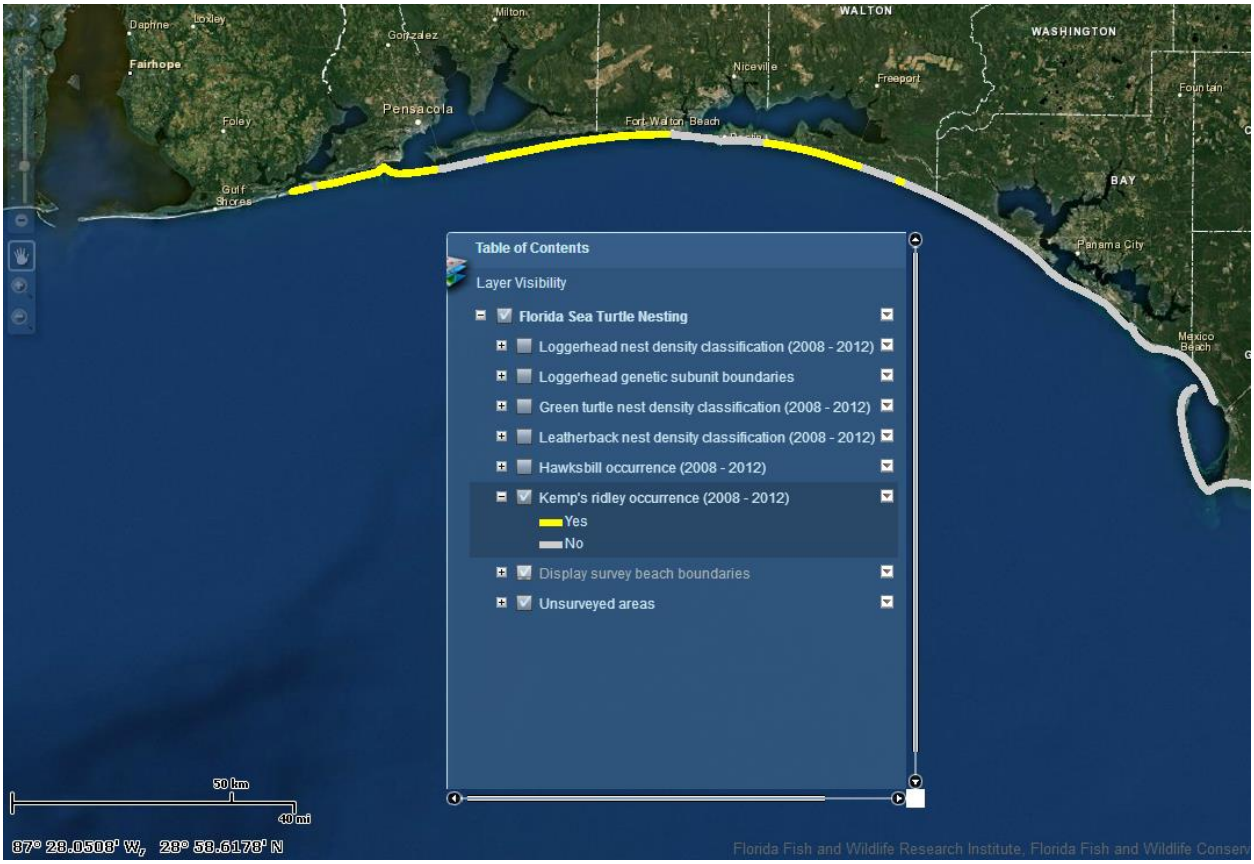

Figure 10. Map illustrating the observed nesting density of Kemp's Ridley sea turtles in the project area. Source: FWC, 2013d

Environmental Baseline

Geology and Substrates

Affected Resources

The existing geology and substrates in the project area for artificial reef installation is generally flat or gently sloping. The five counties where restoration is planned are part of the Gulf of Mexico formation. Each proposed project location supports existing artificial reef structures.

Sediments

Sediments in the area have been sculptured from alluvial plain underlain by sand, gravel, silt, and clay. The soil surveys for the various counties identify the areas for reef deployment as "waters of the Gulf of Mexico," and no soils data are provided (NRCS 2013).

