US Army Corps
of Engineers ®
Galveston District

NMFS BIOLOGICAL ASSESSMENT
for
Houston Ship Channel Expansion Channel Improvement Project,
Harris, Galveston, and Chambers Counties, Texas

Final Integrated Feasibility Report–Environmental Impact Statement

December 2019

This page left intentionally blank

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

1.1 PURPOSE OF THE BIOLOGICAL ASSESSMENT

This Biological Assessment (BA) has been prepared to fulfill the U.S. Army Corps of Engineers (USACE), Galveston District requirements as outlined under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. This assessment is required by the USACE action for the improvements to the Houston Ship Channel (HSC) navigation system proposed by the National Economic Development (NED) or the Locally Preferred Plan (LPP) to address deep draft navigation problems under the Houston Ship Channel Expansion Channel Improvement Project (HSC ECIP) Federal feasibility study, as this study and NED or the LPP are considered a major Federal action under ESA. These plans would consist of channel modification measures to widen the HSC, Bayport Ship Channel (BSC), and Barbours Cut Channel (BCC), ease channel bends, expand existing turning basins and constructing new ones, and a possible anti-shoaling feature. These measures are geographically spread along the entire length of the HSC navigation system from Bolivar Roads near the entrance into Galveston Bay, to the Main Turning Basin in the Buffalo Bayou reach of the HSC near the center of Houston. **Figure 1** illustrates the NED and the LPP. The LPP includes features of the NED Plan, additional widening of the HSC from Barbours Cut to south of Red Fish Island and the proposed shoaling attenuation feature.

Currently, the study has completed the Tentatively Selected Plan Milestone phase of the Specific, Measurable, Attainable, Risk-Informed, and Timely (SMART) planning process and is currently completing the Feasibility-Level Analysis phase, following the Agency Decision Milestone (ADM) approving the continued study of the NED or LPP presented previously. Several aspects of the NED or LPP have been refined through more detailed economic analysis, engineering and cost data, and refinement of design. The proposed channel width was determined to be 700 feet, using ship simulation conducted with the participation of the Houston Pilots Association (HPA) during two simulation rounds during the previous planning phases. Sufficient width to realize the economic benefits necessary to justify the plan depends on having enough width for safe two-way traffic meeting of design vessels. The Bay widening is also divided lengthwise into the 3 straight segments of the existing HSC alignment. The need to replace the existing shallow draft barge lanes directly adjacent to the main channel of the HSC and shift them outward of the revised channel is also accounted. The measures have been shown to either be economically justified during more detailed economic analysis, or identified as a navigation safety feature that warrants detailed engineering analysis during the Preconstruction Engineering and Design (PED) phase that follows this phase.

The lower segment of the Bay widening (shown as CW1_BR-Redfish) is part of the NED and the upper and middle segments (shown as CW1_Redfish-BSC, and CW1_BSC-BCC) the additional sections of the LPP. The LPP includes all of the measures of the NED. With the LPP BE1_28+605 and BE2_BSCFlare would not be needed as separate measures because the widening would include these two measures. Previously, a range of widening larger and smaller than the 700-foot wide channel was analyzed for NEPA purposes in the Draft Integrated Feasibility Report and EIS (DIFR-EIS) for this study, and in the previous version of the BA. This is the final BA report that would be included in the Final IFR-EIS.

