# Appendix N

# Biological Assessment

# APPENDIX N
# BIOLOGICAL ASSESSMENT FOR THE PROPOSED PORT OF GULFPORT EXPANSION PROJECT HARRISON COUNTY, MISSISSIPPI

Prepared for:

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## Figures



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## Acronyms and Abbreviations

| | |
|---|---|
| AOU | American Ornithologist's Union |
| BA | Biological Assessment |
| BMC | Biloxi Marsh Complex – Northeastern Outlying Islands |
| BO | Biological Opinion |
| BU | beneficial use |
| BUG | Beneficial Use Group |
| CFR | Code of Federal Regulation |
| CIAP | Coastal Impact Assistance Program |
| cSEL | cumulative sound exposure level |
| cy | cubic yards |
| dB | decibels |
| dBA | A-weighted decibels |
| DMMP | Dredged Material Management Plan |
| DO | dissolved oxygen |
| EIS | Environmental Impact Statement |
| EPA | U.S. Environmental Protection Agency |
| ERDC | Engineer Research and Development Center |
| ESA | Endangered Species Act |
| ESCA | Endangered Species Conservation Act |
| °F | degrees Fahrenheit |
| FHWG | Fisheries Hydroacoustic Working Group |
| FNC | Federal Navigation Channel |
| FR | Federal Register |
| GRBO | Gulf of Mexico Regional Biological Opinion |
| Gulf | Gulf of Mexico |
| IMMS | Institute for Marine Mammal Studies |
| KCS | Kansas City Southern |
| LDNR | Louisiana Department of Natural Resources |
| mcy | million cubic yards |
| MBTA | Migratory Bird Treaty Act |
| MDEQ | Mississippi Department of Environmental Quality |
| MDMR | Mississippi Department of Marine Resources |
| MDWFP | Mississippi Department of Wildlife, Fisheries and Parks |
| mg/L | milligrams per liter |
| MLLW | mean lower low water |
| MMNS | Mississippi Museum of Natural Sciences |
| MMPA | Marine Mammal Protection Act |

| | |
|---|---|
| MPRSA | Marine Protection, Research, and Sanctuaries Act |
| MsCIP | Mississippi Coastal Improvements Program |
| msl | mean sea level |
| MSPA | Mississippi State Port Authority |
| NFWL | National Fish and Wildlife Laboratory |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanographic and Atmospheric Administration |
| NPS | National Park Service |
| ODMDS | Ocean Dredged Material Disposal Site |
| PCE | primary constituent elements |
| PGEP | Port of Gulfport Expansion Project |
| RMG | rail-mounted gantry crane |
| RMS | root mean square |
| STSSN | Sea Turtle Stranding and Salvage Network |
| TED | turtle excluder device |
| TEU | Twenty-foot Equivalent Unit |
| USACE | U.S. Army Corps of Engineers |
| USFWS | U.S. Fish and Wildlife Service |

# 1.0 INTRODUCTION

## 1.1 PURPOSE OF THE BIOLOGICAL ASSESSMENT

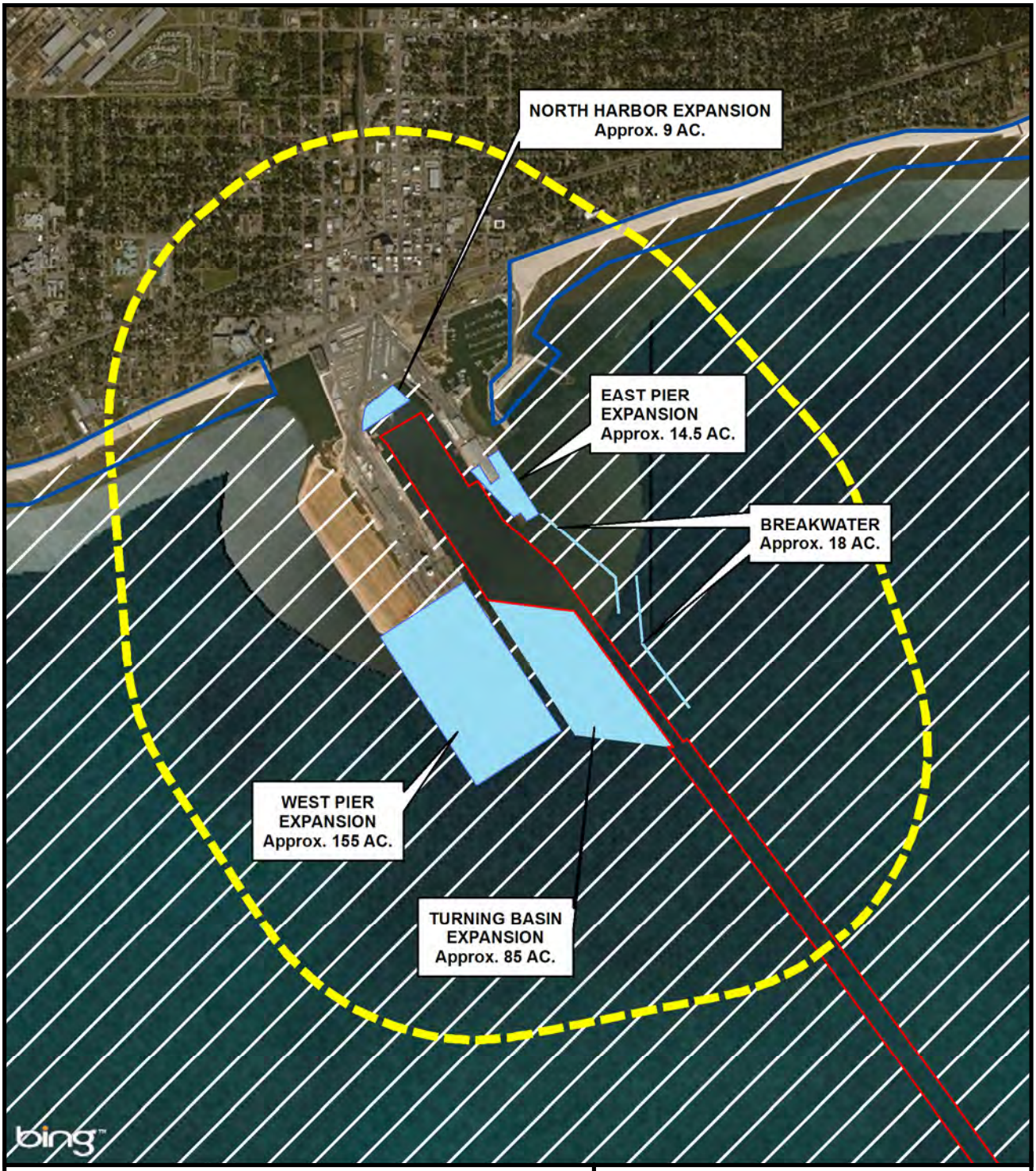
This Biological Assessment (BA) was prepared to fulfill the U.S. Army Corps of Engineers (USACE), Mobile District requirements as outlined under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. The proposed action requiring this assessment is the expansion of the Port of Gulfport in Harrison County, Mississippi, referred to as the Port of Gulfport Expansion Project (PGEP). To more accurately describe potential impacts associated with the PGEP or Project, both a study area and Project area have been defined. The study area encompasses a 10.5-mile radius that includes Harrison County, the southeastern edge of Hancock County and the southwestern tip of Jackson County, and continues into the Gulf of Mexico (Gulf) approximately 2 miles south of the barrier islands, including Cat Island, East Ship Island, and West Ship Island (Figure 1). The Project area is defined as the areas where actual dredge and fill activities would take place, and provides spatial boundaries for evaluation of resources that may be more-directly impacted by the construction and operation of the proposed Project, and is therefore a smaller area. Specifically, the Project area surrounding the Port is defined as the Project footprint with a 5,000-foot buffer (Figure 2). Additionally, disposal areas for new work dredged material would include the Biloxi Marsh Complex (BMC) and the Pascagoula Ocean Dredged Material Disposal Site (ODMDS) (Figure 1), located outside of the proposed Project area, as discussed in Section 1.2; maintenance dredged material would be disposed of as discussed in the Dredged Material Management Plan (DMMP) (Anchor QEA LLC, 2017, Appendix F of the EIS). The DMMP was prepared by Anchor QEA LLC (2017) to evaluate potential placement options for the new work and maintenance dredged material associated with the proposed Project. The BMC is the recommended placement alternative for the new work dredged material for the proposed Project. If the BMC is not permitted prior to dredging, and no other suitable BU sites are available, the Pascagoula ODMDS would be used for disposal of new work dredged material if the material is determined to be in compliance with Section 103 of the Marine Protection, Research, and Sanctuaries Act (MPRSA) (33 USC 1413). Appendix G of the EIS provides results from sediment sampling and testing conducted by MSPA for all sediment that would be dredged as part of the proposed Project according to requirements of Section 103 of the MPRSA. Material not suitable for disposal at the Pascagoula ODMDS would be designated for disposal at a permitted and approved upland disposal site(s). Initial results indicate that only a portion of the disposal material would not be feasible for ODMDS disposal (see Appendix G of the EIS) and would therefore be placed in a permitted and approved upland disposal site. This BA evaluates the potential impacts the proposed PGEP may have on federally listed threatened and endangered species identified by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS).


**Figure 1**

**Port of Gulfport Expansion Project**

**Critical Habitat in the Study Area**

| | |
|---|---|
| Prepared By: 19910 | Scale: 1" = 6 miles |
| Job No.: 100018536 | Date: Nov. 21, 2016 |





Project Area
**Proposed Project Features**
**Piping Plover Critical Habitat**
**Gulf Sturgeon Critical Habitat**
**Federal Navigation Channel (FNC)**

N

0 3,000 Feet

**Figure 2**

**Port of Gulfport Expansion Project**

**Critical Habitat in the Project Area**

| | |
|---|---|
| Prepared By: 13188 | Scale: 1" = 3000' |
| Job No.: 100018536 | Date: Nov. 21, 2016 |

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The NMFS and USFWS websites were referenced to determine species protected under the ESA with the potential to occur in the Project area that should be included in this BA. The NMFS website identified 11 species: Gulf sturgeon (*Acipenser oxyrinchus desotoi*), green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaengliae*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephalus*). The five whale species receive additional protection under the Marine Mammal Protection Act (MMPA) (NMFS, 2013a). The USFWS website identified several of the same marine species and the following additional nine species with the potential to occur in the Project area: rufa red knot (*Calidris canutus*), piping plover (*Charadrius melodus*), red-cockaded woodpecker (*Picoides borealis*), Louisiana black bear (*Ursus americanus luteolus*), dusky gopher frog (*Rana sevosa*), Alabama red-bellied turtle (*Psuedemys alabamensis*), gopher tortoise (*Gopherus polyphemus*), West Indian manatee (*Trichechus manatus*), and Louisiana quillwort (*Isoetes louisianesis*). Critical habitat for the Gulf sturgeon and piping plover are also addressed.

Additional state-protected species are listed by the Mississippi Department of Wildlife, Fisheries and Parks (MDWFP) as potentially occurring in Harrison County: black pine snake (*Pituophis melanoleucus lodingi*), eastern indigo snake (*Drymarchon couperi),* brown pelican (*Pelecanus occidentalis*), Mississippi sandhill crane (*Grus canadensis*), Crystal Darter (*Crystallaria asprella*), Ironcolor Shiner (*Notropis chalybaeus*) (Mississippi Museum of Natural Sciences [MMNS], 2011). Federally listed species that are non-marine and state listed species not specifically listed by the jurisdictional Federal agencies (NMFS and USFWS) are not addressed in this BA, because they are not likely to occur in the Project area.

Recently removed from the Federal list of threatened and endangered species, the American peregrine falcon, Arctic peregrine falcon, brown pelican, and bald eagle are protected under the Migratory Bird Treaty Act (MBTA), and the bald eagle continues to receive additional protection under the Bald and Golden Eagle Protection Act (64 *Federal Register* [FR] 164:46542–46558; 72 FR 130:37346–37372); however, these bird species are not included in this BA, as they are no longer protected under the ESA. Table 1 presents a list of the 14 federally listed threatened and endangered species that are addressed in this BA.

This BA also describes the avoidance, minimization, and conservation measures proposed for this Project relative to habitat and species covered in the BA. This BA is offered to assist the USFWS and NMFS personnel in fulfilling their obligations under the ESA. An Environmental Impact Statement (EIS) has been prepared to further address the potential effects resulting from the proposed Project.

Table 1
Federally Listed Threatened and Endangered Species Discussed

| Common Name[1] | Scientific Name[1] | Status | |
|---|---|---|---|
| | | USFWS | NMFS |
| **FISH** | | | |
| Gulf Sturgeon | *Acipenser oxyrinchus desotoi* | T | T w/CH |
| **REPTILES** | | | |
| Green sea turtle | *Chelonia mydas* | T | T |
| Hawksbill sea turtle | *Eretmochelys imbricata* | E | E |
| Kemp's ridley sea turtle | *Lepidochelys kempii* | E | E |
| Leatherback sea turtle | *Dermochelys coriacea* | E | E |
| Loggerhead sea turtle | *Caretta caretta* | T | T |
| **BIRDS** | | | |
| Piping plover | *Charadrius melodus* | T w/CH | N/A |
| Rufa red knot | *Calidris canutus* | T | N/A |
| **MAMMALS** | | | |
| Blue whale | *Balaenoptera musculus* | | E |
| Fin whale | *Balaenoptera physalus* | | E |
| Humpback whale | *Megaptera novaengliae* | | E |
| Sei whale | *Balaenoptera borealis* | | E |
| Sperm whale | *Physeter macrocephalus* | | E |
| West Indian manatee | *Trichechus manatus* | E | E |

[1] Nomenclature follows American Ornithologist's Union (AOU, 1998, 2000, 2002–2013), Crother et al. (2008), USFWS (2013), and NMFS (2013b–f).

E – Endangered; T – Threatened; w/CH – with designated Critical Habitat;
N/A – Status Not Applicable for that Agency.

## 1.2 PROPOSED PROJECT ALTERNATIVE

The proposed PGEP involves the dredging and filling of approximately 282 acres of estuarine mud and sand bottom habitat in Mississippi Sound for the construction of wharfs, bulkheads, terminal facilities, container storage areas, intermodal container transfer facilities, expanded turning basin, and construction of a 4,000-linear-foot breakwater, and the placement of new work and maintenance dredged material (refer to Table 2). The expansion and modification of the Port facility under the Proposed Project Alternative would be configured and automated as described below. The main features of this alternative include:

- Expansion of the West Pier
- Expansion of the East Pier
- Fill in the North Harbor
- Expansion of the federally authorized Turning Basin (at 36-foot depth)
- Construction of an eastern breakwater

- Placement of dredged material
- Site configuration and automation

Table 2
Proposed Project Alternative, Direct Impact Estimates

| Feature | Estimated Acreage Impact (acres) | Estimated Dredged Material Volume (mcy) |
|---|---|---|
| West Pier Expansion | 155 | 2.40 |
| East Pier Expansion | 15 | 0.56 |
| North Harbor Expansion | 9 | 0.91 |
| Breakwater | 18 | 0 |
| Turning Basin Expansion | 85 | 3.80 |
| Totals | 282 | 7.68* |

*560,000 cubic yards (cy) of dredged material is designated for upland disposal.
mcy = million cubic yards

The Proposed Project Alternative assumes that the Restoration Project has been completed. The Restoration Project (or 84-acre project) consists of restoring 60 acres destroyed by Hurricane Katrina and filling 24 acres on the west side of the West Pier thereby completing the 84-acre project, as originally permitted in 1998 (see Section 1.3.1 in the EIS). The proposed PGEP features would be added to the post-Restoration Project footprint, with a few exceptions as discussed below (Table 3).

The proposed expansion features (not including the post-Restoration Project footprint) would be elevated to up to +25 feet msl to provide protection against future tropical storm surge events. The post-Restoration Project footprint would be elevated to up to +14 feet msl, with the proposed expansion footprint elevated to up to +25 feet msl. Each feature of the proposed expansion footprint is provided in Table 3. Fill material would be obtained from permitted sites along the Tennessee-Tombigbee River and transported into the Port via barge for construction (see MSPA letter dated January 7, 2016, Appendix E-1 of the EIS).

## West Pier Expansion

The West Pier Expansion is intended for development of a new concession area consisting of new, multiuse semi-automated container terminals. The proposed concession area would extend to the south of the West Pier footprint approximately 3,500 linear feet, adding approximately 155 acres to the existing facility. Prior to construction, the expansion footprint may require dredging for removal of soft to very soft foundation materials and to mitigate mud waves outside of the project footprint. The estimated volume of dredged material is 2.4 mcy (Anchor QEA LLC, 2017, Appendix F of the EIS).

Table 3
Port Footprint Following Proposed Port of Gulfport Expansion Project, Including the Turning Basin Area (Acres)

| Feature | Post-Restoration Footprint | Proposed Expansion Footprint | Total Footprint |
|---|---|---|---|
| West Pier | 171 | 155 | 326 |
| East Pier | 30 | 14.5 | 44.5 |
| North Harbor | 63 | 9 | 72 |
| Turning Basin | 105 | 85 | 190 |
| Breakwater | N/A | 18 | 18 |
| Total Footprint | 369 | 281.5 | 650.5 |

## East Pier Expansion

The East Pier Expansion would add approximately 14.5 acres to the working surface of the Port's existing East Pier facility. This area would be used for rail operations and a new berth, and would provide additional space for McDermott. Similar to the West Pier Expansion, this area may require dredging prior to construction. The estimated volume of dredged material is 560,000 cy, which is generally debris that would be disposed of in the permitted upland Harrison County Development Commission disposal site on Industrial Seaway in Gulfport (Anchor QEA LLC, 2017, Appendix F of the EIS). The disposal site is immediately adjacent to the canal and material would be transported by barge, unloaded and placed into disposal cells where it would dewater, with no additional hauling or trucking required (see MSPA letter dated August 17, 2016, Appendix E-1 of the EIS).

## North Harbor Expansion

The North Harbor Expansion would create approximately 9 acres of upland in the area formerly occupied by the *Copa Casino* boat. This upland area would be used as a new berthing area. Both new work dredging associated with the construction of this berth and future maintenance dredging would be required in this area (Anchor QEA LLC, 2017, Appendix F of the EIS). The estimated volume of new work dredged material is 913,000 cy, with an estimated future maintenance dredging volume between 212,000 and 581,000 cy every year.