Hydrology and Water Quality

Affected Resources

Artificial reef installation would take place in nearshore, open-water habitats and shallower waters closer to shores in the waters of five counties in the panhandle of Florida. Existing hydrology and water quality are affected by shoreline development and management, as well as boat traffic in the bays and Gulf of Mexico.

Water Quality

The CWA requires that the surface waters of each state be classified according to designated uses. Florida has six classes with associated designated uses, which are arranged in order of degree of protection required. According to 62-302.400, Fla. Admin. Code, most of the project occurs within Class III waters. Therefore, standards to meet the following uses apply to the project area: fish consumption, recreation, and propagation and maintenance of a healthy, well-balanced population of fish and wildlife. The surface waters of the state are designated Class III unless otherwise described in Florida rule. Short-term water quality impacts are possible due to sediment disturbance during artificial reef installation at project sites.

Gulf Sturgeon Baseline Information

Areas within the Pensacola Bay system where Gulf sturgeon show a preference (Redfish Point, Fort Dickens, Escribano Point near Catfish Basin, and Ft. Pickens) are protected or managed for conservation by state and federal agencies. These areas are also protected as critical habitat (Critical Habitat Unit 9). A 5-Year Assessment for the Gulf sturgeon used mark-recapture studies to estimate population size at a riverine scale. This data showed a roughly stable or slightly increasing population trend in eastern (Florida) river systems. However, the number of Gulf sturgeon in the Escambia River system may have declined due to hurricane impacts. Importantly though for this project, no artificial reef emplacement will occur in Pensacola Bay waters.

Sea Turtle Baseline Information

Loggerheads, green turtles, and leatherbacks nest regularly in Florida; hawksbill and Kemp’s ridley turtle nesting is rare. A detailed analysis of Florida's long-term loggerhead nesting data (1989-2013) revealed three distinct annual trends. Following a 30 percent increase between 1989 and 1998, nest counts declined sharply over nearly a decade. However, annual nest counts showed a strong increase over the last six years. Examining only the period between the high-count nesting season in 1998 and the most recent nesting season (2013), researchers found no demonstrable trend, indicating a reversal of the post-1998 decline. The overall change in counts from 1989 to 2013 was positive (29.29 percent). Nest counts in 2013, corrected for subtle variation in survey effort, were slightly below the high nest count recorded in 1998 (FWC 2013g). In contrast to the loggerhead nesting trend, nest counts for green turtles and leatherback turtles in Florida have increased dramatically over the 25-year period. Average increases for these two sea turtle species have been approximately 11 to 13 percent per year. These two species nest on many of the same beaches in Florida as the loggerhead, but in smaller numbers (FWC 2013g).

Other Consultations in Action Area to Date

All permitted reef areas have been and will be subject to consultation and review with the U.S. Army Corps of Engineers and, in most cases, the FDEP. Given the multi-county area and numerous potential locations where the artificial reef units could be placed not all consultations completed to date in the area have been identified.

Effect of the Proposed Action

Gulf Sturgeon

The proposed action was evaluated for impacts to Gulf sturgeon and their critical habitat. Gulf sturgeon mortality may occur from certain in-water activities including boat traffic. Mortality due to boat collisions is rare, but can occur especially in shallow waters. Potential impacts from project activities may be avoided by imposing work restrictions during sensitive time periods (i.e., spawning, migration, staging, feeding) when sturgeon are most vulnerable to mortalities. Currently, plans for the summertime deployment of the artificial reef modules are consistent with the period when Gulf sturgeon would be in riverine habitats thereby helping reduce the risk of collisions. The risks to Gulf sturgeon will be further mitigated as a result of the species' mobility and their ability and likely desire to avoid the project work areas as a result of noise and disturbance. As a result, of the low likelihood of encountering Gulf sturgeon at the project sites and as a result of incorporation of the *Sea turtle and Smalltooth Sawfish Construction Guidelines* (NOAA, 2006), which should further help reduce the risks of direct adverse impacts to the point they are not likely to be detectable or measureable, we believe the project will result in discountable impacts to Gulf sturgeon.