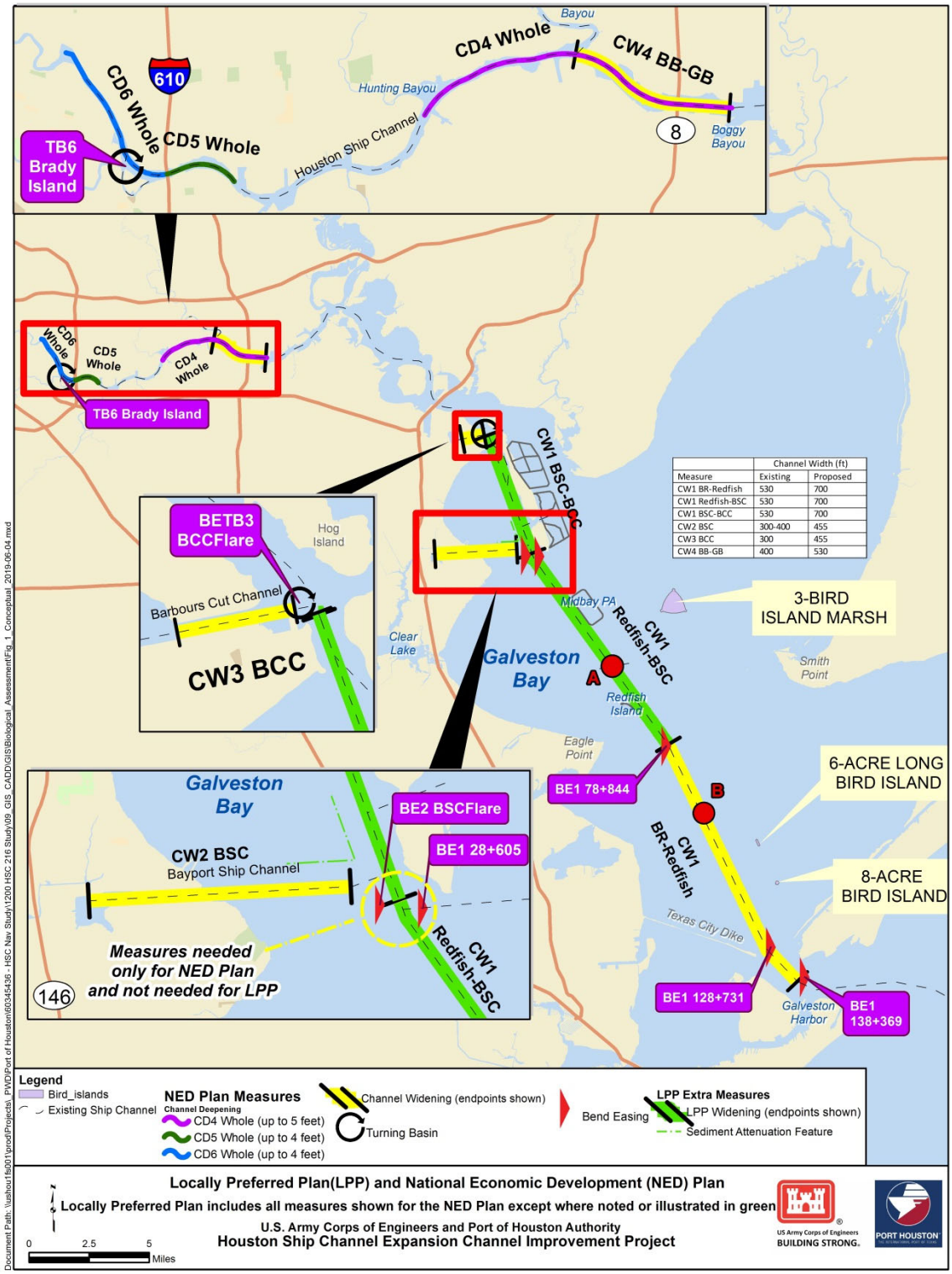


Figure 1 – Conceptual Map of the Locally Preferred and National Economic Development Plans

Because the feasibility and cost of dredge material placement are highly dependent on the specifics of the channel modifications are very quantity and distance dependent, and in the highly developed region of the study very location dependent, a specific dredge material placement plan is being developed in this Feasibility-Level Analysis planning phase. Currently, the Dredged Material Management Plan (DMMP) for the NED or LPP is examining the feasibility of using three new upland tracts of land for the upper HSC, constructing new beneficial use (BU) features in Galveston Bay, and very limited use of existing PAs, to accommodate new work material. The BU features currently being evaluated are variants of tidal marsh, bird/rookery islands, oyster reef, and a dike-like channel shoaling attenuation feature. This BA has been updated for inclusion in the Final IFR-EIS to incorporate assessment of the final dredge material placement plan effects on Federally-listed species. For this version of the BA, the effects of the NED channel modifications, the effects of the LPP channel modifications, and use of the proposed upland confined placement areas and the existing upland confined placement areas, beneficial use sites, possible sediment attenuation feature, and ocean dredged material disposal site (ODMDS) have been assessed.