## Turning Basin Expansion

The existing Gulfport Turning Basin would be expanded to support the West Pier Expansion. The proposed Turning Basin Expansion (approximately 85 acres) would be between the existing Sound Channel and the proposed terminal, immediately adjacent to the Gulfport Turning Basin. This area would be dredged to a depth of –36-foot mean lower low water (MLLW) plus 2 feet of advance maintenance, plus 2 feet of allowable overdepth, and up to an additional 3 feet due to a sediment disturbance layer consistent with the adjacent FNC and USACE maintenance dredging practices (Anchor QEA LLC, 2017, Appendix F of the

EIS). The estimated volume of new work dredged material is 3.8 mcy, with an estimated future maintenance dredging volume of between 211,000 and 586,000 cy every year.

### Eastern Breakwater

A 4,000-linear-foot rip-rap breakwater is proposed on the eastern side of the FNC to provide protection from tropical storm events. The breakwater would vary from 98 to 102 feet wide at its base with a top width of 10 feet and a top elevation of +10 feet NAVD 88. The proposed breakwater would require placing approximately 250,000 cy of rip-rap over a footprint of approximately 18 acres. Baker (2011) evaluated four breakwater alternatives for the PGEP to determine the need to protect the expanded West Pier under storm conditions. Numerical modeling was used to recommend alternatives that would provide protection to the turning basin and terminals while maintaining operational and navigational utility. Modeling indicated that wave action would impact the expanded West Pier compared with current conditions and a need for a breakwater could not be ruled out. The Proposed Project Alternative provides protection from wave energy from the south and east. A breach midway along the alignment of the structure is planned to allow shallow-draft access to the FNC from the adjacent Bert Jones Marina and at the recommendation of the pilots performing ship simulations.

### Dredged Material Placement

The new work dredging associated with the construction of the proposed West Pier and East Pier expansions, North Harbor and West Pier berthing areas, and the Turning Basin expansion is estimated to require removal of approximately 7.68 mcy of dredged material, including 560,000 cy of dredged material (debris from East Pier) that would be designated for upland disposal. Following construction of the Turning Basin Expansion, the Mississippi State Port Authority (MSPA) would be responsible for maintenance dredging of the portion of the new turning basin that is not part of the federally authorized project, as well as the berthing areas associated with the expanded East Pier, North Harbor, and West Pier. Maintenance dredging associated with these areas is anticipated to require removal of approximately 486,000 cy to 1.3 mcy every year. A DMMP was prepared to evaluate potential placement options for the new work and maintenance dredged material associated with this Proposed Project Alternative (Anchor QEA LLC, 2017, Appendix F of the EIS). Estimated dredged material quantities are shown in Table 4. Estimated dredge quantities assume maintenance for a 30-year period. At this time, it is expected that new work dredging would occur using mechanical/hopper dredge and maintenance dredging would occur using hydraulic/cutterhead or mechanical/hopper dredges, as necessary.

The DMMP evaluated multiple placement alternatives for new work and maintenance dredged material. Sites considered for placement of dredged material included:

- Use as fill for the West Pier Expansion
- 12 designated Beneficial Use (BU) sites
- Thin layer placement

- Candidate BU sites
- Placement in an approved ODMDS
- Placement in an approved and permitted upland disposal site(s)

Table 4
Estimated Dredge Material Quantities (Proposed Project Alternative)

| Feature | West Pier Expansion | East Pier Expansion | North Harbor and West Pier Berthing Areas | Turning Basin Expansion | Total |
|---|---|---|---|---|---|
| New Work | 2.4 mcy | | 913,000 cy | 3.8 mcy | 7.11 mcy |
| New Work (upland disposal) | | 560,000 cy | | | 560,000 cy |
| Maintenance | N/A | 63,000–172,000 cy/year | 212,000–581,000 cy/year | 211,000–586,000 cy/year | 486,000 cy–1.3 mcy/year |

Source: Anchor QEA LLC (2017).
cy – cubic yards
mcy – million cubic yards

All sites were evaluated based on feasibility, potential environmental impacts, cost, and suitability of material. Potential BU sites were evaluated based on capacity and distance to the dredge site, taking into consideration habitat value, stability, and sediment transport. Recommendations were made for each option (Anchor QEA LLC, 2017, Appendix F of the EIS). Considering additional information is needed to finalize the recommendations of dredged material placement alternatives, the following summarizes the various placement options.

New work dredged material structurally suitable would be used for fill at the Project site. Any material not structurally suitable would be evaluated for potential beneficial use and possible placement at a designated or candidate BU site. The Mississippi Department of Marine Resources (MDMR) submitted a permit application to the USACE and Louisiana Department of Natural Resources (LDNR) in February 2016 to permit the Biloxi Marsh Complex (BMC) in Louisiana for beneficial use of dredged material. The goal of this designation is to provide a new BU site on the western side of the state to accommodate material generated from private and public dredging projects to meet the requirements of Mississippi's beneficial use law.

During the DMMP evaluation, the Port began discussions with the MDMR/USACE Beneficial Use Group (BUG) on using the BMC as a placement area for suitable dredged material from the Port (see Figure 1). For the proposed PGEP, the BUG was in favor of a BU site instead of an ODMDS. As such, the BMC is the recommended placement alternative for the new work dredged material for the proposed Project (Anchor QEA LLC, 2017, Appendix F of the EIS). If a suitable BU site is identified in Mississippi, appropriate coordination with MDMR and the Mississippi Department of Environmental Quality (MDEQ) for placement of dredged material at the approved and permitted location would occur at that time. The BMC BU site would function to provide needed particulate material for shoreline nourishment, as

protection from shoreline erosion on the Mississippi and Louisiana coasts, and to offset impacts to Essential Fish Habitat (EFH). If the BMC is not permitted prior to dredging, and no other suitable BU sites are available, the Pascagoula ODMDS (see Figure 1) would be used for disposal of new work dredged material if the material is determined to be in compliance with Section 103 of the MPRSA (33 USC 1413). Appendix G of the EIS provides results from sediment sampling and testing conducted by MSPA for all sediment that would be dredged according to requirements of Section 103 of the MPRSA. This comprehensive sampling process satisfies the requirements of EPA, MDMR, USACE New Orleans District, MDEQ, and LDNR for the placement of dredged material in either an ODMDS or BU site. New work, dredged material not suitable for beneficial use would also be placed in the Pascagoula ODMDS if it meets the criteria in Section 103 of the MPRSA. If the dredged material is not suitable for the ODMDS, the material would be placed in an approved and permitted upland disposal site(s). Initial results indicate that only a portion of the disposal material would not be feasible for ODMDS disposal (see Appendix G of the EIS) and would therefore be placed in a permitted and approved upland disposal site. Currently, the Harrison County Development Commission dredged material disposal site on the Industrial Seaway has capacity for up to 750,000 cy. The material would be transported by barge and offloaded to the disposal site as described in the DMMP (Anchor QEA LLC, 2017, Appendix F of the EIS). Because dewatering of the material occurs in the disposal site, dewatering of the dredged material before transporting or offloading is unnecessary. This site would be suitable for the East Pier Expansion dredged material. An upland disposal site 30 miles north of the Port in Stone County has been identified as a potential placement site for the remaining 7.11 mcy of dredged material; the name of the site and specific location have been withheld at the owner's request. For this option, the material would be mechanically dredged, dewatered, placed into trucks, and hauled to the disposal site for offloading. Considering that it would require approximately 14 years to dredge, transport, and offload the material to the upland disposal site, and would cost over $200 million, use of an upland disposal site for the 7.11 mcy of dredged material is not a viable placement alternative (Anchor QEA LLC, 2017, Appendix F of the EIS). However, this upland site may still be utilized for the portion of disposal material that could not feasibly be placed in an ODMDS or BU site. The Port would be responsible for maintenance dredging of those areas outside of Federal jurisdiction. Maintenance dredged material would be disposed of using thin-layer placement, as discussed in the DMMP (Anchor QEA LLC, 2017, Appendix F of the EIS).

### Site Configuration/Automation

The PGEP would further develop the Port into a semi-automated container terminal. The Port has added three rail-mounted gantry (RMG) cranes to Port operations. The road and rail access constructed for the Restoration Project would be extended south on the western side of the West Pier along the expansion footprint. The gantry crane rail would be extended south on the eastern side of the West Pier along the expansion footprint. New infrastructure would include a new wharf, backlands, gates, and an additional warehouse. The new terminal would increase throughput by reducing handling times, allowing ships to come into the Port, unload, reload, and depart in a day or less. The proposed layout assumes that all berths would be utilized as common berths, and the berthing of a vessel would be based on berth availability, vessel schedule, and tenant needs. With the semi-automated operation of the container terminal via RMG

cranes, refrigerated containers would be grounded within the RMG crane container blocks and placed four containers high and nine containers wide per row. This layout would require three-story steel platforms in front of each row for mechanics to access containers, plug into reefer receptacles, and perform monitoring, inspection, and pretripping of refrigerated equipment. Loading and unloading of containers would be performed by utilizing two RMG cranes to transfer containers between trackside ground positions and railcar well positions. The operation of the West Pier and the Turning Basin Expansion areas would include shared facilities, berths, backlands, and utilization of RMG cranes. With this layout, throughput capacity is projected to reach up to 1.7 million TEUs annually by 2060.

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# 2.0 STATUS OF THE LISTED SPECIES

To assess the potential impacts of the proposed Project on federally listed threatened and endangered species within the Project area, the USACE, Regulatory Division: (1) reviewed the online list of species from the NMFS and USFWS database to include in this BA; (2) reviewed available NMFS and USFWS literature, and other scientific data to determine species distributions, habitat needs, and other biological requirements; and (3) conducted an onsite evaluation, where feasible, of the biological resources within the Project area.

Literature sources consulted for this report include the USFWS series on endangered species of the seacoast of the U.S. (National Fish and Wildlife Laboratory [NFWL], 1980), Federal species status reports and recovery plans, peer-reviewed journals, and other standard references, such as agency websites. Habitat assessments were initially based on aerial photography. Input was also solicited from state and Federal resource agency personnel.

Species identified by the online list of the USFWS and NMFS sites for this BA are listed in Table 1 (Section 1.1). The following sections present the natural history of each considered species relevant to its potential occurrence in the broader study area. Section 3.0 presents the potential of the proposed action to affect these species.

## 2.1 GULF STURGEON

The Gulf sturgeon is a primitive anadromous fish, which means it breeds in freshwater after migrating up rivers from marine and estuarine environments. It is identified by its bony plates or scutes and is nearly cylindrical in form. The head ends in a hard, extended snout; the mouth is inferior and protrusible and is preceded by four conspicuous barbels. The tail (caudal fin) is distinctly asymmetrical, the upper lobe is longer than the lower lobe (heterocercal). Adults range from 4 to 8 feet in length, with adult females larger than males (50 Code of Federal Regulations [CFR] Part 226). In the late 19th century and early twentieth century, the Gulf sturgeon supported commercial fisheries, and was harvested for caviar, flesh for smoked fish, and other products. Overfishing of the species caused its numbers to decline throughout most of the 20th century. Habitat loss associated with the construction of in-water structures, such as dams and sills, also resulted in declining population numbers (50 CFR Part 226).

The Gulf sturgeon was listed on September 30, 1991, by the USFWS, as a threatened species under the ESA (16 United States Code [USC] 1531 et seq.) (56 FR 49653). The 1991 listing identified other potential threats that included modifications to habitat associated with dredged material disposal, desnagging (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; aquaculture and incidental or accidental introductions; and the Gulf sturgeon's slow growth and late maturation (50 CFR Part 226). The Gulf Sturgeon Recovery/Management Plan (USFWS et al., 1995) provides more information on the species decline and threats.

Critical habitat is a term used in the ESA to refer to specific geographic areas that are essential for the conservation of a threatened or endangered species and that may require special management and protection. Critical habitat was designated for the federally threatened Gulf sturgeon on March 19, 2003 (68 FR 13369 13495). There are 14 Designated Critical Habitat units for the Gulf sturgeon. The proposed Project area is located in Gulf sturgeon Critical Habitat Unit 8, which includes the following description (50 CFR Part 226):

The Mississippi Sound includes adjacent open bays including Pascagoula Bay, Point aux Chenes Bay, Grand Bay, Sandy Bay, and barrier island passes, including Ship Island Pass, Dog Keys Pass, Horn Island Pass, and Petit Bois Pass. The northern boundary of the Mississippi Sound is the shorelines of the mainland between Heron Bay Point, Mississippi and Point aux Pins, Alabama. Critical habitat excludes St. Louis Bay, north of the railroad bridge across its mouth; Biloxi Bay, north of the U.S. Highway 90 bridge; and Back Bay of Biloxi.

The primary constituent elements (PCEs) essential for the conservation of Gulf sturgeon are those habitat components that support feeding, resting, and sheltering, reproduction, migration, and physical features necessary for maintaining the natural processes that support these habitat components. Impacts to these PCEs are discussed in Section 4.19.2.

The PCEs for Gulf sturgeon include:

1. Abundant prey items within riverine habitats for larval and juvenile life stages, and within estuarine and marine habitats and substrates for juvenile, subadult, and adult life stages;
2. Riverine spawning sites with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone or hard clay;
3. Riverine aggregation areas, also referred to as resting, holding, and staging areas, used by adult, subadult, and/or juveniles, generally, but not always, located in holes below normal riverbed depths, believed necessary for minimizing energy expenditures during fresh water residency and possibly for osmoregulatory functions;
4. A flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) necessary for normal behavior, growth, and survival of all life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging; and necessary for maintaining spawning sites in suitable condition for egg attachment, egg sheltering, resting, and larvae staging;
5. Water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages;
6. Sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; and

7. Safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (e.g., a river unobstructed by any permanent structure, or a dammed river that still allows for passage).

Gulf sturgeon is under the joint jurisdiction of the USFWS and NMFS. The USFWS maintains primary responsibility for recovery actions, and NMFS assists in and continues to fund recovery actions pertaining to estuarine and marine habitats. The USFWS is responsible for all critical habitat consultations in riverine units. Responsibility for the estuarine units has been divided based on the action agency involved. The NMFS is responsible for all consultations regarding Gulf sturgeon and critical habitat in marine units. The NMFS has jurisdiction over the Gulf sturgeon for this Project based on the nexus with the USACE and the location of critical habitat units involving the proposed Project within marine units.

### 2.1.1 Habitat

A benthic habitat assessment of the proposed Project area and study area was conducted in 2012 (see Appendix L of the EIS). Results showed that similar habitat characteristics occur in the Project footprint, Project area, and study area that were documented at locations where adult Gulf sturgeon were repeatedly located. Preferred habitat is described as shallow water (<13 feet) over sandy substrate with water quality characteristics, such as high dissolved oxygen (DO) content (>7.2 milligrams per liter [mg/L]) that also contained two or three organisms known to occur in adult diets. Preferred habitat for the Gulf sturgeon within the Project footprint was located in the North Harbor Expansion, West Pier Expansion, and west of the West Pier Expansion areas (see Appendix L of the EIS).

### 2.1.2 Range

Historically, Gulf sturgeon occurred in rivers from the Mississippi River to the Tampa Bay, and in bays and estuaries from Florida to Louisiana, including the Pearl River and Pascagoula River (USFWS et al., 1995). Gulf sturgeon have been documented to inhabit coastal rivers from Louisiana to Florida during the warmer months and overwinters in estuaries, bays, and the Gulf. In Florida, Gulf sturgeon have been documented to spend summer months near the mouth of springs and cool water rivers in the Suwannee River (USFWS et al., 1995). Fox et al. (2002) found that Gulf sturgeon occupied the shoreline areas of Choctawhatchee Bay, Florida, in 7- to 10-foot waters over sand substrate.

Immature and mature Gulf sturgeon participate in freshwater migration. Studies have shown that subadults and adults spend 8 to 9 months each year in rivers and 3 to 4 of the coolest months in the estuaries or Gulf waters (USFWS et al., 1995).

### 2.1.3 Distribution in Mississippi

Gulf sturgeon are found in rivers, bays, and estuaries along the Mississippi Gulf Coast. Ross et al. (2009) and Heise et al. (2004) conducted an extensive tagging and tracking study from 1997 to 2004, where they followed individual fish throughout the Pascagoula and Pearl rivers, Mississippi Sound, and in Breton

Sound. In Mississippi Sound, the majority of the tracking effort was near the barrier islands and concentrated in the central and eastern portion of Mississippi Sound. Gulf sturgeon from both the Pearl and Pascagoula rivers are known to use the Mississippi Gulf Coast, including the barrier islands for migration and foraging. Rogillio et al. (2007) and Ross et al. (2009) located tagged adult Gulf sturgeon among Cat, Ship, Horn, and Petit Bois islands from October through March.

The USACE Engineer Research and Development Center (ERDC) is conducting an ongoing Gulf sturgeon monitoring effort at Ship Island in association with the Mississippi Coastal Improvements Program (MsCIP). The study's objective is to define the seasonal occurrences and movements of Gulf sturgeon around Ship Island and within Camille Cut. This research has shown that between September 2011 and June 2012, a total of 13,720 detections from approximately 14 Gulf sturgeon originating from five rivers (Pearl, Pascagoula, Escambia, Blackwater, and Yellow) were found in their study area (ERDC, 2012).

Comparatively, between September 2012 and June 2013, they logged 94,244 detections from 21 Gulf sturgeon originating from the Pearl, Pascagoula, Escambia, Blackwater, Yellow, Choctawhatchee and Brothers Rivers. The greatest number of Gulf sturgeon detected during the 2011-2012 sampling period occurred in November and December followed by decreasing monthly numbers for January through March. Whereas, the greatest number of fish documented during the 2012-2013 sampling period occurred in December with similar numbers through March. They noted a significant decrease in Gulf sturgeon activity in April, while the greatest number of detections was recorded in December and January. The fewest number of detections per month were reported for October and April (ERDC, 2013). The summary for the 2014 deployment period had not yet been submitted to the USACE.

Havrylkoff et al. (2012) used an array of automated telemetry receivers, to monitor Gulf sturgeon in the Pascagoula River and associated estuary. They observed that Gulf sturgeon appear to prefer the eastern distributary upriver from Bayou Chemise as the primary travel corridor between freshwater habitats and marine feeding grounds in the area studied. In their study, the western distributary of the Pascagoula River appeared to represent the main entrance point by Gulf sturgeon to the Pascagoula River (Havrylkoff, 2012). Prolonged and extensive use of the mouth of the Pascagoula River and immediate adjacent coastal habitats associated with the western distributary was observed in April and May during seasonal migrations, when previous manual tracking activity within this system had not documented Gulf sturgeon within the coastal nearshore environment between April and September. Findings by Havrylkoff et al. (2012) were supported by research conducted by Peterson et al. (2015) that documented Gulf sturgeon in the Mississippi Sound during May (Appendix O of the EIS). Recent tagging efforts led by Mark S. Peterson of the University of Southern Mississippi, Gulf Coast Research Laboratory and William T. Slack of the USACE ERDC have shown that adults spend more time in the Mississippi Sound than previously thought (Peterson et al., 2015, Appendix O of the EIS).