Critical Habitat

As previously described the deployment of materials/modules for the planned artificial reefs will all occur in Gulf of Mexico waters. In some locations, these areas will intersect with Gulf sturgeon critical habitat unit 11 (Florida Nearshore Gulf of Mexico unit). The following critical habitat features are present and may be affected by the proposed action: (1) water quality; (2) migratory pathways; (3) abundant prey items necessary for normal behavior, growth, and viability of all life stages.

Water Quality

The project is not expected to adversely impact water quality. For a short duration after initial reef deployment there will may some re-suspension of the in-situ sediments, and are expected to settle out naturally. Turbidity reduction devices would not be effective and cannot be used under this circumstance. The proposed activity will not affect water quality in the long term but may increase turbidity until sediment settles following placement of the reef units. These effects would not be detectable or measureable so would be discountable and thus not affect sturgeon activities that depend on the maintenance of a certain quality of water over longer periods of time.

Migratory Pathways

The proposed activity will not hinder sturgeon migration patterns given the dispersed placement of the units, and their leaving clearance room to the surface. As a result, the proposed activity will not affect migration behavior of the gulf sturgeon.

Prey items

The project site is not located within a riverine area and will not alter or negatively affect foraging opportunities.

As a result, we believe the emplacement of artificial reef units through this project will result in discountable impacts to Gulf sturgeon.

Sea Turtles

No work will occur in the terrestrial environment; therefore no impacts will occur to sea turtle species in the terrestrial environment. Consultation will be initiated with NMFS, as this agency has jurisdiction to review impacts to sea turtles in the estuarine and marine environments. The main risk to sea turtles during execution of this project would come from boat collisions which could result in harm or mortality.

The proposed action was evaluated for impacts to 5 threatened or endangered sea turtles and their critical habitat (Green, Loggerhead, Hawksbill, Leatherback, and Kemp's Ridley). The proposed project direct action area is in open water so does not contain suitable nesting habitat for sea turtles; therefore no effects are anticipated to nesting sea turtles. However, in-water impacts to sea turtles using the proposed action area could occur. Based on nesting surveys it is unlikely that Hawksbill sea turtles will occur within the project action area (see discussion above). For the remaining species there are nesting areas in the project area that suggest the turtles could be encountered.

Sea turtle mortality may occur from certain in-water activities including boat traffic and dredging. Mortality due to boat collisions is rare, but can occur especially in shallow waters. Potential impacts from boat/barge operations associated with emplacement of artificial reef modules will be mitigated by requiring compliance during all in-water activities with the *Sea turtle and Smalltooth Sawfish Construction Guidelines* (NOAA, 2006).

In addition, sea turtles are mobile and will likely avoid active deployment areas due to project activity and noise. The clearance of the placed units to the water surface means the project would not be expected to impede sea turtle migratory routes. In summary, impacts to these species, if any, would be short-term and minor. If any sea turtles are found to be present in the immediate project area during restoration activities, construction would be halted until species moves away from project area. *Sea turtle and Smalltooth Sawfish Construction Guidelines* (NOAA, 2006) also include construction personnel education, use of "no wake/idle" speeds in proper locations, adhering to protection guidelines when a sea turtle is within 100 yards or activities, and reporting turtle injuries will be utilized to prevent and minimize impacts to sea turtles.

As a result, we believe the mobility of the sea turtles combined with the adherence to relevant in-water construction guidelines (NOAA, 2006) during emplacement activity will result in impacts that are not likely to be measurable or detectable so are insignificant with respect to sea turtles.

Critical Habitat

Critical habitat for the green sea turtle has been designated for the waters surrounding Culebra Island, Puerto Rico, and its outlying keys (63 FR 46693). Marine and terrestrial critical habitat for the leatherback sea turtle has been designated at Sandy Point on the western end of the island of St. Croix, U.S. Virgin Islands (44 FR 17710) and critical habitat will be reassessed during the future planned status review (76 FR 47133). Critical habitat for the hawksbill sea turtle has been designated for selected beaches and/or waters of Mona, Monito, Culebrita, and Culebra Islands, Puerto Rico (63 FR 46693). No designated critical habitat for the green, leatherback, or hawksbill sea turtles occurs within the action area. No critical habitat has been designated for the Kemp's ridley sea turtle; therefore, none will be adversely affected or modified.