This BA evaluates the potential impacts the proposed action may have on federally listed threatened and endangered species identified by the U.S. Fish and Wildlife Service (USFWS) for Chambers, Galveston, and Harris Counties, Texas and the National Marine Fisheries Service (NMFS) for the State of Texas. Species included in this BA (**Table 1-1**). These species were identified from lists obtained from databases managed by the USFWS and NMFS (USFWS 2019a-d; NMFS 2019). Additional federally protected species are listed by the Texas Parks and Wildlife Department (TPWD) as potentially occurring in Chambers, Galveston, and Harris Counties. However, these additional species are not covered in this BA as they were not identified on the lists obtained from the databases managed by the jurisdictional Federal agencies (USFWS and NMFS).

The bald eagle has been delisted from the Federal list of threatened and endangered species in 2007. The bald eagle still remains federally protected under both the Bald and Golden Eagle Protection Act (16 United States Code (U.S.C. 668-668c) and the Migratory Bird Treaty Act [16 U.S.C. 703-712]. The bald eagle is not included in this BA as they are no longer protected under the ESA.

The brown pelican was removed from the Federal list of endangered and threatened species on December 17, 2009 (*Federal Register*. 2009), but still receives protection under the Migratory Bird Treaty Act and the Lacey Act (16 U.S.C. 3371-3378). The brown pelican is not included in this BA as they are no longer protected under the ESA.

The red knot was listed as threatened on January 12, 2015 (Federal Register. 2014b). The red knot is a medium size shorebird. The red knot is not expected to be found within the NED or the LPP footprint since these areas consist of open water near developed land or active dredged material placement areas with armored shorelines lacking natural shore accretion. The three proposed upland disposal sites are forested, open pasture, abandoned parking and laydown area, and are located inland from the coast. None are habitats for this coastal bird. Four invertebrate coral species are listed by NMFS: lobed star, mountainous star, boulder star, and elkhorn coral. None of the coral species are expected within the project area.

Two fish species have been recently listed: oceanic whitetip shark (*Carcharhinus longimanus*) and Giant manta ray (*Manta birostris*). Both are pelagic species and are not expected within the project area

(NOAA 2018; NOAA 2017a). One whale species is proposed to be listed: Gulf of Mexico Bryde's whale (*Balaenoptera edeni* - subspecies).The Gulf of Mexico Bryde's whale is a pelagic species and in not expected to be within the project area (NOAA. 2019b).

Table 1-1 – Federally-Listed Threatened and Endangered Species in Chambers, Galveston, and Harris Counties, Texas

Common Name	Scientific Name	USFWS[1] County by County List and IPaC List[3]	NMFS[2] List for State of Texas
Birds			
Attwater's Greater Prairie-Chicken[4]	*Tympanuchus cupido attwateri*	E	NA
Eskimo curlew[5]	*Numenius borealis*	E	NA
Piping Plover	*Charadrius melodus*	T, CH	NA
Red Knot	*Calidris canutus rufa*	T	NA
Invertebrates			
Lobed star coral	*Orbicella annularis*	NA	T
Mountainous star coral	*Orbicella faveolata*	NA	T
Boulder star coral	*Orbicella franksi*	NA	T
Elkhorn coral	*Acropora palmata*	NA	T, CH[6]
Mammals			
Fin whale	*Balaenoptera physalus*	NL	E
Sei whale	*Balaenoptera borealis*	NL	E
Sperm whale	*Physeter macrocephalus*	NL	E
Gulf of Mexico Bryde's whale	*Balaenoptera edeni - subspecies*	NL	Proposed E
West Indian manatee	*Trichechus manatus*	T	E
Fish			
Oceanic whitetip shark	*Carcharhinus longimanus*	NL	T
Giant manta ray	*Manta birostris*	NL	T
Reptiles			
Loggerhead sea turtle	*Caretta caretta*	T	T, CH[7]
Green sea turtle	*Chelonia mydas*	T	T
Hawksbill sea turtle	*Eretmochelys imbricata*	E	E
Leatherback sea turtle	*Dermochelys coriacea*	E	E, CH[6]
Kemp's Ridley sea turtle	*Lepidochelys kempii*	E	E
Plants			
Texas prairie dawn	*Hymenoxys texana*	E	NA