### 2.1.4 Presence in the Project Area and Study Area

Gulf sturgeon monitoring was conducted in the Mississippi Sound, between West and East Ship Islands, and around the proposed Project area from fall 2012 to fall 2014 [Peterson et al., 2015 (Appendix O of the EIS); Peterson, 2015]. The Gulf sturgeon monitoring study was conducted using a network of telemetry receivers in the area surrounding the proposed Project area (referred to as the Gulfport array) and further east (east gate) and west (west gate) between the Port and the Pascagoula and Pearl Rivers, respectively, to determine the use of near shore and project areas by Gulf sturgeon [Peterson et al., 2015 (Appendix O of the EIS)]. Key results from this study are summarized below; detailed results are provided in Appendix O of the EIS.

- Adult Gulf sturgeon are mainly from the Pascagoula and Pearl drainages, but there were some eastern population fish [Escambia, Choctawhatchee and Blackwater (recaptured fish) drainages] that appeared in the Gulfport array.
- Overall, Gulf sturgeon occurrence appears to be more concentrated on the east gate and eastern portion of the Gulfport array compared to the west gate and western portion of the Gulfport array.
- Total detections were markedly lower in the year 2 data set than year 1, with four individuals (two from each drainage) returning to the array over the 2 years of this monitoring study. These data suggest some level of consistent and repeatable regional-scale movement patterns in Gulf sturgeon from the western Gulf drainages.
- The number of detections per fish and time within the array varied greatly among all the detected Gulf sturgeon, with individuals taking both transitory paths through the array, and localized movements within the entire array.
- Gulf sturgeon from each life stage category (adult, sub-adult, juvenile) were detected. The adults, unexpectedly, had the greatest number of occurrences and detections. Juveniles and sub-adults life history stages may experience restricted movements away from natal rivers as young fish, and only begin to expand their range later with age, based on the relative low occurrence of detections of those two life history stages. However, adults have been documented within the proposed Project area during pre- and post-migratory periods. The data suggest that the Gulf sturgeon habitat monitored serves as a corridor between other habitat types, drainages, feeding zones, or is used as a pre-/post-migratory acclimation zone.

## 2.2 GREEN SEA TURTLE

The green sea turtle or green turtle was listed on July 28, 1978, as threatened, except for Florida and the Pacific Coast of Mexico (including the Gulf of California), where it was listed as endangered (43 FR 32808). The greatest cause of decline in green turtle populations is commercial harvest for eggs and food. Other turtle parts are used for leather and jewelry, and small turtles are sometimes stuffed as curios. Incidental catch during commercial shrimp trawling is a continued source of mortality that adversely affects recovery. It is estimated that before the implementation of turtle excluder devices (TEDs) requirements, the offshore commercial shrimp fleet captured about 925 green turtles a year, of which approximately 225 would die. Most turtles killed are juveniles and subadults. Various other fishing operations also negatively

affect this species (NMFS, 2013b). Epidemic outbreaks of fibropapilloma, or "tumor" infections, have occurred on green turtles, especially in Hawaii and Florida, posing a severe threat. The cause of these outbreaks is largely unknown, but it could be caused by a viral infection (Barrett, 1996). This species is also subject to various other threats shared by sea turtles in general (see Section 2.4).

### 2.2.1 Habitat

The green turtle primarily utilizes shallow habitats such as lagoons, bays, inlets, shoals, estuaries, and other areas with an abundance of marine algae and seagrasses. Individuals observed in the open ocean are believed to be migrants en route to feeding grounds or nesting beaches (Meylan, 1982). Hatchlings often float in masses of marine plants (e.g., *Sargassum* rafts) in convergence zones. Coral reefs and rocky outcrops near feeding pastures often are used as resting areas. The adults are primarily herbivorous, while the juveniles consume invertebrates. Their diets include seagrasses, macroalgae and other marine plants, mollusks, sponges, crustaceans, and jellyfish (Mortimer, 1982).

Terrestrial habitat is typically limited to nesting activities, although in some areas, such as Hawaii and the Galápagos Islands, green turtles often bask on beaches (Balazs, 1980). They prefer high-energy beaches with deep sand, which may be coarse to fine, with little organic content. At least in some regions, they generally nest consistently on the same beach, which is apparently their natal beach (Meylan et al., 1990; Allard et al., 1994), although an individual might switch to a different nesting beach within a single nesting season (Derek Green, Atkins, pers. obs.).

### 2.2.2 Range

The green turtle is a circumglobal species in tropical and subtropical waters. In U.S. Atlantic waters, it occurs around the U.S. Virgin Islands, Puerto Rico, and continental U.S. from Massachusetts to Texas. Major nesting activity occurs on Ascension Island, Aves Island (Venezuela), Costa Rica, and in Surinam. Relatively small numbers nest in Florida, with even smaller numbers in Georgia, North Carolina, and Texas (NMFS and USFWS, 1991; Hirth, 1997).

### 2.2.3 Distribution in Mississippi

Green turtles are generally found in tropical and subtropical waters along continental coasts. The Institute for Marine Mammal Studies (IMMS) in Gulfport, Mississippi, rehabilitated a green turtle that was caught by an angler on June 12, 2012, in Gulfport, Mississippi. The turtle was equipped with a satellite tracking device and released on October 25, 2012. The tracking showed that the turtle stayed in the Mississippi Sound for approximately 1 month before moving on to Chandeleur Sound, Louisiana, and was last recorded south of Bastian Bay, Louisiana (IMMS, 2012). The Sea Turtle Stranding and Salvage Network (STSSN), which documents strandings in Mississippi as well as other coastal states, documented seven green turtles in 2011, one in 2012, and two through August 2013 (National Oceanographic and Atmospheric Administration [NOAA], 2013). The green turtle is not known to nest on the Mississippi coast or barrier islands (IMMS, 2012).

### 2.2.4 Presence in the Project Area and Study Area

The USACE Sea Turtle Data Warehouse (USACE, 2013) maintains records of documented incidental take of sea turtles, as a result of hopper dredging activities throughout southeastern coastal waters. No incidental take involving green turtles was reported between 1980 and 2013. On April 2011, one green turtle was captured and relocated during the pre-dredge trawling for the Gulfport Expansion Project (a USACE Civil Works project; USACE, 2013). These documented events provide clear indication of the possibility of these turtles occurring within the proposed Project area. No green turtle nests have been recorded from the study area (NMFS and USFWS, 2007).

## 2.3 HAWKSBILL SEA TURTLE

The hawksbill sea turtle or hawksbill was federally listed as endangered on June 2, 1970 (35 FR 8495), with critical habitat designated in Puerto Rico on May 24, 1978 (43 FR 22224). The greatest threat to this species is harvest for tortoiseshell and stuffed turtle curios (Meylan and Donnelly, 1999). Hawksbill turtleshell (bekko) yields high prices. Japanese imports of raw bekko between 1970 and 1989 totaled 1,573,768 pounds, representing more than 670,000 turtles. The hawksbill turtle is also used in the manufacture of leather, oil, perfume, and cosmetics (NMFS, 2007a).

Other threats include destruction of breeding locations by beach development, incidental take in lobster and Caribbean reef fisheries, pollution by petroleum products (especially oil tanker discharges), entanglement in persistent marine debris (Meylan, 1992), and predation on eggs and hatchlings. In American Samoa, most hawksbill turtles and eggs encountered by villagers are harvested (Tuato'o-Bartley et al., 1993). The USFWS (1998) provides detailed information on certain threats, including beach erosion, beach armoring, beach nourishment, sand mining, artificial lighting, beach cleaning, increased human presence, recreational beach equipment, predation, and poaching. In 1998, NMFS designated critical habitat near Isla Mona and Isla Monito, Puerto Rico, seaward to 2.2 miles (63 FR 46693–46701).

### 2.3.1 Habitat

Hawksbill sea turtles generally inhabit coastal reefs, bays, rocky areas, passes, estuaries, and lagoons, where they occur at depths of less than 70 feet. Like some other sea turtle species, hatchlings are sometimes found floating in masses of marine plants (e.g., *Sargassum* rafts) in the open ocean (NFWL, 1980). Hawksbills re-enter coastal waters when they reach a carapace length of approximately 8 to 10 inches. Coral reefs are widely recognized as the foraging habitat of juveniles, subadults, and adults. This habitat association is undoubtedly related to their diet of sponges, which need solid substrate for attachment. Hawksbill turtles also occur around rocky outcrops and high-energy shoals, which are also optimum sites for sponge growth. In Mississippi, juvenile hawksbills are associated with stone jetties (NMFS, 2007a).

While this species is omnivorous, it prefers invertebrates, especially encrusting organisms, such as sponges, tunicates, bryozoans, mollusks, corals, barnacles, and sea urchins. Pelagic species consumed include jellyfish, fish, and plant material, such as algae, seagrasses, and mangroves (Carr, 1952; Rebel, 1974;

Pritchard, 1977; Musick, 1979; Mortimer, 1982). The young are reported to be somewhat more herbivorous than adults (Ernst and Barbour, 1972).

Terrestrial habitat is typically limited to nesting activities. The hawksbill is typically a solitary nester and nests on undisturbed, deep-sand beaches, from high-energy ocean beaches to tiny pocket beaches that are several feet wide bounded by crevices of cliff walls. Typically, the sand beaches used for nesting are low energy, with woody vegetation, such as sea grape (*Coccoloba uvifera*), near the waterline (National Research Council, 1990).

### 2.3.2 Range

The hawksbill is circumtropical, occurring in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans (Witzell, 1983). This species is probably the most tropical of all marine turtles, although it does occur in many temperate regions. The hawksbill is widely distributed in the Caribbean Sea and western Atlantic Ocean, with representatives of at least some life history stages regularly occurring in southern Florida, the northern Gulf (especially Texas), and south to Brazil (NMFS, 2007a). In the continental U.S., the hawksbill mainly nests in Florida, where it is sporadic at best (NFWL, 1980). A major nesting beach, however, occurs on Mona Island, Puerto Rico. Elsewhere in the western Atlantic, hawksbills nest in small numbers along the Gulf Coast of Mexico, the West Indies, and along the Caribbean coasts of Central and South America (Musick, 1979).

### 2.3.3 Distribution in Mississippi

Texas is the only state outside of Florida where hawksbill turtles are sighted with any regularity. Most of these sightings involve posthatchlings and juveniles and are primarily associated with stone jetties. These small turtles are believed to originate from nesting beaches in Mexico (NMFS, 2007a). No documented sightings have been reported in Mississippi waters during dredging operations (USACE, 2013) or stranded on the Mississippi Coast (NOAA, 2013).

### 2.3.4 Presence in the Project Area and Study Area

No documented records of hawksbill turtles exist from Harrison County, Mississippi; however, this species could potentially occur in the proposed Project area and study area, although unlikely.

## 2.4 KEMP'S RIDLEY SEA TURTLE

Kemp's ridley sea turtle or Kemp's ridley was listed as endangered throughout its range on December 2, 1970 (35 FR 18320). Populations of this species have declined since 1947, when an estimated 42,000 females nested in one day (Hildebrand, 1963), to a total nesting population of approximately 1,000 in the mid-1980s. The decline of this species was primarily due to human activities including collection of eggs, fishing for juveniles and adults, killing adults for meat and other products, and direct take for indigenous use. In addition to these sources of mortality, Kemp's ridleys have been subject to high levels of incidental

take by shrimp trawlers (NMFS, 2007a; USFWS and NMFS, 2011). The National Research Council Committee on Sea Turtle Conservation estimated in 1990 that 86 percent of the human-caused deaths of juvenile and adult loggerhead sea turtles and Kemp's ridleys resulted from shrimp trawling (Campbell, 1995). Before the implementation of TEDs, estimates showed that the commercial shrimp fleet killed between 500 and 5,000 Kemp's ridleys each year (NMFS, 2007a). Kemp's ridleys have also been taken by pound nets, gill nets, hook and line, crab traps, and longlines.

Another problem shared by adult and juvenile Kemp's ridley turtles is the ingestion of manmade debris and garbage. Postmortem examinations of Kemp's ridley turtles found stranded on the south Texas coast from 1986 through 1988 revealed 54 percent (60 of the 111 examined) of the sea turtles had eaten some type of marine debris. Plastic materials were most frequently ingested and included pieces of plastic bags, Styrofoam, plastic pellets, balloons, rope, and fishing line. Nonplastic debris such as glass, tar, and aluminum foil were also ingested by Kemp's ridley turtles. Much of this debris comes from offshore oil rigs, cargo ships, commercial and recreational fishing boats, research vessels, naval ships, and other vessels operating in the Gulf. Laws enacted during the late 1980s to regulate this dumping are difficult to enforce over vast expanses of water. In addition to trash, pollution from heavy spills of oil or waste products pose an additional threat (Campbell, 1995).

Further threats to this species include collisions with boats, explosives used to remove oil rigs, and impingement at power plant intakes (Campbell, 1995). Dredging operations affect Kemp's ridleys through incidental take and habitat degradation. Incidental take of Kemp's ridley has been documented with hopper dredges. In addition to direct take, channelization of the inshore and nearshore areas can degrade foraging and migratory habitat through dumping of dredged material, degraded water quality/clarity, and altered current flow (USFWS and NMFS, 2011).

Kemp's ridley turtles are especially subject to human impacts during the time the females come ashore for nesting. Modifications to nesting areas can have a devastating effect on Kemp's ridley turtle populations. In many cases, prime nesting sites are also prime real estate. If a nesting site has been disturbed or destroyed, female turtles may nest in inferior locations where the hatchlings are less likely to survive, or they may not lay any eggs at all. Artificial lighting from developed beachfront areas often disorients nesting females and hatchlings, causing them to head inland by mistake, often with fatal results. Adult females may also avoid brightly lit areas that would otherwise provide suitable nesting sites (Butler, 1998; Witherington and Martin, 2003).

Because of the dangerous population decline at the time, a headstarting program for Kemp's ridley sea turtles was carried out from 1978 to 1992. Headstarting is a process whereby sea turtles are maintained in captivity for a period following hatching before being released into the wild, in an effort to increase survival during the critical first year of life by protecting them from the high rates of natural predation that would otherwise have occurred in their early months in the natural environment. Other goals of the headstarting program were to establish a nesting colony on Padre Island, Texas, through imprinting hatchlings to natal sand beaches, to develop sea turtle captive-rearing practices, and to study growth and survival in captivity.

This headstarting effort was a subsidiary and experimental part of the Kemp's Ridley Recovery Program. Eggs were collected from Rancho Nuevo, Mexico, and placed into polystyrene foam boxes containing Padre Island sand so that the eggs never touched the Ranch Nuevo sand. The eggs were flown to the U.S. and placed in a hatchery on Padre Island and incubated. The resulting hatchlings were allowed to crawl over the Padre Island beaches into the surf for imprinting purposes before being recovered from the surf and taken to Galveston, Texas, for rearing. They were fed a diet of high-protein commercial floating pellets for 7 to 15 months before being released into Texas or Florida waters. This program has had some success. The first nesting from one of these head-started individuals occurred at Padre Island in 1996 and more nesting has occurred since then. In later years, some of the eggs were incubated and imprinted at Rancho Nuevo, Mexico. The captive-rearing program ended in 1992 (Eckert et al., 1994; Caillouet et al., 1995; Shaver, 2000; Fontaine and Shaver, 2005; NMFS et al., 2011; National Park Service [NPS], 2013).

Kemp's ridleys appear to be in the early stages of recovery. In 1985, 706 nests were recorded at Rancho Nuevo, Mexico (Witzell et al., 2005), approximately 6,000 Kemp's ridley nests were recorded on Mexican beaches during the 2000 nesting season (Shaver, 2000), and just over 10,000 nests were recorded there during the 2005 nesting season (Shaver, 2006). In 2011, 20,570 nests were recorded at Rancho Nuevo (Jones, 2012). Similarly, increased nesting activity was recorded on the Texas beaches in the last decade or so from 4 nests in 1995 to 51 nests in 2005 (NPS, 2006; Shaver, 2006). Some of these nests were from the headstarting program for Kemp's ridleys. In 2012, 209 Kemps' ridley nests were recorded, although in 2013 that number inexplicably dropped to 153 (NPS, 2013). The overall increase can likely be attributed to two primary factors: full protection of nesting females and their nests in Mexico and the requirement to use TEDs in shrimp trawls both in the U.S. and in Mexico (NMFS, 2007a).

### 2.4.1 Habitat

Kemp's ridleys inhabit shallow coastal and estuarine waters, usually over sand or mud bottoms. Adults are primarily shallow-water benthic feeders that specialize on crabs, especially portunid crabs, while juveniles feed on *Sargassum* and associated infauna and other epipelagic species of the Gulf (USFWS and NMFS, 2011). In some regions, blue crab (*Callinectes sapidus*) is the most common food item of adults and juveniles. Other food items include shrimp, snails, bivalves, sea urchins, jellyfish, sea stars, fish, and occasional marine plants (Pritchard and Marquez, 1973; Shaver, 1991; Campbell, 1995).

### 2.4.2 Range

Adults are primarily restricted to the Gulf, although juveniles may range throughout the Atlantic Ocean, since they have been observed as far north as Nova Scotia (Musick, 1979) and in coastal waters of Europe (Brongersma, 1972). Important foraging areas include Campeche Bay, Mexico, and Louisiana coastal waters.

Almost the entire population of Kemp's ridley nests on an 11-mile stretch of coastline near Rancho Nuevo, Tamaulipas, Mexico, approximately 190 miles south of the Rio Grande. A secondary nesting area occurs at Tuxpan, Veracruz, and sporadic nesting has been reported from Mustang Island, Texas, southward to Isla

Aquada, Campeche, Mexico, on the Yucatan Peninsula. Several scattered isolated nesting attempts have occurred from North Carolina to Colombia.

### 2.4.3 Distribution in Mississippi

Kemp's ridleys are regularly seen in both the Mississippi Sound and around the barrier islands, and a number have been accidentally captured in recent years by recreational anglers on mainland piers (MMNS, 2001). The IMMS has rehabilitated numerous Kemp's ridley and released them back to the wild. In July 2011, the IMMS released 22 Kemp's ridley sea turtles into the Gulf, south of Ship Island. In 2011, the STSSN documented 265 stranded Kemp's ridley sea turtles in Mississippi, 153 stranded in 2012, and 176 through August 2013 (NOAA, 2013). This species has also been taken in Mississippi waters during dredging operations (USACE, 2013). The IMMS data indicate that the Mississippi Sound is vital developmental habitat for the Kemp's ridley (IMMS, 2013).