The project areas in Escambia and Santa Rosa counties may overlap with a currently proposed critical habitat area (LOGG-N-33) (NOAA, 2013). Primary constituent elements (PCEs) that support this habitat include:

(1) Nearshore waters directly off the highest density nesting beaches as identified in 78 FR 18000 (March 25, 2013) to 1.6 km offshore;
(2) Waters sufficiently free of obstructions or artificial lighting to allow transit through the surf zone and outward toward open water; and
(3) Waters with minimal manmade structures that could promote predators (i.e., nearshore predator concentration caused by submerged and emergent offshore structures), disrupt wave patterns necessary for orientation, and/or create excessive longshore currents.

The proposed project will not introduce obstructions or artificial lighting that will impede transit through the surf zone, promote predators or disrupt wave patterns or currents given the relatively small aquatic area affected and the depth the structures will be placed at and their locations..

As a result, the emplacement of artificial reef materials will result in effects that are not likely to be detectable or measurable to identified proposed critical nesting habitat to loggerhead sea turtles so impacts to this habitat would be discountable.

Conservation Measures

Conditions within the *Sea turtle and Smalltooth Sawfish Construction Guidelines* (NOAA, 2006) (Appendix A) and the *Standard Manatee Conditions for In-water Work* (USFWS, 2011) (Appendix B) will be implemented and adhered to as part of this project. In addition, as previously described, in locations where pyramid-type structures are selected for use all modules to be deployed will include an opening at the "pyramid" top that is no less than 3 feet wide.

Determination of Effect

Based upon the findings of this BA, the proposed action "may affect, but is not likely to adversely affect" the following species under the purview of the NOAA Fisheries:

- Gulf Sturgeon - The restoration operations associated with this project may affect, but not likely to adversely affect and will not jeopardize the continued existence of the species.
- Gulf Sturgeon Critical Habitat – The project footprint does fall within Gulf sturgeon critical habitat (Unit 11); however, it has been determined that the construction activities associated with this project will not adversely affect designated Gulf sturgeon critical habitat.
- Green Sea Turtle - The restoration operations associated with this project may affect, but not likely to adversely affect and will not jeopardize the continued existence of the species.
- Loggerhead Sea Turtle - The restoration operations associated with this project may affect, but not likely to adversely affect and will not jeopardize the continued existence of the species.
- Loggerhead Critical Habitat – The project footprint intersects loggerhead critical habitat unit LOGG-N-33. However, none of the PCEs associated with this nearshore reproductive habitat unit will be adversely affected by the project.
- Hawksbill Sea Turtle - The restoration operations associated with this project may affect, but not likely to adversely affect and will not jeopardize the continued existence of the species.
- Leatherback Sea Turtle - The restoration operations associated with this project may affect, but not likely to adversely affect and will not jeopardize the continued existence of the species.
- Kemp's Ridley Sea Turtle - The restoration operations associated with this project may affect, but not likely to adversely affect and will not jeopardize the continued existence of the species.

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Appendix A

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

The permittee shall comply with the following protected species construction conditions:

a. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles and smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of these species.

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.

c. Siltation barriers shall be made of material in which a sea turtle or smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers may not block sea turtle or smalltooth sawfish entry to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.

d. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

e. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

f. Any collision with and/or injury to a sea turtle or smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

g. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Revised: March 23, 2006
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Appendix B

STANDARD MANATEE CONSTRUCTION CONDITIONS FOR IN WATER WORK

STANDARD MANATEE CONDITIONS FOR IN-WATER WORK
2011

The permittee shall comply with the following conditions intended to protect manatees from direct project effects:

a. All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.

b. All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

c. Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.

d. All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shutdown if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

e. Any collision with or injury to a manatee shall be reported immediately to the Florida Fish and Wildlife Conservation Commission (FWC) Hotline at 1-888-404-3922. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-731-3336) for north Florida or in Vero Beach (1-772-562-3909) for south Florida, and emailed to FWC at ImperiledSpecies@myFWC.com.

f. Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Temporary signs that have already been approved for this use by the FWC must be used. One sign which reads *Caution: Boaters* must be posted. A second sign measuring at least 8½ " by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities. These signs can be viewed at http://www.myfwc.com/WILDLIFEHABITATS/manatee_sign_vendors.htm. Questions concerning these signs can be forwarded to the email address listed above.