1. USFWS 2019a, USFWS 2019b, USFWS 2019c
2. NMFS 2019
3. USFWS 2019d
4. Listed only within USFWS 2019d
5. Listed only with the USFWS County-by-County, USFWS 2019c
6. Critical Habitat is listed, but not present within or near the project area
7. Critical habitat is listed for Gulf of Mexico that includes the offshore disposal area ODMDS No. 1

1.2 DESCRIPTION OF THE PROPOSED PROJECT AND EXISTING HABITATS

Proposed Project Description

The proposed project is the National Economic Development (NED) for this study, which is considered a major Federal action for purposes of the Section 7. The NED is located within the HSC navigation system that traverses Galveston Bay to the tidal portions of the San Jacinto River and Buffalo Bayou in Galveston, Chambers, and Harris Counties, Texas. The HSC is currently maintained by the USACE to depths of -37.5 feet to -46.5 feet mean lower low water (MLLW) [-36 to -40 feet mean low tide (MLT)] plus between one to two feet of advanced maintenance and two feet of allowable overdepth. Currently, the majority of the HSC is 530 feet wide through its length in the Bay, with some relatively short discontinuous sections of 600 feet and 700 feet-wide channel between Morgans Point and the Battleship Texas, and a narrowing down above that from 530 feet to 400 feet, down to 300 feet wide. The side channels to the HSC, the Bayport Ship Channel (BSC) and Barbours Cut Channel (BCC) have been recently deepened to match the -46.5 ft MLLW depth of the HSC, and widened to address navigation deficiencies and inefficiencies associated with the current vessel fleet and berths, with the BSC widened to between 350 and 400 feet wide, and the 300 foot-wide BCC shifted 75 feet northward. The NED proposes a variety of measures to modify the HSC, BSC and BCC, summarized in **Table 2.1** and as follows:

- Widen the lower section of the HSC channel and ease bends of the HSC in Galveston Bay to provide a wider channel of approximately 700 feet wide.
- Widen one segment (CW4 BB-GB) in the HSC above Morgans Point to address places where the channel narrows down from its existing widths.
- Deepen the HSC above Boggy Bayou by between 4 and 5 feet
- Expand the Bradys Island turning basin.
- Widen the BSC to approximately 455 feet, expand the existing flare at its confluence with the HSC, and provide a turning basin at the entrance to the landcut.
- Provide a shoaling attenuation feature (e.g. dike-like groin) for the Bayport Flare, to be planned in the next phases when a hydrodynamic and sediment transport model is ready.
- Widen the BCC to approximately 455 feet, and expand the existing flare in combination with providing a turning basin, at its confluence with the HSC.
- Create two bird islands east of HSC with approximately 18 acres of oyster mitigation.
- Create three bird islands associated with beneficial marsh with approximately 14 acres of oyster mitigation east of HSC and east of MidBay placement area.
- Create approximately 67 acres of oyster reef mitigation southeast of Eagle Point

The LPP proposes the following additional measures:

- Widen the HSC channel in Galveston Bay to provide a wider channel of approximately 700 feet wide. Widening would remove two of the NED ease bends associated with the Bayport Channel.
- Create approximately 321 acres of Oyster reef Mitigation north and southeast of Eagle Point.
- Create two new beneficial use marshes.
- Create a proposed sediment attenuation feature

Figure 1 shows a conceptual map that illustrated the measures that make up the NED and the LPP. As discussed at the beginning of this BA, the study is at a point where the NED and the LPP would be refined in the next planning phase and may change the size or inclusion of some measures that make up the NED and LPP. Specific design details would be developed in later planning phases, and the Preconstruction

Engineering Design (PED) phase once the final NED or LPP are approved. Therefore, construction techniques and details can only be discussed generally at this point.