### 2.4.4 Presence in the Project Area and Study Area

The USACE Sea Turtle Data Warehouse (USACE, 2013) maintains records of documented incidental takes of sea turtles as a result of hopper dredging activities throughout southeastern coastal waters. From 2002 through 2013, two incidental takes involving Kemp's ridley were reported within Gulfport Harbor and the FNC. During the Gulfport widening improvements in 2011, 71 Kemp's ridleys were captured and relocated (USACE, 2013). These documented events provide clear indication of the likelihood of these turtles occurring within the proposed Project area and study area. Kemp's ridley is probably the most likely of the sea turtle species to occur in the proposed Project area and study area.

## 2.5 LEATHERBACK SEA TURTLE

The leatherback sea turtle or leatherback was listed as endangered throughout its range on June 2, 1970 (35 FR 8495), with critical habitat designated in the U.S. Virgin Islands on September 26, 1978, and March 23, 1979 (43 FR 43688–43689 and 44 FR 17710–17712, respectively). In 1999, NMFS amended and redesignated this habitat, while also establishing a "conservation zone" extending from Cape Canaveral, Florida, to the Virginia-North Carolina border and including all inshore and offshore waters; this zone is subject to shrimping closures when a high abundance of leatherbacks is documented (64 FR 14067, March 23, 1999).

This species' decline is attributable to overexploitation and incidental mortality, generally associated with commercial shrimping and fishing activities. Use of turtle meat for fish bait and the consumption of garbage by turtles are also causes of mortality, the latter phenomenon apparently occurring when plastic is mistaken for jellyfish (Rebel, 1974). Egg collection, nest destruction, and habitat degradation are major adverse impacts to nesting beaches and hatch success (NatureServe, 2010a). Because leatherbacks nest in the tropics during hurricane season, a potential exists for storm-generated waves and wind to erode nesting beaches, resulting in nest loss (NMFS and USFWS, 1992). This species may be susceptible to drowning in shrimp trawlers equipped with TEDs, because adult leatherbacks are too large to pass through the TED exit

opening. Mortality associated with the swordfish gillnet fisheries in Peru and Chile represents the single largest source of mortality for the East Pacific populations of leatherback turtles (Eckert and Sarti, 1997).

### 2.5.1 Habitat

The leatherback sea turtle is mainly pelagic, inhabiting the open ocean, and seldom approaches land except for nesting (Eckert, 1992). It is most often found in coastal waters only when nesting or when following concentrations of jellyfish (Texas Parks and Wildlife Department, 2007), when it can be found in inshore waters, bays, and estuaries. It dives almost continuously, often to great depths (Eckert, 1992).

Despite their large size, the diet of leatherbacks consists largely of jellyfish and sea squirts. They also consume sea urchins, squid, crustaceans, fish, blue-green algae, and floating marine plants (NFWL, 1980). The leatherback typically nests on beaches with a deep-water approach (Pritchard, 1971).

### 2.5.2 Range

The leatherback is probably the most wide-ranging of all sea turtle species. It occurs in the Atlantic, Pacific, and Indian oceans; as far north as British Columbia, Newfoundland, Great Britain, and Norway; as far south as Australia, Cape of Good Hope, and Argentina; and in other waterbodies such as the Mediterranean Sea (NFWL, 1980). Leatherbacks nest primarily in tropical regions; major nesting beaches include Malaysia, Mexico, French Guiana, Surinam, Costa Rica, and Trinidad (Ross, 1982). Leatherbacks nest only sporadically in some of the Atlantic and Gulf states of the continental U.S., with one nesting reported as far north as North Carolina (Schwartz, 1976). In the Atlantic and Caribbean, the largest nesting assemblages occur in the U.S. Virgin Islands, Puerto Rico, and Florida (NMFS, 2007a).

The leatherback sea turtle migrates farther and ventures into colder water than any other marine reptile. Adults appear to engage in routine migrations between boreal, temperate, and tropical waters, presumably to optimize both foraging and nesting opportunities. The longest-known movement is that of an adult female that traveled 3,666 miles to Ghana, West Africa, after nesting in Surinam (NMFS and USFWS, 1992). During the summer, leatherback turtles tend to use the east coast of the U.S. from the Gulf of Maine south to the middle of Florida.

### 2.5.3 Distribution in Mississippi

The leatherback turtle is seen occasionally along the Mississippi coast. A group of at least six leatherbacks was observed feeding on jellyfish near Petit Bois Island in 2000 (MMNS, 2001). The STSSN has only one documented stranding of a leatherback turtle in Mississippi in June 2013 (NOAA, 2013). In 2007, a non-lethal take of a leatherback occurred during dredging of the federally authorized Gulfport FNC; no lethal takes of leatherbacks have been reported during dredging activities in Mississippi waters (USACE, 2013).

### 2.5.4 Presence in the Project Area and Study Area

Leatherback turtles are pelagic but are sporadically observed in Mississippi waters. Because of their pelagic nature, they are unlikely to occur in the proposed Project area and study area, except on rare occasions.

## 2.6 LOGGERHEAD SEA TURTLE

The loggerhead sea turtle or loggerhead was listed by the USFWS as threatened throughout its range on July 28, 1978 (43 FR 32808). The decline of the loggerhead turtle, like that of most sea turtles, is the result of overexploitation by man, inadvertent mortality associated with fishing and trawling activities, and natural predation. The most significant threats to its population are coastal development, commercial fisheries, and pollution (NMFS, 2007a).

### 2.6.1 Habitat

The loggerhead sea turtle occurs in the open seas as far as 500 miles from shore, but mainly over the continental shelf, and in bays, estuaries, lagoons, creeks, and mouths of rivers. It favors warm temperate and subtropical regions not far from shorelines. The adults occupy various habitats, from turbid bays to clear waters of reefs. Subadults occur mainly in nearshore and estuarine waters. Hatchlings move directly to sea after hatching, and often float in masses of *Sargassum*. They may remain associated with *Sargassum* for an unknown period of several years (NMFS, 2007a).

Commensurate with their use of varied habitats, loggerheads consume a wide variety of both benthic and pelagic food items, which they crush before swallowing. Conch, shellfish, horseshoe crabs, prawns and other crustacea, squid, sponges, jellyfish, basket stars, fish (carrion or slow-moving species), and even hatchling loggerheads have all been recorded as loggerhead sea turtle prey (Hughes, 1974; Rebel, 1974; Mortimer, 1982). Adults forage primarily on the bottom, but also take jellyfish from the surface. The young feed on prey concentrated at the surface, such as gastropods, fragments of crustaceans, and *Sargassum*.

Nesting occurs usually on open sandy beaches above the high-water mark of ordinary tidal action and seaward of well-developed dunes. They nest primarily on high-energy beaches on barrier islands adjacent to continental land masses in warm-temperate and subtropical regions. Steeply sloped beaches with gradually sloped offshore approaches are favored. In Florida, nesting on urban beaches was strongly correlated with the presence of tall objects (trees or buildings), which apparently shield the beach from city lights (Salmon et al., 1995).

### 2.6.2 Range

The loggerhead is widely distributed in tropical and subtropical seas, being found in the Atlantic Ocean from Nova Scotia to Argentina, the Gulf, Indian and Pacific oceans (although it is rare in the eastern and central Pacific), and the Mediterranean Sea (Rebel, 1974; Ross, 1982; Iverson, 1986). In the continental U.S., loggerheads nest along the Atlantic coast from Florida to as far north as New Jersey (Musick, 1979)

and sporadically along the Gulf Coast. In recent years, a few have nested on barrier islands along the Texas coast. The loggerhead is the most abundant sea turtle species in U.S. coastal waters (NMFS, 2007a).

### 2.6.3 Distribution in Mississippi

The loggerhead is known to nest in small numbers on the barrier islands (Petit Bois, Horn, and Cat islands), but rarely nests on the mainland of Mississippi. However one loggerhead turtle was reported on May 22, 2012, nesting on a beach in Jackson County (Hoke, 2012) and another in Pass Christian (Johnson, 2013).

The loggerhead prefers shallow inner continental shelf waters; occurring very infrequently in the bays. It often occurs near offshore oil rig platforms, reefs, and jetties. Loggerheads are probably present year-round but are most noticeable in the spring when a favored food item, the Portuguese man-of-war (*Physalia physalis*), is abundant. The STSSN reported four loggerhead turtle strandings in Mississippi in 2011, three in 2012, and 11 through August 2013 (NOAA, 2013).

### 2.6.4 Presence in the Project Area and Study Area

The loggerhead is likely to pass through the proposed Project area and study area, but would not be a resident of the Mississippi Sound. During the Gulfport Harbor Navigation Channel Widening Project in 2011, five loggerhead sea turtles were captured and relocated in the study area prior to dredging activities, and one loggerhead turtle was taken during dredging activities (USACE, 2013). One loggerhead nest has been recently recorded from the study area at Pass Christian in July 2013 (Johnson, 2013). The hatchlings form this nest were subsequently released by the IMMS in September 2013. Another loggerhead turtle nest was recorded just outside of the study area in 2012. On May 22, 2012, a loggerhead was observed nesting along the beach in Jackson County; it contained 109 eggs (Hoke, 2012).

## 2.7 PIPING PLOVER

The USFWS listed the piping plover as threatened and endangered on December 11, 1985 (50 FR 50726–50734). The piping plover is federally listed as endangered in the Great Lakes watershed, while the birds breeding on the Atlantic Coast and northern Great Plains are federally listed as threatened. Piping plovers wintering in Texas, Louisiana, and Mississippi are part of the northern Great Plains and Great Lakes populations.

Shorebird hunting during the early 1900s caused the first known major decline of piping plovers (Bent, 1929). Since then, loss or modification of habitat resulting from commercial, residential, and recreational developments, dune stabilization, river impounding and channelization (eliminating sandbars, encroachment of vegetation, and altering water flows), and wetland drainage have further contributed to the decline of the species. Additional threats include human disturbances through recreational use of habitat and predation of eggs by feral pets (USFWS, 1995).

### 2.7.1 Habitat

Piping plovers typically inhabit shorelines of oceans, rivers, and inland lakes. Nest sites include sandy beaches, especially where scattered tufts of grass are present; sandbars; causeways; bare areas on dredge-created and natural alluvial islands in rivers; gravel pits along rivers; silty flats; and salt-encrusted bare areas of sand, gravel, or pebbly mud on interior alkali lakes and ponds (Haig and Elliott-Smith, 2004). For wintering grounds, these birds use beaches, mudflats, sandflats, dunes, and offshore islands of dredged material (AOU, 1998; USFWS, 1995).

### 2.7.2 Range

The piping plover breeds on the northern Great Plains (Iowa, northwestern Minnesota, Montana, Nebraska, North and South Dakota, Alberta, Manitoba, and Saskatchewan), in the Great Lakes (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and Ontario), and along the Atlantic Coast from Newfoundland to Virginia and (formerly) North Carolina. It winters on the Atlantic and Gulf coasts from North Carolina to Mexico, including coastal Mississippi and, less commonly, in the Bahamas and West Indies (AOU, 1998; 50 FR 50726, December 11, 1985). Migration occurs both through the interior of North America east of the Rocky Mountains (especially in the Mississippi Valley) and along the Atlantic Coast (AOU, 1998). Few data exist on the migration routes of this species.

### 2.7.3 Distribution in Mississippi

Critical habitat has been designated for the piping plover along the Mississippi coast, including portions of the study area. Critical habitat units in the study area include Mississippi Units 02–06 (along the coast), with Unit 04 directly west of Gulfport Harbor and Unit 05 directly east of the harbor, 12 (Deer Island), and 14 (Cat, East Ship Island, and West Ship Island) (see Figure 1). The PCEs for piping plover wintering habitat are those habitat components that are essential for the primary biological needs of foraging, sheltering, and roosting, and the physical features necessary for maintaining the natural processes that support these habitat components. Only those areas containing these PCEs within the designated boundaries are considered critical habitat. The PCEs are found in geologically dynamic coastal areas that support intertidal beaches and flats (between annual low tide and annual high tide) and associated dune systems and flats above annual high tide. Intertidal flats include sand and/or mud flats with no or very sparse emergent vegetation. In some cases, these flats may be covered or partially covered by a mat of blue-green algae. Adjacent unvegetated or sparsely vegetated sand, mud, or algal flats above high tide are also important, especially for roosting piping plovers. Such sites may have debris or detritus (decaying organic matter) offering refuge from high winds and cold weather. Important components of the beach/dune ecosystem include surf-cast algae for feeding of prey, sparsely vegetated beach area above mean high tide for roosting and refuge during storms, spits (a small point of land, especially sand, running into water) for feeding and roosting, and washover areas for feeding and roosting. Washover areas are broad, unvegetated zones with little or no topographic relief that are formed and maintained by the action of hurricanes, storm surge, or other extreme wave action (USFWS 2001b). Impacts to these PCEs are discussed in Section 3.9.3.

### 2.7.4 Presence in the Project Area and Study Area

The USFWS designated critical habitat for the species in its nesting and wintering range (65 FR 41781–41812, July 6, 2000). Designation of critical habitat became final on July 10, 2001 (66 FR 17:36038–36143) and was modified in 2009 (74 FR 23475–23600). Critical habitat includes the land from the seaward boundary of MLLW to where densely vegetated habitat (not used by the species) begins and where the PCEs no longer occur. Figure 2 illustrates that piping plover designated critical habitat occurs within the proposed Project area; however, it is not located within the expansion footprint of the Proposed Project Alternative. More specifically, piping plover designated critical habitat is a component of the beach along the eastern side of the PGEP, ending just northeast of the proposed East Pier Expansion footprint, as well as on the western side of the PGEP.

## 2.8 RUFA RED KNOT

The rufa red knot is listed as a federally threatened species (USFWS, 2014a). It is a medium-sized shorebird about 9 to 11 inches in length with a wingspan of 20 inches and is recognized during the breeding season by its distinctive red feathers. There is a prominent stripe above the eye, with the breast and upper belly being a rich red to a brick or salmon red. Rufa red knots will sometimes have a few scattered light feathers mixed in (USFWS, 2014b).

### 2.8.1 Habitat

Rufa red knots use coastal marine and estuarine habitats with large, wide areas of exposed intertidal sediments. Both the migrating and wintering populations use high-energy gulf, ocean or bay-front areas, as well as sheltered tidal flats in lagoons. The preferred wintering and migration microhabitats are muddy or sandy coastal areas, such as the mouths of bays, estuaries, unimproved tidal inlets, and tidal flats (USFWS, 2014b).

### 2.8.2 Range

The rufa red knot migrates on an annual basis between its breeding grounds in the Canadian Arctic and several wintering regions, which include the Southeast U.S., the Northeast Gulf, northern Brazil, and Tierra del Fuego at the southern tip of South America; the rufa red knot is an uncommon to rare winter resident or visitor in Mississippi.

### 2.8.3 Distribution in Mississippi

The rufa red knot utilizes specific key stopover areas during both the spring and fall migrations for resting and feeding. It has been documented mainly on the offshore islands but has been recorded on all major islands from Cat Island east to Petit Bois Island, with only five birds at Horn Island observed during the peak winter months. The peak count of 74 birds at Long Beach occurred in January 1986 (USFWS, 2014b).

### 2.8.4 Presence in the Project Area and Study Area

The rufa red knot is noted as an uncommon to rare winter resident or visitor in Mississippi, with occurrences documented mainly on offshore islands. Winter visits by observers are scarce; however, rufa red knots have been recorded on all major islands within the study area from Cat Island east to Petit Bois Island, with peak counts in winter of only five birds at Horn Island. The peak count of 74 rufa red knots at Long Beach occurred in January 1986 (USFWS, 2014b). Although known to occur in the study area, it is unlikely that rufa red knots occur in the proposed Project area, as most documented occurrences have been on the barrier islands.

## 2.9 BLUE WHALE

The blue whale is listed as a federally endangered species and is protected under both the ESA and the MMPA. The blue whale is known to be the largest mammal to ever inhabit the earth.

Blue whales were hunted by whalers of the 19th century in small numbers. While the steam power boats aided in overtaking the large, fast-swimming blue whales, the deck-mounted harpoon cannons developed for killing made it an industrial scale operation by the turn of the century. From the turn of the century until the mid-1960s, blue whales from various stocks were intensively hunted in all the world's oceans (NMFS, 2013c).

### 2.9.1 Habitat

Blue whales are rare in the shelf waters of the eastern U.S., but are known to inhabit subpolar and subtropical latitudes. Blue whales will migrate toward the poles in the spring to feed and are commonly observed off the coast of Canada. They are considered more coastal than the humpback whale, and migration is driven mostly by food availability. The southernmost range of the North Atlantic population of blue whales is thought to be Massachusetts; however, it has been reported that blue whales will occasionally stray into the Gulf, although rarely (NMFS, 2013c).

### 2.9.2 Range

Blue whales are found in all oceans and are separated into populations by ocean basin in the North Atlantic, North Pacific, and Southern Hemisphere. They are known to follow a seasonal migration pattern between summering and wintering areas, but some evidence suggests that individuals remain in certain areas year round. The extent of knowledge concerning distribution and movement varies with area, and migratory routes are not well known (NMFS, 2013c).

### 2.9.3 Distribution in Mississippi

Few records of blue whale sightings exist for the northern Gulf (NMFS, 2013c).

### 2.9.4 Presence in the Project Area and Study Area

The blue whale is not expected to occur in the proposed Project area or study area due to lack of food availability and water depth (NMFS, 2013c).

## 2.10 FIN WHALE

The fin whale is listed as endangered throughout its range under the ESA and is listed as "depleted" throughout its range under the MMPA. The fin whale is second only to the blue whale in size and weight.

### 2.10.1 Habitat

Fin whales inhabit deep water offshore of all major oceans, but are uncommon in the tropics. In general, fin whales in the central and eastern North Atlantic tend to occur most abundantly over the continental slope and on the shelf seaward of the 328-foot isobaths. They have also been sighted in shallower waters (NMFS, 2011).

### 2.10.2 Range

The fin whale has an extensive distribution in the North Atlantic, occurring from the Gulf and Mediterranean Sea, northward to the edges of the arctic pack ice. In general, fin whales are more common north of approximately 30 degrees north latitude (NMFS, 2011).

### 2.10.3 Distribution in Mississippi

No sightings of fin whales have been recorded within the northern Gulf.

### 2.10.4 Presence in the Project Area and Study Area

The fin whale is known to occur along the continental slope at depths of 328 feet (NMFS, 2011). It is not expected to occur in the proposed Project area or study area.

## 2.11 HUMPBACK WHALE

In 1946, the International Convention for the Regulation of Whaling regulated commercial whaling of humpback whales. In 1966, the International Whaling Commission prohibited commercial whaling of humpbacks. In June 1970, humpback whales were designated as "endangered" under the Endangered Species Conservation Act (ESCA). In 1973, the ESA replaced the ESCA and continued to list humpbacks as endangered. Under the MMPA, threats to humpbacks are mitigated through implementation of the Pacific Offshore Cetacean Take Reduction Plan and the Atlantic Large Whale Take Reduction Plan (NMFS, 2013d).