The channel modifications of the NED and LPP would be constructed by dredging to widen and deepen channels, and expand the Brady Island turning basin. The depths of widened features would be in the range of -41.5 feet to -46.5 feet MLLW. **Table 1-2** provides the proposed methods for dredging new work material by general dredging segments and measures involved. **Figure 1** shows the dividing points or limits of these segments as Point A and Point B. The NED and the LPP would be constructed primarily using hydraulic dredging to remove new work material and hydraulically pump it via pipelines to placement sites to be selected in detail in the next planning phase. It is anticipated that some new work dredging using clamshell (aka mechanical) dredges would also be used to remove softer new work materials more suitable for that type of dredge within a segment between Point B near Moses Lake and the Point A. This dredged material would be transported via scow (essentially a barge with bottom doors) to the existing approved ODMDS No. 1, located at the Entrance Channel (reference **Figure 2**).

Table 1-2 – Proposed New Work Dredging Methods by Segment and Measure

Dredging Segment	Extent Description	NED Measures	LPP Measures	New Work Dredging and Placement Method
Lowest segments	Entrance Channel to Point B	BE1_128+731 BE1_138+369 CW1_BR-Redfish (lower)		Hydraulic cutterhead and pipeline
Station 57+00 to 100+00	Point B to Point A	CW1_BR-Redfish (upper) BE1_78+844	CW1_Redfish-BSC (lower)	Clamshell bucket and scow
Upper segments	Point A to Main Turning Basin	BE1_28+605 BE2_BSCFlare CW2_BSC CW3 BCC BETB3 BCCFlare CW4 BB-GB CD4 Whole CD5 Whole CD6 Whole TB6_Brady_Island	CW1_Redfish-BSC (upper) BE1_28+605 and BE2_BSCFlare are incorporated in channel widening and not needed as separate measures	Hydraulic cutterhead and pipeline

For long-term maintenance dredging, hydraulic cutterhead, clamshell, and suction hopper dredging would be used to maintain the channels long term, with material deposited at the selected placement sites. Both hydraulic cutterhead and Trailing suction hopper have been used to maintain the existing HSC. Other types of work expected would be installing sheet piling and mooring dolphins. Sheet piling would be limited to a few areas where existing shoreline and bank would be supported where channel slopes are intended to be dredged steeper to minimize land impacts. Currently these areas are limited to the land cut north shore along the BSC [**Figure 1**, bottom inset], the north shoreline along the BCC [**Figure 1**, middle inset], along a short stretch of the HSC at Morgans Point [**Figure 1**, middle inset], and at the expansion of the existing Brady Island Turning Basin [**Figure 1**, top inset]. The construction for the channel modifications would be accessed by water via a dredge. Construction for sheet piling has not been

determined, but could be either by the adjacent shore or by water. The project would not be constructed until the study and NED and or the LPP are approved, and Congress appropriates funding for this project. Construction is expected to last several years. Further details of construction would be determined at a later planning phase of the study.

The NED would at maximum impact approximately 94 acres of oyster reef and the LPP would impact approximately 421 (NED 72 + LPP 349 additional) acres of oyster reef. The oyster reefs are located extensively along the HSC and BSC, and would require mitigation. A mitigation plan was provided in Appendix Q of the DIFR-EIS sent with the Final BA, detailing the reef impacts, mitigation proposed, and candidate mitigation locations. The mitigation would require construction of between approximately 90 acres for the NED and additional approximately 315 acres for the LPP of restored reef based on habitat modeling, by beneficially using dredged new work material to build a 1 foot or greater relief off of the bay bottom and capping it with a veneer of suitable cultch material to naturally recruit reef. The candidate sites are shown in **Figure 1** of the Mitigation Plan and proposed oyster reef sites are shown in **Figure 2**, and specific site(s) would be selected from among these or others that emerge from public and agency input during the public and agency review period for this Draft IFR-EIS. Final mitigation amounts would be determined following refinements to the NED and habitat modeling to account for those changes.