### 2.11.1 Habitat

Humpback whales inhabit deep water, and tend to occur most over the continental shell at latitudes between about 40 to 75 degrees (NMFS, 2013d).

### 2.11.2 Range

The humpback whales in the western North Atlantic are known to migrate and feed over the continental shelf. They inhabit Gulf of Maine, U.S. jurisdictional waters during summer and autumn. During the winter, humpback whales migrate to the Lesser Antilles, Virgin Islands, Puerto Rico, and Dominican Republic. They have been reported to migrate into the northern Gulf (NMFS, 1991).

### 2.11.3 Distribution in Mississippi

Humpback whales are not likely to occur off the coast of Mississippi (NMFS, 2013d).

### 2.11.4 Presence in the Project Area and Study Area

Humpback whales are not known to calf in the Gulf and are not expected to occur in the proposed Project area or study area (NMFS, 2013d).

## 2.12 SEI WHALE

In 1970, Sei whales were designated as "endangered" under the ESCA. In 1973, the ESA replaced the ESCA, and continued to list Sei whales as endangered. Sei whales are also listed as endangered under the MMPA of 1972 (NMFS, 2013e).

### 2.12.1 Habitat

Sei whales mainly inhabit deep, temperate water, and tend to occur mostly over the continental shelf at latitudes between about 40 to 75 degrees (Davis, 1998). They are typically observed in deep water far from coastlines (NMFS, 2013e). Few reliable records exist for the sei whale offshore of Louisiana and none exist in Mississippi (Davis, 1998).

### 2.12.2 Range

Sei whales are found in the Western North Atlantic during the summer, as well as the Gulf of Maine, Georges Bank, and Stellwagen Bank. During the winter, Sei whales migrate to the Lesser Antilles, Virgin Islands, Puerto Rico, and Dominican Republic. They have been reported to migrate into the northern Gulf (NMFS, 1991) but stay outside the 100-foot isobath (Davis, 1998).

### 2.12.3 Distribution in Mississippi

Sei whales do not occur off the coast of Mississippi (Davis, 1998; NMFS, 2013e).

### 2.12.4 Presence in the Project Area and Study Area

Sei whales are not expected to occur in the proposed Project area or study area (Davis, 1998; NMFS, 2013e).

## 2.13 SPERM WHALE

The sperm whale is listed as endangered throughout its range under the ESA and is listed as "depleted" throughout its range under the MMPA.

### 2.13.1 Habitat

Sperm whales tend to inhabit areas with a depth of 2,000 feet or more and are uncommon at depths less than 1,000 feet. These conditions generally correspond to sea surface temperatures greater than 59 degrees Fahrenheit (°F) (NMFS, 2013f). Recent studies by Jochens et al. (2008) found that sperm whales concentrate at the mouth of the Mississippi River near the Mississippi Canyon. No critical habitat has been designated for this species.

### 2.13.2 Range

The sperm whale has an extensive distribution in the North Atlantic, occurring from the Gulf and Mediterranean Sea, northward to the edges of the arctic pack ice. In general, sperm whales are more common at less than 40 degrees north latitude (NMFS, 2013f).

A distinct population segment occurs in the Gulf, with numerous recordings of sperm whales year round near the Mississippi Canyon and between the 100- and 2,000-foot isobath (Davis, 1998; Jochens et al., 2008). Jochens et al. (2008) describe the northern Gulf stock as female dominated that is distinct from the western Atlantic sperm whales.

### 2.13.3 Distribution in Mississippi

Although a distinct population segment of sperm whales occurs in the Gulf (NMFS, 2013f), no sightings of sperm whales have been recorded in Mississippi.

### 2.13.4 Presence in the Project Area or Study Area

The sperm whale is known to occur along the continental slope at depths of approximately 700 feet near the mouth of the Mississippi River (Jochens et al., 2008); however, the sperm whale is not expected to occur in the proposed Project area or study area.

## 2.14 WEST INDIAN MANATEE

The West Indian or Florida manatee is listed as endangered throughout its range under the ESA (USFWS, 2001a) and under the MMPA.

### 2.14.1 Habitat

The manatee (sometimes called sea cow) is found primarily along the coast of Florida; however, it has also been recorded in coastal waters of Alabama and Mississippi (Mississippi-Alabama Sea Grant Consortium, 2008). Most adult manatees are approximately 10 feet long and weigh 800 to 1,200 pounds. Manatees have a tough, wrinkled, brown-to gray skin, which is continuously sloughed off. Hair is distributed sparsely over the body, with stiff whiskers around the mouth. They spend approximately 5 hours feeding daily, consuming amounts up to 4 to 9 percent of their body weight (USFWS, 2012).

The manatee inhabits marine, estuarine, and freshwater environments, preferring large, slow-moving rivers, river mouths, and shallow coastal areas, such as coves and bays (Lefebvre et al., 1989; USFWS, 2013). Manatees are opportunistic herbivores, feeding on a wide variety of submerged, floating and emergent marine, estuarine, and freshwater plants (O'Shea and Ludlow, 1992).

### 2.14.2 Range

The manatee is more common in the warmer waters off the coasts of Mexico, the West Indies, and Caribbean to northern South America (NatureServe, 2010b). Outside of Florida, manatees are mainly migratory species during the warmer months. During summer months, manatees may migrate as far north as coastal Virginia on the east coast and as far west as the Louisiana coast on the Gulf.

### 2.14.3 Distribution in Mississippi

Manatees are mainly a migratory species during the warmer months and sightings in Mississippi have increased (O'Shea and Ludlow, 1992; Mississippi-Alabama Sea Grant Consortium, 2008). According to USFWS (2013), the manatee may potentially occur in coastal waters off of Hancock, Harrison, and Jackson counties; whereas, MMNS (2011) shows the manatee only occurring in coastal waters off of Harrison County.

### 2.14.4 Presence in the Project Area or Study Area

Manatees are known to migrate through the study area. In May 2011, two anglers reported hooking a manatee around the Katrina reef near Deer Island, just off the Mississippi Coast (Raines, 2011). Since 1998, seven manatee sightings have occurred within the vicinity of the proposed Project area (Carmichael, 2013). This species is transient and is expected to occur in the study area intermittently and potentially in the proposed Project area.

## 2.15 SUMMARY OF THE STATUS OF LISTED SPECIES

The Gulf sturgeon, green sea turtle, Kemp's Ridley sea turtle, and loggerhead sea turtle have been documented from the Project area. The hawksbill sea turtle, leatherback sea turtle, piping plover, rufa red knot, and West Indian Manatee could potentially occur in the Project area. Thus, these nine species are discussed and analyzed further throughout the document. The five whale species (blue whale, fin shale, humpback whale, sei whale, and sperm whale) are not expected to occur in the Project area; thus, these five whale species will not be discussed or analyzed further in this document.

# 3.0 DIRECT, INDIRECT, AND CUMULATIVE EFFECTS FROM THE PROPOSED PROJECT

This section details the direct, indirect, and cumulative effects from the Proposed Project Alternative described in Section 1.2.2. Proposed Project activities include new work dredging and fill, maintenance dredging, and dredged material disposal at various areas around the Port for the West Pier Expansion, East Pier Expansion, Turning Basin Expansion, North Harbor Expansion, and construction of a breakwater on the eastern side of the FNC. The effects of proposed Project activities on listed species and/or their habitat include noise, water quality, habitat modifications, and entrainment. Conservation measures would be employed to minimize these effects. Noise and water quality impacts would be short-term and limited to the duration of construction and dredging activities. Furthermore, the area is already utilized by an industrial facility that readily has noise associated with its current operations. Permanent habitat impacts would result from the dredging or filling of approximately 155 acres for the West Pier Expansion, 15 acres for the East Pier Expansion, 9 acres for the North Harbor Expansion, 18 acres for the breakwater, and 85 acres for the Turning Basin (see Table 3). The proposed Project would impact a total area of approximately 282 acres. Since the proposed dredging activities would occur within close proximity of existing navigational channels, it is likely the channel currents would facilitate the recolonization of impacted benthic organisms in the marine environment of the Mississippi Sound. Therefore, permanent habitat impacts as a result of the proposed PGEP dredging activities are expected to be minimal.

The new work dredging associated with the construction of the proposed West Pier and East Pier expansions, North Harbor and West Pier berthing areas, and the Turning Basin Expansion is estimated to require removal of approximately 7.68 mcy of material, including 560,000 cy of dredged material (debris from East Pier) that would be designated for upland disposal (Table 5). Following construction of the Turning Basin Expansion, the MSPA would be responsible for maintenance dredging of the portion of the new Turning Basin that is not part of the federally authorized project, as well as the berthing areas associated with the expanded East Pier, North Harbor, and West Pier. Maintenance dredging associated with these areas is anticipated to require removal of approximately 486,000 cy to 1.3 mcy every year (Table 5). A DMMP was prepared to evaluate potential placement options for the new work and maintenance dredged material associated with the Proposed Project Alternative (Anchor QEA LLC, 2017, Appendix F of the EIS). Estimated dredge quantities assume maintenance for a 30-year period. At this time, it is expected that new work dredging would occur using a mechanical/hopper dredge and maintenance dredging would occur using a hydraulic/cutterhead or mechanical/hopper dredges, as necessary. Sites considered for placement of dredged material include:

- Use as fill for the West Pier Expansion
- 12 designated BU sites
- Thin layer placement
- Candidate BU sites
- Placement in a proposed ODMDS

Table 5
Summary of Proposed Project Alternative Impacts

| | Proposed Expansion Footprint (acres) | Estimated Acreage Impact (acres) | Estimated New Work Dredged Material Quantities | Estimated Maintenance Dredged Material Quantities (every year) |
|---|---|---|---|---|
| West Pier | 155 | 155 | 2.4 mcy | 0 |
| East Pier | 14.5 | 15 | 560,000 cy* | 63,000–172,000 cy |
| North Harbor | 9 | 9 | 913,000 cy | 212,000–581,000 cy |
| Turning Basin | 85 | 85 | 3.8 mcy | 211,000–586,000 cy |
| Breakwater | 18 | 18 | 0 | 0 |
| Total | 281.5 | 282 | 7.68 mcy | 486,000 cy–1.3 mcy |

*Material designated for upland disposal.
cy – cubic yards
mcy – million cubic yards

Potential entrainment of listed species during dredging activities would be the most significant potential impact associated with the proposed Project. Dredging and disposal methods in the study area would be consistent with recent and current maintenance and new work dredging methods used by the USACE in Pascagoula, Mobile, and Gulfport harbors. These methods have been addressed in a number of previous environmental documents, including BAs and Biological Opinions (BOs), regarding threatened and endangered species. Specific effects from the Proposed Project Alternative are discussed in the following sections.

## 3.1 NOISE

Fish are thought to use sound in a number of ways that are important to their survival. For example, sound can be used by fish to understand their surrounding environment, detect predators and prey, orient themselves during migration, and for acoustic communication (USFWS, 2015). Potential direct take could result from elevated underwater noise form proposed Project construction activities (e.g., dredging, pile driving) resulting in instantaneous death, latent death soon after exposure, or death several days later. Indirect take could potentially make fish susceptible to predation, disease, starvation, or affect an individual's ability to complete its life cycle. Behavioral changes resulting from underwater noise could cause fish to alter their movement and foraging patterns. If foraging shifts from food-rich to food-poor habitat patches or energy expenditures for foraging increase, overall fitness of the fish may decline (USFWS, 2015).

The West Indian manatee is the only endangered mammal likely to visit the study area, albeit infrequently. The MMPA of 1972 (16 U.S.C. § 1361 et seq.) established, the "taking" of marine mammals in waters or on lands under United States (U.S.) jurisdiction. The term "take," as defined in Section 3 (16 U.S.C. § 1362 [13]) of the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." "Harassment" is further defined in the 1994 amendments to the MMPA, which

establishes two levels of harassment: Level A (potential injury) and Level B (potential behavioral disturbance). The potential effects of pile driving on marine mammals (e.g. West Indian manatee) and sea turtles would be expected to be similar to those effects on fish and depend on several factors which may include, but are not limited to: the species, animal size, and proximity to the underwater noise source; the intensity and duration of the pile driving noise; the depth of the water column; and the type of substrate. Impacts to marine mammals and sea turtles from pile driving activities, if any, would be related to the level and duration of the noise exposure along with consideration of the distance between the marine animal and the source. Shallow water environments can be more structurally complex and lead to rapid sound attenuation. However, soft estuarine mud and sand bottoms can absorb or attenuate the noise and require less intensity and time to drive the pile.

The Proposed Project Alternative may result in underwater noise from pile installation, dredging, and boat traffic associated with the proposed construction activities. The Mississippi Sound currently experiences moderately high volumes of boat traffic, particularly from large vessels accessing the Port. Noise may be generated by vessels associated with construction of the Proposed Project Alternative; however, noise levels are not expected to add to the current background noise levels from existing boat traffic. Therefore, noise from vessels and barges will not be discussed further in this analysis.

Underwater noise associated with construction activities may occur from pile installation. Underwater pile driving activities have the potential to produce high intensity sound pressure underwater, which could cause injurious or lethal impacts to fish (Caltrans 2001; Hastings and Popper 2005; Popper and Hastings 2009). Underwater sounds with a sharp sound pressure peak occurring in a short interval of time can affect fish with swim bladders, such as sturgeon (Caltrans 2001). High pressure waves from underwater noise can pass through fish, causing the swim bladder to be rapidly squeezed and then rapidly expanded as the sound wave passes through the fish. Other impacts may include the rupture of capillaries in internal organs as indicated by observed blood in the abdominal cavity, and maceration of the kidney tissues (Caltrans 2001).

The Fisheries Hydroacoustic Working Group (FHWG), a multi-agency work group, developed criteria for the acoustic levels at which various physiological effects to fish could be expected (FHWG, 2008). The criteria were developed primarily for species on the west coast of the United States; however, the NMFS and USFWS have relied on these criteria for assessing projects on the east coast and the Gulf for sound effects analysis (USFWS, 2015). The FHWG determined that peak sound pressure waves should be within a single strike threshold of 206 decibels (dB), and the cumulative sound exposure level (cSEL) associated with a series of pile strike events should be less than 187 dB cSEL to protect listed fish species that are larger than 2 grams, and less than 183 dB cSEL for fish species that are smaller than 2 grams (FHWG 2008).

The Proposed Project Alternative includes the installation of approximately 4,000 pre-stressed concrete piles for construction of the new wharf associated with the West Pier Expansion. These piles would consist of approximately 2,680 24-inch x 24-inch square, pre-stressed concrete piles that range in length from 80 feet to 100 feet. The remaining 1,320 piles would be 36-inch cylindrical, hollow, pre-stressed concrete

piles installed along the outside edge of the wharf to support the crane rail. The proposed installation plan estimates driving six piles per day (during daylight hours) in approximately 20 feet of water depth, within a 10-hour work day. It is anticipated that the selected contractor would install the piles one at a time and that there would be no simultaneous pile-driving operations of either or both pile types. Using one installation rig, the installation would occur 6 days per week and take approximately 2.5 years to complete. However, if a second installation rig is utilized, up to 12 piles could be driven in a single work day. The installation would include pre-augering or jetting the piles for the first 65 to 70 feet; the remaining 10–15 feet would be driven with a standard pile-driving hammer to set the bearing capacity of the pile. A "ramp-up" method would be utilized at the beginning of the in-water impact driving of piles that would involve driving at a low force and gradually increasing to full force over a period of 10 to 15 minutes. If driving stops for more than 1 hour during the course of a day, the "ramp-up" would be repeated. The estimated total number of strikes per day would range from 3,768 to 15,132.

The NMFS Pile Driving Calculator Model was used to assess the potential underwater noise impacts from pile driving for the Proposed Project Alternative (NMFS, 2015). This model is based on data from similar piles in similar substrate and requires an estimate of the total number of strikes per day to install the piles. Assumptions for input into the NMFS model were based on the number of strikes proposed for the 24-inch x 24-inch square pre-stressed concrete piles and the 36-inch cylindrical, hollow, pre-stressed concrete piles. Reference noise levels were selected from the Compendium of Pile Driving Sound Data, updated in October 2012, provided as Appendix I to Caltran's Final Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish (February 2009) to represent the proposed Project (Caltrans, 2012).

Based on the size of the piles and estimated water depth, noise generated by installation of the square and cylindrical piles is estimated to be 185 dB peak, with a cumulative strike sound exposure level of 197 dB cSEL (square piles) and 196 dB cSEL (cylindrical piles), and root mean square (RMS) sound levels of 173 dB (square piles) and 176 dB (cylindrical piles). Based on a scenario of 3,768 total strikes per day (2,514 strikes for the square piles and 1,254 strikes for the cylindrical piles), the model analysis shows that the threshold for physical injury to listed fish species that are larger than 2 grams would have the potential to be exceeded up to 151 and 131 feet from the installation site of square piles and cylindrical piles, respectively. The threshold for physical injury to listed fish species that are smaller than 2 grams would have the potential to be exceeded up to 243 feet for the square piles and 240 feet for the cylindrical piles.

Calculations for the pile driving scenario of 15,132 total strikes per day (10,092 strikes for the square piles and 5,040 strikes for the cylindrical piles) show that the noise generated by installation of the square and cylindrical piles is estimated to be 185 dB peak, with a cumulative strike sound exposure level of 203 dB cSEL (square piles) and 202 dB cSEL (cylindrical piles), and RMS sound levels of 173 dB (square piles) and 176 dB (cylindrical piles). The threshold for physical injury would have the potential to be exceeded within up to 243 and 328 feet from the installation site of square piles and cylindrical piles, respectively, for listed fish species both larger and smaller than 2 grams. Table 6 provides a summary of the NMFS Pile Driving Calculator Model outputs for this analysis.