As discussed at the beginning of this BA, the study is at a point where the NED and the LPP have been refined in this planning phase and the final inclusion of some measures that make up the NED and the LPP are being determined with completion of detailed Feasibility-level cost estimates and economic analysis. The Planning Development team (PDT) has conservatively identified the longest extent of channel widening, which widening the full length of the HSC in Galveston Bay is the largest component of the NED and the LPP. Primarily, the number of measures is expected to be tailored at the end of this phase. Because feasibility and cost for dredge material placement are highly dependent on the specifics of the channel modifications, is very quantity and distance dependent, and in this highly developed region, very location dependent, specific dredge material placement planning would be performed once the NED and the LPP have been refined in the next planning phase. A DMMP is being developed in the current planning phase. However, it is the PDT's intention to use existing PAs used to maintain the current HSC system as much as possible. Given the existing capacities, it is expected that some new placement features would be needed for long term maintenance of the revised channels. Potential locations of the new placement features are shown in **Figure 2** (Future without Project). The Future without Project planning is not included in the current NED or LPP and is not included in this BA. The future planning would include consideration of BU features and upland placement. This BA includes the review of the existing upland confined placement areas, BU marsh cells and islands, 3 new upland placement areas, proposed sediment attention feature, and the one existing ODMDS (**Table 1-2** and **Figure 2**). Once a DMMP is developed, this BA would be reviewed and revised as necessary to incorporate any new placement sites.

The action area is generally the area of dredging, the dredge pipelines, and the PAs that would accept the material. It would consist of the existing PAs listed in **Table 1-3** and any new placement features determined for the DMMP developed in the next planning phase as called out in **Figure 2**. The action area regarding indirect effects from turbidity from dredging is expected to be less than 1,000 meters, considering the literature for studies that have examined turbidity plume dispersal through detailed monitoring studies. These studies are discussed in Section 2.1.5.1, Water Quality, of Appendix G in the DIFR-EIS.

The creation of the 3 bird islands and 3-bird island marsh would cover the existing bay bottom with new material. These islands and marsh would create beneficial areas. The placement of the new material would temporarily create areas of turbidity and would expect to be less than 1,000 meters. The placement of the dredge and new clutch materials for the proposed oyster reefs would temporarily create areas of turbidity and would be less than 500 feet. The placement of the oyster reef materials are discussed in Appendix P Mitigation for Oyster Reef Habitat.

The placement of the materials for the proposed sediment attainment feature would temporarily create areas of turbidity around the proposed feature. The feature would alter the local currents to reduce sedimentation within the HSC. The location and design of the attainment feature would be determined in the next phase of planning.

The purpose of the feasibility study is to evaluate Federal interest in alternative plans (including the No-Action Plan) for reducing transportation costs and addressing navigation safety issues on the HSC system and assess the effects of the alternatives on the natural system and human environment, including the economic development of existing inefficiencies. The study is being conducted to address problems with deep draft navigation in the HSC system to ensure these ship channels can more efficiently and more safely handle current and future vessel sizes and traffic, both of which have increased due to trends in the shipping industry, regional growth, and national and global demand for products and cargo originating in, or shipping through, Houston.

Table 1-3 Placement Areas Proposed for New Work and O&M for the NED or LPP

	Name	Type	New Work	O&M
1	3 Bird Island Marsh	Beneficial Use	x	x
2	3 Bird Island	Beneficial Use	x	
3	6-acre Bird Island	Beneficial Use	x	
4	8-acre Bird Island	Beneficial Use	x	
5	Alexander Island	Upland Placement		x
6	BABUS	Future without Project		
7	Beltway 8	Upland Placement	x	
8	E2 Clinton	Upland Placement	x	
9	East Clinton	Upland Placement		x
10	Filter Bed	Upland Placement	x	
11	Glendale	Upland Placement	x	
12	House-Stimson	Upland Placement		x
13	Lost Lake	Upland Placement		x
14	M10	Beneficial Use		x
15	M11	Beneficial Use	x	x
16	M12	Beneficial Use	x	x
17	M7/8/9	Beneficial Use		x
18	Midbay PA	Upland Placement		x
19	ODMDS No.1	Ocean Dredged Material Disposal	x	x
20	PA 14/15	Beneficial Use		x
21	PA14	Beneficial Use		x
22	PA15	Beneficial Use		x
23	Rosa Allen	Upland Placement		x
24	Rosa Allen Expansion	Upland Placement		x
25	Sediment Attenuation Feature	Beneficial Use	x	
26	Spilmans Island	Upland Placement		x
27	West Clinton	Upland Placement		x

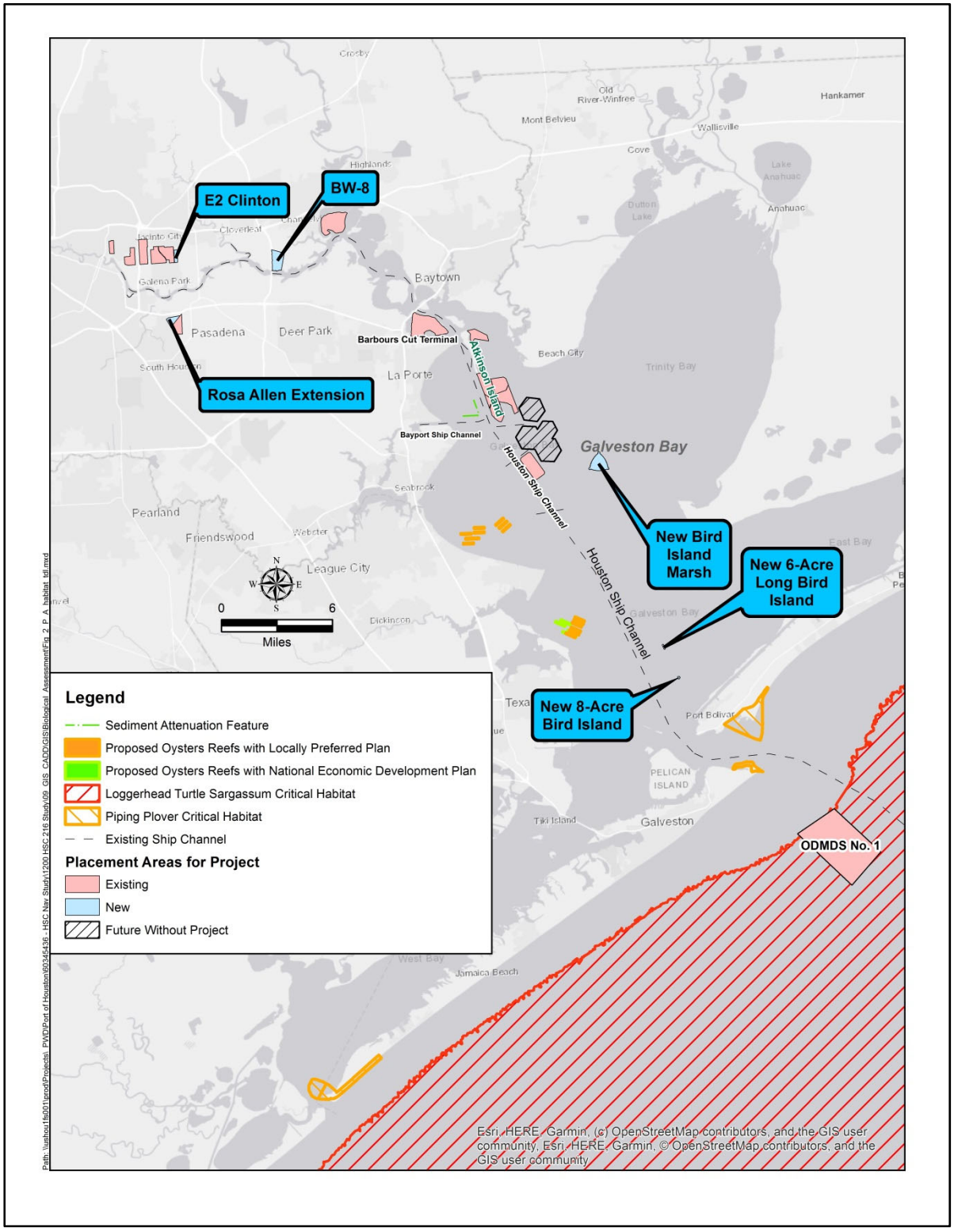


Figure 2 – NED and LPP, Placement Areas, and Critical Habitat

2.0 EXISTING HABITAT

The existing environment within the proposed project footprint is composed of the existing channel, the adjacent shallow estuarine waters with a few very small areas of developed, urbanized land with armored shoreline and various existing upland, offshore, and beneficial use disposal areas. Relevant natural resources data was reviewed to determine if natural resources may be located in or around the project area. Geographic Information Systems (GIS) data obtained from the Texas Parks and Wildlife Department and the Texas General Land Office (TxGLO) indicate oyster reefs within the proposed NED footprint lining the HSC from approximately Redfish Reef to Morgans Point. For terrestrial areas where the NED footprint overlaps land, a combination of TPWD Natural Resources Information System and 2014 aerial imagery were reviewed to confirm the urbanized nature of impacts on or near land.