Table 6
Proposed Project Alternative NMFS Pile Driving Calculator Model Underwater Noise Analysis

| **Analysis Based on 3,768 Total Strikes Per Day** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Distance (feet) to threshold** | | | |
| | | | | | | **Onset of Physical Injury** | | | **Behavior** |
| | **Source sound at 33 feet** | | | **Estimated Number of Strikes (total)** | **SEL, accumulated** | | **Cumulative SEL dB*** | | |
| **Pile Type** | **peak sound dB** | **SEL, single strike dB** | **RMS dB** | | | **Peak dB (206)** | **Fish ≥2 grams (187)** | **Fish <2 grams (183)** | **RMS dB (150)** |
| 24-x-24-inch Square Pre-Stressed Concrete | 185 | 163 | 173 | 2,514 | 197 | 0 | 151 | 243 | 1,120 |
| 36-inch Cylindrical Pre-Stressed Concrete | 185 | 165 | 176 | 1,254 | 196 | 0 | 131 | 240 | 1,775 |
| **Analysis Based on 15,132 Total Strikes Per Day** | | | | | | | | | |
| | | | | | | **Distance (feet) to threshold** | | | |
| | | | | | | **Onset of Physical Injury** | | | **Behavior** |
| | **Source sound at 33 feet** | | | **Estimated Number of Strikes (total)** | **SEL, accumulated** | | **Cumulative SEL dB** | | |
| **Pile Type** | **Peak sound dB** | **SEL, single strike dB** | **RMS dB** | | | **Peak dB (206)** | **Fish ≥2 grams (187)** | **Fish <2 grams (183)** | **RMS dB (150)** |
| 24-x-24-inch Square Pre-Stressed Concrete | 185 | 163 | 173 | 10,092 | 203 | 0 | 243 | 243 | 1,120 |
| 36-inch Cylindrical Pre-Stressed Concrete | 185 | 165 | 176 | 5,040 | 202 | 0 | 328 | 328 | 1,775 |

* This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet).
dB = decibels
SEL = sound exposure level
RMS = root mean square

Based on the underwater noise analysis, the proposed pile driving of the aforementioned piles would likely exceed the adopted underwater noise thresholds for physical and behavioral (Level B) impacts to fish species, marine mammals and sea turtles. Sound pressure levels in excess of the disturbance threshold (but below the threshold for injury) can potentially cause temporary behavioral changes that may increase the risk for predation and reduce an individual fish's likelihood of foraging or spawning success. For example, a behavioral response of Gulf sturgeon may be to move to areas outside of the noise threshold and avoid the Project area, which may affect normal migratory movements. Notably, comparable pile driving activities to those proposed for the PGEP were occurring at Port facilities as part of the Restoration Project construction while the Gulf sturgeon monitoring was being conducted by Peterson et al. (2015).

Any marine species that are exposed to high sound pressure levels during pile installation may change their normal behavior patterns (e.g., foraging). As a result, such activities may have only a minor effect on individuals and are not likely to affect their populations. While some underwater noise exposure will be unavoidable, minimization measures (e.g., use of bubble curtains, resonators, or other sound-cancelling options) are expected to reduce or avoid most potential adverse underwater impacts to marine species from pile driving activities. Therefore, no significant impacts to fish, marine mammals, and sea turtles are anticipated as a result of the Proposed Project Alternative.

Noise impacts from dredging associated with the Proposed Project Alternative may occur. It is estimated that a dredge would have a noise level of 70 dBA (A-weighted decibels) at 50-foot water depth (see Section 4.6.4.1 of the EIS). Based on this information, the noise level produced from dredging activities would be below the interim fish injury thresholds currently accepted by the NMFS, 206 dB peak level sound measurement (LPEAK) and 187 dB cSEL (Federal Highway Administration, 2012). The noise level produced from dredging activities would also be below the interim guidance for Level A (180 dB RMS) and Level B (160 RMS) for marine mammals within 66 feet of an active dredge (NOAA, 2012). Injury thresholds are not likely to be exceeded. The probability of noise impacts to marine species from dredging noise impacts would be expected to be minimal.

## 3.2 ENTRAINMENT IN DREDGING EQUIPMENT

Past construction and maintenance of the FNC via dredging equipment has been identified as potentially a significant source of sea turtle and Gulf sturgeon mortality or injury (NMFS, 2007b, 2012). Operations involving hopper dredge suction dragheads, bed-leveling operations, and relocation trawlers have been identified as potential sources of sea turtle injury/mortality (NMFS, 2012). Impacts may also include avoidance of the Project area during construction and maintenance operations because of disturbance, lighting, and disposal of dredged material. Of these, only interactions with hopper dredges, bed-leveling, and relocation trawlers have the potential for adverse impacts. The BO for the Bayou Casotte and Lower Pascagoula Sound Channel Widening Project (NMFS, 2012) concludes that for all sea turtle species, the use of cutterhead dredges, lighting effects from the hopper and cutterhead dredges, and placement of dredged material are not likely to adversely affect sea turtles. Reasons for this conclusion include: (1) sea turtles are mobile enough to avoid the cutterhead dredges used in the Gulf; and (2) lighting installed on cutterhead dredges would have no impact on sea turtles, because no turtle nesting beaches occur near the action area, and the MSPA would follow the lighting guidelines in the reasonable and prudent measures set forth in the Gulf of Mexico Regional Biological Opinion (GRBO) (NMFS, 2005, 2007c).

For the proposed Project, the potential for incidental take exists, because hopper dredges are known to adversely impact sea turtles and Gulf sturgeon by entrainment. Therefore, the proposed Project could result in harm, injury, or harassment to sea turtle species or Gulf sturgeon. In order to reduce the potential for take, MSPA will adhere to the proposed avoidance and minimization measures in the GRBO (NMFS, 2007c). These have largely been incorporated in USACE regulatory and civil works projects throughout the Gulf for more than a decade and are acknowledged by the USFWS and NMFS to reduce impacts to sea

turtles. The avoidance, minimization, and conservation measures that would be employed during hopper dredging operations for the proposed Project include onboard observers, screening, sea turtle deflecting draghead and dredging pumps, dredge lighting, dredge take reporting, STSSN notification, and relocation trawling (NMFS, 2007c). These measures are discussed in more detail in Section 4.19. Should incidental take of sea turtles, particularly Kemp's ridley, loggerhead, and green turtles, and the Gulf sturgeon occur, the GRBO has an allotted take amount. The leatherback and hawksbill sea turtles are less likely to be impacted, since they are less likely to occur in the study area or proposed Project area.

## 3.3 TURBIDITY AND RESUSPENDED SEDIMENTS

Suspended solids vary broadly in the Mississippi Sound and the study area, with periods of high natural turbidity. According to the U.S. Environmental Protection Agency (EPA, 2013), mean total suspended solids in the study area was 20 mg/L and ranged from 6 to 68 mg/L. River inflows carry sediments and wind-driven currents suspend sediments in Mississippi Sound. However, dredging activities can affect water quality by further increasing turbidity. In general, levels of suspended sediments are expected to be highest closest to the dredging and placement operations. The amount and extent of resuspension is a byproduct of several factors, including physical properties of the sediment, site conditions, nature and extent of debris, obstructions, and operational considerations of the dredge equipment and operator.

Resuspended sediment and turbidity can affect fish via several mechanisms, including direct mortality, gill tissue damage, physiological stress, and behavioral changes (Fry, 1971). The level of impact to individuals depends on the amount of time an individual is exposed to suspended sediments, the concentration of suspended sediment in the water column, and the composition of the sediments (e.g., fine-grained versus coarse-grained, chemical associations). Impacts could result in lethal or sub-lethal physical or behavioral responses from aquatic organisms.

Although turbidity would increase whenever sediment is being removed (dredging) and placed (filling), measurable increases in turbidity would be temporary, lasting only days after dredging activity is completed, and would not extend far beyond the area where sediment is being disturbed. Appropriate turbidity control measures would be used to keep turbidity levels to a minimum and within the immediate dredge and fill area. Turbidity increases would not exceed the Mississippi Department of Environmental Quality's turbidity standard of 50 Nephelometric Turbidity Units above background outside a 750-foot mixing zone around dredged material placement areas in coastal areas of Mississippi (Anchor QEA LLC, 2017, Appendix F of the EIS).

## 3.4 DISSOLVED OXYGEN, SALINITY, AND WATER TEMPERATURE

Water quality in the Mississippi Sound is highly variable depending on the season, weather, and water depth. Construction activities proposed for the PGEP are expected to cause site-specific temporary changes to water quality, such as suspension of anoxic sediments during dredging, which can result in reduced DO in the water column as the sediments oxidize, and sublethal effects of DO concentrations below saturation.

Since the increased area with low DO would be very small, it should not alter ecological health in the study area or Mississippi Sound.

Once the proposed Project is operational, some areas (i.e., Turning Basin) around the Port are expected to have lower DO concentrations than under current conditions due to the deeper depths. Aquatic species in the study area occupy both shallow and deep water habitats and are accustomed to high fluctuations of DO, salinity, and temperature in the Mississippi Sound from existing natural processes. Thus, significant effects to listed species from temporary changes in localized water quality conditions during dredging are not anticipated.

## 3.5 DISTURBANCE OF BENTHIC PREY

A study of benthic macroinvertebrates was conducted to identify suitability of prey for the Gulf sturgeon in the Project area in April 2012 (see Appendix L of the EIS). Samples were taken from 48 sample locations within the Project footprint, Project area, and study area. The samples yielded a total of 105 benthic macroinvertebrate taxa with polychaete worms, ribbon worms, decapods, amphipods, and bivalves most common in the study area. Some of the species important to the Gulf sturgeon diet were collected close to the proposed Project footprint, indicating that Gulf sturgeon may potentially forage in the Project area.

Dredging, disposal, and filling would cause the complete removal or burial of benthic species within the Project footprint, causing loss of Gulf sturgeon foraging opportunities in the vicinity of the proposed Project. Although some impacts would be temporary and some permanent, resulting from fill for example, it is important to note that Gulf sturgeon rely completely on the benthic habitat of the Mississippi Sound for feeding. However, only few areas in the Project area that might serve as foraging habitat were found (see Appendix L of the EIS). These areas appeared to be marginal, and the total Project footprint is relatively small relative to the range of the Gulf sturgeon in Mississippi Sound. While the proposed Project would temporarily affect foraging habitat for Gulf sturgeon, the species is known to forage around the offshore islands, which would remain as a potential foraging area during Project construction. In addition, the sediment material of the proposed Project area is composed primarily of silts and clays, which is not suitable substrate for supporting Gulf sturgeon benthic prey items.

The proposed Project would not be expected to negatively affect sea turtle foraging habitat. Leatherback sea turtles are pelagic feeders and modification of benthic habitat through dredging and disposal activities would not affect pelagic resources. Green sea turtles are largely herbivorous, feeding primarily on sea-grasses or macroalgae that do not exist in the Project area. Kemp's ridley and loggerheads are generalist carnivores, typically preying on benthic mollusks and crustaceans in the nearshore environment. Dredging activities would only have temporary impacts on the foraging habitats of these species. Although filling activities would result in the permanent loss of the areas filled, as stated above, sea turtles are not likely to forage in the fill areas of the proposed Project area.

## 3.6 DREDGED MATERIAL DISPOSAL SITES

A DMMP was prepared to evaluate potential placement options for new work and maintenance dredged material associated with the Proposed Project Alternative (Anchor QEA LLC, 2017, Appendix F of the EIS). Sites considered for placement of dredged material, as discussed in Section 1.2, include:

- Use as fill for the West Pier Expansion
- 12 designated BU sites
- Thin layer placement
- Candidate BU sites
- Placement in an approved ODMDS

In summary, new work dredged material structurally suitable would be used for fill at the Project site. Any material not structurally suitable would be evaluated for potential beneficial use and possible placement at a designated or candidate BU site, such as the BMC. If the BMC is not permitted prior to dredging, and no other suitable BU sites are available, the Pascagoula ODMDS would be used for disposal of new work dredged material if the material is determined to be in compliance with Section 103 of the MPRSA (33 USC 1413). If the dredged material is not suitable for the ODMDS, the material would be placed in an approved and permitted upland disposal site(s). Depending on which sites are used in coordination with the responsible permitting agencies, various species have the potential to be impacted from burial, to clogging of gills, to impacts on benthic prey species. Most organisms are highly mobile and are expected to move from the area until it returns to normal. However, some species such as brittle stars, sea lancelets, and other benthic species would not be able to move from the affected area, thereby temporarily impacting the availability of prey to benthic feeders such as the Gulf sturgeon.

## 3.7 POTENTIAL INDIRECT PROJECT EFFECTS

As a result of the proposed Project, indirect effects are expected to occur. However, the magnitude of impact resulting from indirect effects should naturally be reduced as distance and time from the Project area increases. Indirect effects associated with the proposed Project include increased traffic in the channel, resulting in increased noise and propwash. Sea turtles and Gulf sturgeon are anticipated to either acclimate to the additional noise or vessel traffic or use other areas of Mississippi Sound, since these species are highly mobile and boats and vessels currently traverse the sound. Increased propeller scour occurring during low tide events may have some minor impacts on the benthic community in the FNC; however, such disturbances are anticipated to be rare due to the depth and width of the channel. Additionally, increased traffic would cause an increased risk of vessel strikes to whales outside the study area.

## 3.8 POTENTIAL EFFECTS OF INTERRELATED/INTERDEPENDENT ACTIONS

Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the proposed Project under consideration. No potential interrelated/interdependent actions associated with the proposed Project are known.

## 3.9 CUMULATIVE EFFECTS

Cumulative effects are effects of future state, tribal, local, or private activities, not involving Federal activities, that are reasonably certain to occur within the study area of the Federal action subject to consultation (50 CFR §402.02). The purpose of this cumulative effects summary is to aid the USFWS and NMFS in making a jeopardy/no jeopardy determination for a species, preparing BOs, and tracking the environmental conditions throughout the area. A comprehensive cumulative impact assessment is presented in Section 5 of the EIS.

In summary, five projects were determined to be "reasonably foreseeable future actions" to occur in the vicinity of the Proposed Project Alternative. These projects include the Ward Investments Project, Maritime Commerce Center, Gulfport FNC Modification with Bend Easing, Mississippi Department of Transportation's I-310 Project, and the MsCIP Barrier Island Restoration Project (Ship Island and Cat Island) and all occur within the study area. Project details or potential impacts to the surrounding environment are not available for the Maritime Commerce Center. At this time, no other project details or potential impacts to the surrounding environment are available; thus, this project was not included in the cumulative impacts analysis.

In addition, the following projects or actions represent "past or present actions" relative to the study area:

- Maintenance Dredging (refer to Section 5.3.1 in the EIS for recent maintenance dredging activities)
- Beneficial Use Sites and ODMDS
- Gulfport Harbor Navigation Channel Widening Project
- Port of Gulfport Restoration Project 84-acre site (referred to as the "Port of Gulfport Restoration: 60-acre fill" and "Port of Gulfport Restoration 24-acre fill" in Table 7)
- Kansas City Southern (KCS) Railway Rail Improvements Project
- City of Gulfport Small Craft Harbor Redevelopment
- Widening of the Pascagoula Lower Sound/Bayou Casotte Channel
- MsCIP Interim Near-Term Projects
  - Shearwater Bridge Erosion Control and Hurricane Storm Damage Reduction
  - Long Beach Canals

  - Harrison County Beaches Ecosystem Restoration and Hurricane Storm Damage Reduction
  - Courthouse Road Flood Damage Reduction and Ecosystem Restoration

- MsCIP Comprehensive Plan Projects
  - Coast-wide Beach and Dune Ecosystem Restoration
  - West Ship Island North Shore Restoration
  - Deer Island Ecosystem Restoration
  - Forrest Heights Levee Improvements
  - Turkey Creek Ecosystem Restoration

- Coastal Impact Assessment Program (CIAP) Projects
  - Henderson Point Greenway
  - Blakeslee Preserve Habitat Restoration
  - Tchoutacabouffa River Greenway
  - Biloxi River Greenway
  - Harrison County Watershed Assessment and Restoration Projects
  - Oyster Bayou Restoration
  - Acquisition and Restoration of Flood-prone Properties for Green Space, Phases 1 and 2

Placement of dredged material at the possible BMC site and Pascagoula ODMDS represent "past or present actions," and occur just outside of the study area. These actions were not included individually in the resource tables because their impacts are generally limited to only a few resource areas; however, they are described and their impacts are included for applicable projects utilizing these locations and in the total column of resource tables. Projects that are deemed to have no effect on any listed species or have insufficient details to make a determination of the level of impact are not included in this cumulative effects analysis.

### 3.9.1 Gulf Sturgeon

The proposed Project is located within Gulf Sturgeon Critical Habitat Unit 8, which includes areas of the Mississippi Sound surrounding the FNC. A benthic habitat assessment of the Project area was completed in 2012 (see Appendix L of the EIS), wherein Gulf sturgeon preferred habitat was located in the North Harbor Expansion, West Pier Expansion, and west of the West Pier Expansion areas. Impacts to the water quality, sediment quality, and migration habitat PCEs for the Gulf sturgeon would be localized and temporary. Increased vessel traffic that is expected with the proposed Project Alternative could slightly increase the potential for a petroleum spill impacting Gulf sturgeon. Dredging, dredged material placement, and fill operations would temporarily reduce benthic feeding areas, thereby affecting the quality, quantity, and availability of prey for the Gulf sturgeon.

Peterson et al. 2015 (Appendix O of the EIS) found that individual Gulf sturgeon were detected taking both transitory paths through the Project area, and localized movements within the entire study area. The data suggest that the monitored habitat area serves as a corridor between other habitat types, drainages, feeding zones, or is used as a pre-/post-migratory acclimation zone for the Gulf sturgeon. Studies are underway in the Mississippi Sound, between West and East Ship islands, and around the proposed Project area (ERDC, 2013). Data from these studies suggest that Gulf sturgeon utilize the barrier islands and nearshore waters in the Pascagoula River and distributary. Permanent habitat impacts from the proposed Project are expected from the filling of approximately 155 acres of existing estuarine mud and sand bottom habitat for the West Pier Expansion, 15 acres for the East Pier Expansion, 9 acres for the North Harbor Expansion, and 18 acres for the breakwater. Potential impacts to Gulf sturgeon from the proposed Project include permanent reduction of critical habitat area; temporary degradation of critical habitat due to suspended solids, noise from increased vessel traffic, reduced DO, and burial of benthic organisms (prey items); reduction in the availability of prey for foraging during dredging and placement activities; entrainment during dredging and placement activities; behavioral impacts due to construction noise from pile driving and dredging activities; and reduction in habitat quality around construction areas (e.g., elevated turbidity and low DO during dredging and placement). Potential impacts from other evaluated projects that involve dredge, fill, and/or placement activities, have been and would be similar, as shown in Table 7. Avoidance, minimization, and other conservation measures for sea turtles (see Section 4.2.2, below) would reduce adverse cumulative effects on the Gulf sturgeon.

Current evaluation based on available information indicates that the proposed Project may affect, but is not likely to adversely affect the Gulf sturgeon. A benthic habitat assessment was conducted for the proposed Project (see Appendix L of the EIS). Based on the information gathered for this report and published data, it is unlikely that adult Gulf sturgeon would use the proposed Project footprint for feeding during construction and placement activities. Although some of the habitat characteristics are similar to those found near Gulf sturgeon in other parts of Mississippi Sound, not all habitat characteristics were present at any one sample location, and the ongoing Port operations likely deter Gulf sturgeon from persisting in this area. Additionally, published literature show adult Gulf sturgeon congregate near the barrier island passes and use nearshore habitat for moving between river mouths (Ross et al., 2009; Havrylkoff et al., 2012). Therefore, adult Gulf sturgeon are likely to pass through the Project area, but are not likely to feed there.

Other evaluated projects have and will contribute to potential adverse impacts to the Gulf sturgeon include the Gulfport Harbor Navigation Channel Widening Project, Proposed Widening of the Pascagoula Lower Sound/Bayou Casotte Channel, Port of Gulfport Restoration Project, and maintenance dredging, as shown in Table 7. Despite ongoing construction of the Port of Gulfport Restoration Project over the past several years, Gulf sturgeon monitoring efforts show passage of tagged individuals through the Port and the use of benthic habitat in the immediate vicinity. Additionally, recent published data from tagging and monitoring studies suggest that Gulf sturgeon utilize the nearshore habitat directly east of the Port and approximately 8 miles east of the Port more than they use the habitat surrounding the Port and west of the Port (Peterson et al., 2015 (Appendix O of the EIS)). This suggests that the existing Port structure may already serve as a signal/indicator for Gulf sturgeon to swim around and stay away from the Port. The potential for impacts

to the Gulf sturgeon will vary by time of year, depending on when activities are conducted, given that the species is most likely to occur in Mississippi Sound in fall and winter months.

For the USACE Mobile District, according to the GRBO, the documented annual incidental take, by injury or mortality, is expected to consist of two Gulf sturgeon per fiscal year for all channel dredging and sand mining by hopper dredge. Gulf-wide, this estimate includes the annual documented incidental take per fiscal year, by injury or mortality from hopper dredging, of four Gulf sturgeon, as well as non-injurious take of no more than eight Gulf sturgeon, and lethal or injurious takes of up to one Gulf sturgeon, from all yearly relocation trawling in the Gulf. Further, NMFS estimates that approximately 50 percent of all take goes undocumented, and as such, included such take in their evaluation in which they determined that anticipated hopper dredging will not jeopardize the continued existence of any listed species or destroy or adversely modify designated Gulf sturgeon critical habitat (NMFS, 2003, 2005, 2007c). Maintenance activities using hopper dredging in existing federally authorized channels would comply with GRBO guidelines, which would limit the level of impact to the Gulf sturgeon. Although reduced under the proposed Project, the general increase in vessel traffic within the Mississippi Sound would increase the risk for spills, as previously discussed, which could have an adverse cumulative effect on the species. Adverse impacts from these projects would be offset to some degree by benefits from restoration, protection, and conservation projects in the MsCIP and CIAP that would positively affect the Gulf sturgeon, as shown in Table 7.

### 3.9.2 Sea Turtles

Under the proposed Project, new work and maintenance dredging activities have the potential to negatively impact all five federally listed sea turtle species, should they be present in the Project area during the time of construction. Adverse effects could occur from impingement, temporary physical and behavioral impacts from noise, increased turbidity and resuspended sediment, and loss of benthic food resources during dredging and placement activities. Potential entrainment of listed sea turtle species during dredging activity is the most significant potential impact associated with the proposed Project. Avoidance, minimization, and other conservation measures formalized by NMFS in the GRBO (NMFS, 2003, 2007c) and adopted for the proposed Project would greatly reduce the likelihood of adverse effects to these sea turtle species (see Section 4.0, below).

Other dredging activities for past, present, and reasonably foreseeable future projects have had and will continue to have potential adverse impacts to sea turtles, similar in nature to those for the proposed Project and as provided in Table 7. Although no green, hawksbill, or leatherback sea turtles have been reported as taken from recent dredging activities, two incidental takes of Kemp's ridley were reported from 2002 to 2013 within the Gulfport Harbor and FNC. In 2007, a non-lethal take of a leatherback occurred during dredging of the federally authorized Gulfport FNC; no lethal takes of leatherbacks have been reported during dredging activities in Mississippi waters (USACE, 2013). For the Gulfport Harbor Navigation Channel Widening Project, 71 Kemp's ridleys, 5 loggerheads, and 1 green sea turtle were captured and relocated, and 1 loggerhead turtle was taken during dredging operations for this project in 2011 (USACE, 2013). For the USACE Mobile District, the documented annual incidental take, by injury or mortality, is

expected to consist of 3 Kemp's ridleys, 3 green, 1 hawksbill, and 5 loggerhead turtles per fiscal year for all channel dredging and sand mining by hopper dredge. Gulfwide, according to the GRBO this estimate includes the documented annual incidental take per fiscal year, by injury or mortality from hopper dredging, of 40 loggerheads, 20 Kemp's ridleys, 14 greens, and 4 hawksbills, as well as noninjurous take of no more than 300 loggerhead, green, hawksbill, and Kemp's ridley sea turtles, and lethal or injurious takes of up to 2 sea turtles from all yearly relocation trawling in the Gulf. Further, NMFS estimates that approximately 50 percent of all take goes undocumented, and have, therefore, included such take in their evaluation, in which they determined that anticipated hopper dredging will not jeopardize the continued existence of any listed species or destroy or adversely modify designated critical habitat for the sea turtles (NMFS, 2003, 2005, 2007c).

For projects and activities with a Federal nexus (e.g., commercial fisheries, maintenance dredging of Federal channels, etc.), Section 7 consultations have and are anticipated to minimize the cumulative adverse effects of evaluated projects on all listed species. Nonetheless, incidental by-catch from commercial ship trawling, especially shrimping, and other fishing activities, in addition to other threats previously discussed, have and will continue to adversely impact these federally listed sea turtle species, having a cumulative effect of an indeterminable degree. Vessel traffic in the Port, and presumably the Gulf and surrounding Mississippi Sound channels, is projected to increase in the future without completion of the proposed Project due to past, present, and reasonably foreseeable future projects under the No-Action Alternative. Increased vessel traffic, and commensurate rise in spill risk and contribution of pollutants and trash, would likely present greater risk of incidental take (e.g., vessel collision, poisoning, ingestion or entanglement in marine debris) of federally listed sea turtle species within the study area. Likewise, increased recreational vessel traffic and fishing would contribute to increased risk of incidental take. Regardless, with or without implementation of the proposed Project, vessel traffic within the study area will increase in the future, which would have adverse cumulative effects on federally listed sea turtles, such as increased collision risk and higher potential for spills when compared to current conditions. These adverse impacts could be offset to some degree by other projects, such as the Deer Island Restoration Project, which have and will continue to benefit these sea turtle species.

### 3.9.3 Piping Plover

Historic adverse impacts to the piping plover have resulted from numerous stressors, such as shorebird hunting, loss or modification of habitat resulting from commercial, residential, and recreational developments, dune stabilization, river impoundment and channelization (eliminating sandbars, encroachment of vegetation, and altering water flows), and wetland drainages. Under the proposed Project, noise impacts to piping plover are anticipated to be minimal and temporary, as these birds would likely acclimate to the disturbance. A modeling evaluation of impacts to Harrison County beaches showed that the proposed Project would not result in significant changes in wave heights or breaking wave angles along the adjacent beaches (Anchor QEA LLC, 2015). As a result, it is unlikely the proposed Project would affect piping plover beach habitat. A pre-discharge survey would be completed to minimize adverse impacts from beneficial use of dredged materials as part of the proposed Project. Evaluated projects have and will result

in both beneficial and adverse impacts on the species. For instance, temporary displacement of individual piping plovers may result from the Coast-wide Beach and Dune Restoration Project and maintenance dredging. Moreover, the Gulfport Small Craft Harbor Redevelopment resulted in the loss of 0.96 acre of shoreline foraging and roosting habitat. However, long-term beneficial cumulative impacts would result from habitat restoration and protection afforded under MsCIP and CIAP projects, which would result in increased habitat availability and decreased rate of habitat loss. Given the temporary and localized nature of adverse impacts to piping plover from evaluated projects in relation to the benefits from restoration projects, it is reasonable to anticipate cumulative beneficial effects on the species from the evaluated projects.

### 3.9.4 Rufa Red Knot

Threats to the rufa red knot shoreline habitat occur throughout its entire range and include shoreline stabilization/erosion, coastal development, beach cleaning, invasive vegetation, agriculture, and aquaculture. The subspecies-level impacts from these activities are expected to continue into the future. Similar to the piping plover, noise impacts to the rufa red knot associated with the proposed Project are anticipated to be minimal and temporary, as these birds would likely acclimate to the disturbance. A predischarge survey would be completed to minimize adverse impacts from beneficial use of dredged materials as part of the proposed Project. Evaluated projects have and will result in both beneficial and adverse impacts on the species. For instance, temporary displacement may result from the Coast-wide Beach and Dune Restoration Project and maintenance dredging. Moreover, the Gulfport Small Craft Harbor Redevelopment resulted in the loss of 0.96 acre of shoreline foraging and roosting habitat. However, long-term beneficial cumulative impacts would result from habitat restoration and protection afforded under the MsCIP and CIAP projects, which would result in increased habitat availability and decreased rate of habitat loss. Given the temporary and localized nature of adverse impacts to the rufa red knot from evaluated projects in relation to the benefits from restoration projects, it is reasonable to anticipate cumulative beneficial effects on the species from the evaluated projects.

### 3.9.5 West Indian Manatee

The proposed Project may affect but is not likely to adversely affect the West Indian manatee, which may migrate through the study area. The major threat to this species is collision with watercraft. Vessel traffic, as discussed above for sea turtles, is anticipated to increase in the future without the proposed Project, and would be reduced under the Proposed Project Alternative compared to the No-Action Alternative. Nonetheless, increased commercial and recreational vessel traffic in the foreseeable future would result in cumulative adverse impacts to the species through increased risk of collision. New work and maintenance dredging, construction, and disposal activities would result in localized, temporary impacts (e.g., elevated noise and turbidity) to the species, which would likely cause avoidance of these areas by the West Indian manatee. The species would still be anticipated to travel across the study area, without impediment to mobility. Based on the lack of spatial overlap in impact areas, the separation in timing of activities, and the very low likelihood of interaction, direct, indirect, or cumulative adverse impacts on the manatee are

unlikely in the study area. Beneficial cumulative effects could result from the MsCIP and CIAP projects that protect and restore the marine, estuarine, and freshwater environments that manatees depend on, although benefits would be limited due to the infrequent occurrence of the species. Since 1998, seven manatee sightings have been reported within the vicinity of the proposed Project (Carmichael, 2013), and the species is transient, occurring in the study area intermittently.

Table 7
Cumulative Impacts to Threatened and Endangered Species

| Action | Threatened and Endangered Species |
|---|---|
| Proposed Project Alternative | Temporary impacts from construction, dredging, and placement; short-term increases in turbidity and reduced DO conditions; sea turtles, especially Kemp's ridley, most likely to be affected negatively by dredging activities; possibility of entrainment mortality of Gulf sturgeon by dredging equipment |
| Ward Investments Project | N/A; however, regulatory compliance would be required under Section 404 of the CWA |
| Proposed Widening of the Pascagoula Lower Sound/Bayou Casotte Channel | Impacts to open-water communities as a result of increased turbidity during dredging localized around the immediate area of dredging and placement and limited to duration of the plume at a given site, but may temporarily impact localized primary production levels, finfish foraging, and distribution patterns, and filter feeder filtering rates; potential temporary reduction in quality of EFH and displacement of individual species; permanent conversion of 87.6 acres of shallow habitat to deeper habitat and temporary burial of benthic organisms in placement sites; no long-term effects on benthic organisms are expected due to motility, rapid recovery of benthic communities following temporary, short-term impacts in the immediate vicinity of the area dredged; no long-term turbidity impacts on artificial reefs are anticipated because of their distance from the proposed Project area |
| Gulfport Federal Navigation Channel Modification with Bend Easing Project | Increased chances of impingement and entrainment of some threatened and endangered species. A change in water quality and bottom conditions may occur, including potential water column stratification resulting in hypoxic conditions that may temporarily displace sea turtles. Temporary physical and behavioral impacts to sea turtles and Gulf sturgeon from noise, increased turbidity and resuspended sediment, and loss of benthic food resources during dredging activities. Decreased risk of vessel strikes to mammals due to reduction in vessel traffic. Slight reduction in probability of a petroleum spill due to increased vessel traffic safety. |
| Barrier Island Restoration (Ship Island and Cat Island) | Placement of approximately 22 mcy of sand in Camille Cut and replenishment of the southern shoreline of East Ship Island and beach-front placement of sand along the eastern shoreline of Cat Island; convert open water to beach habitat; temporary and localized minor impacts during placement activities |
| Coast-wide Beach and Dune Restoration | Short-term potential displacement during construction and additional unknown impacts requiring consultation; long-term habitat benefits to nesting, roosting, and breeding of listed species, such as piping plover |
| West Ship Island North Shore Restoration | Positive ecological benefits |
| Deer Island Restoration | Habitat could benefit threatened and endangered species, such as Gulf sturgeon, piping plover, manatee, and sea turtles; increased piping plover over-wintering habitat; potential temporary impacts to piping plover, manatees, Gulf sturgeon, and sea turtles but species should avoid construction areas due to noise and activity |
| Forrest Heights Levee Improvement | No impacts anticipated |
| Turkey Creek Ecosystem Restoration | Positive habitat benefits to some species, such as Mississippi sandhill crane, red-cockaded woodpecker, gopher tortoise, and others, by restoration of wet pine savannah habitat; improved water quality |

| Action | Threatened and Endangered Species |
|---|---|
| CIAP Projects | N/A; however, potential benefits from preservation, conservation, and restoration activities |
| MDOT's I-310 Project | No impact to individuals; impact to potentially suitable habitat for red-bellied turtle and mud salamander |
| KCS Rail Improvements Project | Project likely to impact, but not adversely impact, the federally threatened gopher tortoise |
| Courthouse Road Flood Damage Reduction | N/A |
| Shearwater Bridge Storm Damage Reduction | N/A |
| Long Beach Canals | N/A |
| Harrison County Beaches Ecosystem Restoration and Hurricane Storm Damage Reduction | Benefits to threatened and endangered species, such as piping plovers |
| Port of Gulfport Restoration: 24-acre fill | Loss of 24 acres of Gulf sturgeon critical habitat (or 0.005% Mississippi Sound Gulf sturgeon critical habitat); benefits from mitigation plan in accordance with Permit MS96-02828-U to mitigate for these losses (e.g., contribution of $94,000 to MDMR Coastal Preserve acquisition program) |
| Port of Gulfport Restoration: 60-acre fill | Loss of 60 acres (or 0.012% of Mississippi Sound Gulf sturgeon critical habitat); benefits from mitigation plan in accordance with Permit MS96-02828-U to mitigate for these losses (e.g., contribution of $1,000,000 to MDMR Coastal Preserve acquisition program); mitigation result in estuarine benefits |
| City of Gulfport Small Craft Harbor Redevelopment | Temporary loss of shoreline foraging and roosting habitat for federally threatened piping plover from excavation of 0.96 acre of existing shoreline immediately east of the proposed Project site to create compensatory shallow water habitat |
| Maintenance Dredging | Incidental take from injury and mortality of sea turtles and Gulf sturgeon; temporary degradation of Gulf sturgeon critical habitat due to suspended solids, noise, reduced DO, and burial of benthic organisms (prey items); reduction in the availability of prey for foraging during dredging and placement activities; entrainment of Gulf sturgeon and sea turtles during dredging and placement activities; behavioral impacts due to noise from dredging on all listed species; and reduction in habitat quality around dredging areas (e.g., elevated turbidity and low DO levels during dredging and placement activities) |
| Gulfport Harbor Navigation Channel Widening Project | Temporary and minor potential impacts to sea turtles; potential temporary localized disruption to foraging behavior of Gulf sturgeon in dredge/disposal areas and potential for entrainment of Gulf sturgeon swimming in the dredging areas; potential temporary disruption of roosting behavior of piping plover at the western end of Ship Island; impacts incurred during dredging activities |

| Action | Threatened and Endangered Species |
|---|---|
| Qualitative Summary of Cumulative Impacts | Cumulative impacts would include displacement of piping plover, listed sea turtles, West Indian manatee, and Gulf sturgeon during construction, placement, and dredging activities; degradation of habitat quality by these activities; cumulative increase in vessel traffic compared to current conditions would increase risk of petroleum spill and pollution; cumulative increased risk of mortality or injury to listed sea turtles and Gulf sturgeon from impingement or entrainment during dredging activities; avoidance, minimization, and mitigation measures in place to prevent jeopardizing future existence of threatened and endangered species; restoration, stabilization, protection, and beneficial use actions would have cumulative beneficial effects on threatened and endangered species |

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# 4.0 EFFECTS ANALYSIS, AVOIDANCE, MINIMIZATION, AND CONSERVATION MEASURES

The USACE presents their determinations about each species potentially occurring within the affected area of the PGEP, using language recommended by USFWS:

- *No effect* – USACE determines that its proposed action will not affect a federally listed species or critical habitat;
- *May affect, but not likely to adversely affect* – USACE determines that the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial; or
- *Likely to adversely affect* – USACE determines adverse effects to listed species and/or critical habitat may occur as a direct result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or completely beneficial. Under this determination, an additional determination is made whether the action is likely to jeopardize the continued survival and eventual recovery of the species or result in destruction or adverse modification of critical habitat.

The USACE has made the effect determinations for the proposed Project on federally listed species and has provided them to the USFWS and NMFS. The USFWS has reviewed the information as per the Section 7 consultation process under the ESA and concurred with the USACE determination that the proposed Project may affect, but not likely adversely affect, the West Indian manatee, and that the proposed Project should have no effect on the piping plover, the red knot, or any designated critical habitat areas (see USFWS letter dated November 13, 2015, Appendix E-2 of the EIS). The Section 7 consultation process with NMFS is ongoing. As noted above, critical habitat is a term used in the ESA to refer to specific geographic areas that are essential for the conservation of a threatened or endangered species and that may require special management and protection.

This project does not fall under the GRBO (NMFS, 2007a), which is intended to cover routine maintenance of navigation channels and does not include expansion of Port features.

## 4.1 GULF STURGEON

### 4.1.1 Construction Dredging (New Work) and Maintenance

Gulf sturgeon migrate through the Mississippi Sound and may occur in the Sound at any time, but are more likely to occur in the fall and winter (October to March) (Heise et al., 2004). Recent research documented Gulf sturgeon in the Mississippi Sound up until May (Peterson et al., 2015, Appendix O of the EIS). Recent tagging studies have also shown that adult Gulf Sturgeon spend more time in the area than previously thought (Peterson et al., 2015; Appendix O of the EIS). The Gulf sturgeon feed on benthic organisms in the Mississippi Sound and between the barrier islands, traveling into coastal waters of neighboring states to feed, primarily in the winter. Habitat preferred by Gulf sturgeon occurs in the Project area near the West

Pier Expansion (see Appendix L of the EIS), and Gulf sturgeon were tracked numerous times at receivers stationed around the Port. Adult Gulf sturgeon were recorded mainly from the Pascagoula and Pearl drainages, but there were some eastern population fish [from Escambia, Choctawhatchee and Blackwater (recaptured fish) drainages] that appeared in the Gulfport array. The data suggest that the habitat monitored for the presence of Gulf sturgeon serves as a corridor between other habitat types, drainages, feeding zones, or is used as a pre-/post-migratory acclimation zone (Peterson et al., 2015 [Appendix O of the EIS]).

Potential impacts to the Gulf sturgeon from the Proposed Project Alternative include:

- Reduction of critical habitat due to the Turning Basin, North Harbor Expansion, and East and West Pier expansions;
- Temporary degradation of critical habitat due to suspended solids, noise, reduced DO and burial of benthic organisms (prey items);
- Reduction in the availability of prey for foraging during dredging and placement activities;
- Entrainment during dredging and placement activities;
- Behavioral impacts due to construction noise from pile driving and dredging; and
- Reduction in habitat quality around the construction area, including elevated turbidity levels and low DO levels during dredging and placement activities.

The proposed Project is located in Critical Habitat Unit 8 for the Gulf sturgeon; habitat within the West Pier Expansion has sediment characteristics and water quality characteristics favorable to the Gulf sturgeon and contains prey known to occur in an adult Gulf sturgeon's diet (see Appendix L of the EIS). The expansion of the West Pier would result in permanent removal of this sediment and would result in deeper, hypoxic habitat, which would reduce prey availability and critical habitat for Gulf sturgeon. However, the acreage of Gulf sturgeon critical habitat impacted by the proposed Project is relatively small (0.06%) compared to the overall size of Gulf sturgeon critical habitat in the Mississippi Sound. Therefore, the reduction in habitat surrounding the Port from the proposed Project would not cause a significant shortage in suitable habitat for Gulf sturgeon. Furthermore, after conducting a benthic habitat assessment for the proposed Project, it was concluded that adult Gulf sturgeon are likely to pass through the Project area but are not likely to feed there (see Appendix L in the EIS). Although critical habitat surrounds the existing Port, noise and vessel traffic from ongoing operations likely deter Gulf sturgeon from utilizing this habitat.

Recent data suggest that Gulf sturgeon utilize the nearshore habitat directly east of the Port and approximately 8 miles east of the Port more than they use the habitat surrounding and west of the Port (Peterson et al., 2015 [Appendix O of the EIS]). This may suggest that the existing Port structure may already serve as a signal/indicator for Gulf sturgeon to go around and away from the Port toward the barrier islands. They are expected to continue to use it as they do currently, under existing conditions.

Dredging and placement of material would cause temporary increases in suspended solids and reduce DO conditions. Dredging operations can attract some species, because prey items get resuspended in the water column and become easier to catch. Depending on when the dredging operation occurs, dredging could

attract Gulf sturgeon for feeding. After dredging, these conditions would most likely result in less-productive bottom conditions within the dredged area because of the reduced water quality conditions. Following the completion of dredging and placement activities, any displaced animals would be expected to reutilize the placement area after some period of recovery time, if sediment and water characteristics are suitable.

Incidental mortality of Gulf sturgeon could result from entrainment by dredging equipment and could result in population reductions.

### 4.1.2 Avoidance, Minimization, and Conservation Measures

Many of the avoidance, minimization, and conservation measures described for sea turtles in Section 4.2, below, are applicable to Gulf sturgeon.

### 4.1.3 Effect Determinations

Because many of the avoidance, minimization, and conservation measures described for sea turtles in Section 4.2 below are applicable to Gulf sturgeon, the Proposed Project Alternative may affect, but is not likely to adversely affect the Gulf sturgeon. In particular, the measures to be implemented would include halting and postponing operations if injured, sick, or dead Gulf sturgeon are located in the area, and following the proper notification protocol for any injured, sick, or dead Gulf sturgeon as described in permits issued for the proposed Project.

Although the proposed Project would adversely modify or destroy Gulf sturgeon critical habitat through the permanent loss of some critical habitat area and potential prey items, it is unlikely that adult Gulf sturgeon would use the proposed Project footprint for feeding. Furthermore, the acreage of Gulf sturgeon critical habitat impacted by the proposed Project is relatively small (0.06%) compared to the overall size of Gulf sturgeon critical habitat in the Mississippi Sound. Therefore, the reduction in habitat surrounding the Port from the proposed Project would not cause a significant shortage in suitable habitat for Gulf sturgeon. Therefore, no significant impact to Gulf sturgeon critical habitat is expected.

## 4.2 SEA TURTLES

All five sea turtle species (green, hawksbill, Kemp's ridley, leatherback, and loggerhead) have been documented in the Mississippi Sound. Kemp's ridley and loggerhead sea turtles are likely the most common, with the green and leatherback sea turtles being sporadic. Sea turtles are typically present in the study area during the nesting season from May through October (Johnson, 2013). New work and maintenance dredging activities as part of the Proposed Project Alternative have the potential to negatively impact sea turtles, should they be present in the proposed Project area. Any of the sea turtle species may be present in the proposed Project area during certain times of the year.

### 4.2.1 Construction, New Work Dredging, Maintenance, and Operation

Pier construction and maintenance dredging for the PGEP are combined in this section as these actions are implemented with similar equipment. At this time, it is expected that new work dredging would occur using mechanical/hopper dredge and maintenance dredging would occur using hydraulic/cutterhead or mechanical/hopper dredging, as necessary. Hopper dredges have the potential to injure or cause mortality from impingement (NMFS, 2007c); whereas, cutterhead dredges are not expected to cause mortality (NMFS, 2012). Other potential impacts to sea turtles include temporary physical and behavioral impacts from noise, increased turbidity and resuspended sediment, and loss of benthic food resources during dredging and placement activities.

### 4.2.2 Avoidance, Minimization, and Conservation Measures

In other navigation project BOs, the NMFS anticipated incidental take, either by injury or mortality, due to dredging activities. To address potential incidental take during maintenance and other dredging activities, the USACE and NMFS collaborated on avoidance, minimization, and other conservation measures, formalized by NMFS in the GRBO (NMFS, 2003, 2007c).

The GRBO was based on review of regular maintenance dredging of navigation channels and offshore sand mining for beach nourishment and restoration activities; it addresses, among other species, the five sea turtles that could potentially occur in the proposed Project area and study area. Any maintenance activities following implementation of the proposed Project would be covered under the GRBO.

Proposed avoidance and minimization measures include reasonable and prudent precautions and actions that have largely been incorporated in USACE civil works projects throughout the Gulf for more than a decade and are acknowledged by the USFWS and NMFS to reduce impacts to sea turtles. These measures, implemented in full, are necessary and appropriate to authorize any incidental take of sea turtles during construction of the proposed Project. A summary of avoidance, minimization, and conservation measures that would be employed during hopper dredging operations (NMFS, 2007c) include the following:

- *Observers*: The USACE would arrange for NMFS-approved protected species observers to be aboard the hopper dredges to monitor the hopper bin, screening, and dragheads for sea turtles and their remains. Observer coverage sufficient for 100 percent monitoring (i.e., two observers) of hopper dredging operations would be implemented between April 1 and November 30 and/or if the surface water temperatures are 52 °F or greater.
- *Screening*: 100 percent 4-inch inflow screening of dredged material is required. If conditions prevent 100 percent inflow screening using 4-inch mesh, the USACE, observers, and draghead operator must consult with the USACE, and the USACE must notify NMFS before reducing or eliminating inflow screening and provide details regarding effective overflow screening. If deemed necessary, screening may be modified gradually (increasing mesh size to 6 x 6 inch, then 9 x 9 inch, then 12 x 12 inch). If clogging is still an issue after gradual changes, then effective 100 percent overflow screening would be required.

- *Sea Turtle Deflecting Draghead and Dredging Pumps*: A state-of-the-art rigid, non-slotted deflector draghead would be used on all hopper dredges at all times of the year. Dredging pumps would be disengaged by the operator when the dragheads are not firmly on the bottom to prevent impingement or entrainment of sea turtles within the water column (especially important during dredging cleanup).
- *Dredge Lighting*: From May 1 through October 1, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within 3 nautical miles of sea turtle nesting beaches would be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or Occupational Safety and Health Administration requirements. Nonessential lighting would be minimized through reduction, shielding, lowering, and appropriate placement to minimize illumination of nesting beaches and reduce disorientation effects on female sea turtles and hatchlings. However, no sea turtle nesting has been reported along the Mississippi coast.
- *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges would be submitted by fax or email to NMFS Southeast Regional Office by onboard protected species observers within 24 hours of any observed sea turtle take. An end-of-project summary report of the hopper dredging results and any documented sea turtle takes would be submitted to NMFS Southeast Regional Office within 30 working days of completion of the dredging project. The USACE would submit an annual report to the NMFS Southeast Regional Office summarizing hopper dredging projects and documented incidental takes. This report must include a complete explanation why alternative dredges (other than hopper dredges) were not used for maintenance dredging, if that activity occurs between April and November.
- *STSSN Notification*: The USACE or its representative would notify the STSSN state representative of start-up and completion of hopper dredging, bed-leveler dredging, and relocation trawling operations and ask to be notified of any turtle strandings in the project area that may bear the signs of draghead impingement or entrainment or interaction with a bed-leveling type dredge. Dredge-relevant stranding information would be reported in the end-of-project summary report and end of year annual report (these strandings would not be counted against USACE take limit during maintenance).
- *Relocation Trawling*: The function and purpose of capture relocation is to capture sea turtles that may be in the dredge's path and relocated them away from the action area. Relocation trawling would be implemented as circumstances dictate in a manner consistent with the GRBO and as outlined in the GRBO for construction. Handling of sea turtles captured during relocation trawling in association with hopper dredging would be conducted by NMFS-approved protected species observers in a manner designed to ensure their safety and viability. When safely possible, not jeopardizing the health of the individual turtle, scientific measurements/procedures may be taken (see GRBO for details). An end-of-project report would be generated upon completion and incorporated into the hopper dredging annual summary report.
- *Operations*: During periods when hopper dredges are operating and NMFS-approved protected species observers are not required, USACE would (1) advise inspectors, operators, and vessel captains that take, harm, and harassment of turtles is prohibited; (2) instruct the hopper dredge captain to avoid any sea turtles during travel or activity and to immediately contact USACE if sea turtles are seen in the vicinity; (3) notify NMFS if sea turtles are observed in the dredging area to coordinate further take-avoidance precautions; and (4) notify NMFS if a sea turtle (or any other protected species) is taken by the dredge.

Other conservation measures include:

- Operations would be stopped temporarily if injured, sick, or dead listed species are located in the area.
- The Port would follow appropriate notification protocols for any injured, sick, or dead species as described in permits issued for the proposed Project.
- Underwater noise impacts from the installation of pilings would be mitigated through the use of bubble curtains, resonators, or other sound-cancelling options.

### 4.2.3 Effect Determinations

In summary, new work and maintenance dredging activities involving a hopper dredge may result in incidental take of individual sea turtles. Because no impacts to beaches are expected as a result of the proposed Project, no effect on nesting sea turtle habitat or individuals are anticipated. Effect determinations, based on the information presented in this document and in the EIS, are presented in Table 8. The likelihood of adverse effects, including incidental take, during construction and maintenance of the proposed Project are greatly reduced by full implementation of the avoidance, minimization, and conservation measures outlined above. Incidental take, if it occurs, would not likely jeopardize the continued existence or potential recovery of any of the sea turtle species.

Table 8
Sea Turtle Effect Determinations Relative to the Proposed Project Alternative

| Common Name | Scientific Name | Dredging Activity Determination | Placement of Dredged Materials Determination |
|---|---|---|---|
| Green sea turtle | *Chelonia mydas* | May affect, but not likely to adversely affect | May affect, but not likely to adversely affect |
| Hawksbill sea turtle | *Eretmochelys imbricata* | May affect, but not likely to adversely affect | May affect, but not likely to adversely affect |
| Kemp's ridley sea turtle | *Lepidochelys kempii* | May affect, but not likely to adversely affect | May affect, but not likely to adversely affect |
| Leatherback sea turtle | *Dermochelys coriacea* | May affect, but not likely to adversely affect | May affect, but not likely to adversely affect |
| Loggerhead sea turtle | *Caretta caretta* | May affect, but not likely to adversely affect | May affect, but not likely to adversely affect |

## 4.3 PIPING PLOVER

Open-water dredging would not directly affect the piping plover. Wintering piping plovers could potentially occur on beaches and sand and mudflats along the open-water Gulf margins within the study area. The USFWS-designated critical habitat for the piping plover (Mississippi Critical Habitat Units MS-2, MS-3, MS-4, MS-5, MS-6, MS-12, and MS-14) occurs between the mouth of the St. Louis Bay and Biloxi Bay and includes Cat Island, East Ship Island, West Ship Island, and Deer Island (USFWS, 2001b). The

proposed Project does not include beach nourishment, which would affect piping plover principal wintering habitats. A modeling evaluation of impacts to Harrison County beaches showed the proposed Project would not result in significant changes in wave heights or breaking wave angles along the adjacent beaches. As a result, it is unlikely the proposed Project would affect piping plover beach habitat (Anchor QEA LLC, 2015). Wintering piping plovers have been observed using uplands for resting between placement activities. During the DMMP evaluation for the Proposed Project Alternative, the Port began discussion with the MDMR/USACE BUG on using the BMC as a placement area for the dredged material from the Port. For the proposed PGEP, the BUG was in favor of a BU site instead of an ODMDS. As such, the BMC is the recommended placement alternative for the new work dredged material for the proposed Project (Anchor QEA LLC, 2017, Appendix F of the EIS). If the BMC site is approved and permitted, potential impacts to piping plovers would be addressed through the BMC permitting process. Noise from construction and operation of the facilities may have a temporary impact on the piping plover, although the birds would likely become acclimated to the noise level and adjust their proximity accordingly.

### 4.3.1 Effect Determinations

The proposed Project may affect but is not likely to adversely affect piping plovers and/or its habitat.

## 4.4 RUFA RED KNOT

Similar to potential impacts to the piping plover described above, open-water dredging would not directly affect the rufa red knot. The rufa red knot uses coastal marine and estuarine habitats with large, wide areas of exposed intertidal sediments and is known to occur in the study area. It has been documented mainly on the offshore islands but has been recorded on all major islands from Cat Island east to Petit Bois Island, with only five birds at Horn Island observed during the peak winter months. A modeling evaluation of impacts to Harrison County beaches showed the proposed Project would not result in significant changes in wave heights or breaking wave angles along the adjacent beaches; therefore, it is unlikely the proposed Project would affect rufa red knot beach habitat (Anchor QEA LLC, 2015). As discussed above, during the DMMP evaluation for the Proposed Project Alternative, the Port began discussion with the MDMR/USACE BUG on using the BMC as a placement area for the dredged material from the Port. For the proposed PGEP, the BUG was in favor of a BU site instead of an ODMDS. As such, the BMC is the recommended placement alternative for the new work dredged material for the proposed Project (Anchor QEA LLC, 2017, Appendix F of the EIS). If the BMC site is approved and permitted, potential impacts to rufa red knots would be addressed through the BMC permitting process. Noise from construction and operation of the facilities may have a temporary impact on the rufa red knot, although the birds would likely become acclimated to the noise level and adjust their proximity accordingly.

### 4.4.1 Effect Determinations

The proposed Project may affect but is not likely to adversely affect the rufa red knot and/or its habitat.

## 4.5 WEST INDIAN MANATEE

Although the West Indian manatee may migrate through the proposed Project area, the species typically concentrates near tidally influenced rivers, estuaries, and in nearshore habitats along the Gulf coast. The major threat to the manatee is collision with watercraft. Potential for impacts from dredging and disposal, as well as potential collisions with vessel traffic while present, should be minimal, due to the limited use of the area by manatees. Due to underwater noise from construction activities and elevated turbidity levels, active dredging and disposal activities may disturb these animals and cause them to alter their route. Underwater noise impacts from the installation of pilings would be mitigated through the use of turbidity bubble curtains, resonators, or other sound-cancelling options. These temporary impacts would likely cause the manatee to avoid the area, but would not prevent their passage. Given their likely absence, feeding habits, and very low likelihood of interaction, direct or indirect effects on manatee are unlikely. However, manatees are sometimes relatively docile animals and may not leave the Project area and be susceptible to injury or impact. Therefore, the Guidelines for Activities in Proximity to Manatees and Their Habitat, provided by USFWS (see USFWS letter dated November 13, 2015, Appendix E-2 of the EIS) would be adhered to in order to minimize potential impact to this species.

### 4.5.1 Effect Determinations

The West Indian manatee is known to migrate through the proposed Project area between Florida and Louisiana. Manatees favor coastal habitat associated with rivers, estuaries, and nearshore areas. It is anticipated that this species would avoid the construction areas, due to noise and activity. Therefore, it is concluded that the proposed Project may affect, but is not likely to adversely affect the West Indian manatee.

# 5.0 SUMMARY

Table 9 presents a summary of effect determinations for the federally threatened and endangered species covered in this BA. Potential adverse effects from hopper dredging activities would be avoided and minimized to the greatest extent possible through adherence to the measures outlined in this document.

Table 9
Effect Determinations Summary for the Proposed Project Alternative

| Common Name | Scientific Name | Dredging Activity | Placement of Dredged Materials |
|---|---|---|---|
| **FISH** | | | |
| Gulf sturgeon* | *Acipenser oxyrhynchus desotoi* | May affect, but not likely to adversely affect** | Likely to adversely affect |
| **REPTILES** | | | |
| Green sea turtle | *Chelonia mydas* | May affect, but not likely to adversely affect** | May affect, but not likely to adversely affect |
| Hawksbill sea turtle | *Eretmochelys imbricata* | May affect, but not likely to adversely affect** | May affect, but not likely to adversely affect |
| Kemp's ridley sea turtle | *Lepidochelys kempii* | Likely to adversely affect** | May affect, but not likely to adversely affect |
| Leatherback sea turtle | *Dermochelys coriacea* | May affect, but not likely to adversely affect** | May affect, but not likely to adversely affect |
| Loggerhead sea turtle | *Caretta caretta* | May affect, but not likely to adversely affect** | May affect, but not likely to adversely affect |
| **BIRDS** | | | |
| Piping plover*** | *Charadrius melodus* | May affect, but not likely to adversely affect | May affect, but not likely to adversely affect |
| Rufa red knot | *Calidris cannutus rufa* | May affect, but not likely to adversely affect | May affect, but not likely to adversely affect |
| **MAMMALS** | | | |
| West Indian manatee | *Trichechus manatus* | May affect, but not likely to adversely affect | May affect, but not likely to adversely affect |

*No significant impact to Gulf sturgeon critical habitat is expected.

**The likelihood of adverse effects (incidental take) of sea turtles and Gulf sturgeon due to dredging activities is greatly reduced by implementation and adherence to the conservation measures. Adverse effects are not expected to jeopardize the continued survival or recovery of the species.

***No effect to piping plover critical habitat is expected.

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