Of the species listed in **Table 1-1**, sea turtles are most likely to occur in and around the project area. Other species listed are not likely to occur in the vicinity of the project due to lack of suitable habitat or the area is beyond their known range limits. There is no designated critical habitat for any of the listed species within the NED channel footprint. However, there is designated critical habitat for the Piping plover approximately 1.5 to 2 miles from the southern end of the project limits at Bolivar Roads (Texas Units 35 Big Reef south side of Bolivar Roads and 36 Bolivar Beach, north side of Bolivar Roads). Both critical habitat areas are along the Gulf of Mexico side of either Galveston Island or Bolivar Peninsula with no direct impacts by the proposed NED project footprint. Also, critical habitat for the Loggerhead turtle (Sargassum habitat) was designated in 2014 for the offshore waters of the Gulf of Mexico (LOGG-S-2 Gulf of Mexico Sargassum) that includes an existing ocean dredge disposal site (ODMDS No. 1). ODMDS No. 1 is approximately 6 miles from the proposed NED's southern limit (**Figure 2**). ODMDS No. 1 is currently permitted for placement of maintenance material from a lower segment of the HSC, and would be considered for use in maintaining NED features in the same approved segment of the HSC.

LOGG-S-2 Gulf of Mexico Sargassum critical habitat contains only Sargassum habitat (Federal Register 2014a). The Sargassum habitat is for the developmental and foraging for young loggerhead where surface waters form accumulation of floating material, especially Sargassum. The physical or biological features that support this habitat are (i) Convergence zones, surface-water downwelling areas, the margins of major boundary currents (Gulf Stream), and other locations where there are concentrated components of the Sargassum community in water temperatures suitable for the optimal growth of Sargassum and inhabitance of loggerheads; (ii) Sargassum in concentrations that support adequate prey abundance and cover; (iii) Available prey and other material associated with Sargassum habitat including, but not limited to, plants and cyanobacteria and animals native to the Sargassum community such as hydroids and copepods; and (iv) Sufficient water depth and proximity to available currents to ensure offshore transport (out of the surf zone), and foraging and cover requirements by Sargassum for post-hatchling loggerheads, i.e., >10 m (>32.8 feet) depth. The Sargassum habitat is dynamic and large areas may not contain densities of Sargassum that would concentrate loggerhead turtles. It is not necessary that the primary constituent elements of Sargassum habitat be present in the critical habitat area at all times.

The proposed NED or LPP footprint does not involve habitat required for terrestrial (e.g. piping plover) or oceanic species (e.g. fin, sei, sperm, or Bryde's whales, oceanic whitetip shark, giant manta ray, or coral). Fin whales are found in deep, offshore waters and feed on krill, small schooling fish (e.g., herring, capelin,

and sand lance), and squid. Fin whales can be found in social groups of 2-7 whales (NOAA 2019a). Fin whales have been documented to occur within the Gulf of Mexico, but are generally anti-tropical distribution centered in the temperate zones (NOAA 2010a).

Sei whales prefer subtropical to sub polar waters on continental shelf edge and slope worldwide and observed in deeper waters of oceanic areas far from the coastline (NOAA 2017b). Sei whales look similar in appearance to Bryde's whales and they also tend not to enter semi-enclosed water bodies, such as the Gulf of Mexico (NOAA 2011). Sei whales feed primarily on calanoid copepods with secondary preference for krill.

Sperm whales tend to inhabit areas with a water depth of 600 m (1,968 feet) or more and are uncommon in waters less than 300 m (984 feet). Their diet consists of many larger organisms that also occur in deep waters of the ocean such as large squid, large demersal and mesopelagic sharks, skates, and fishes. Sperm whales are the most common large cetacean in the northern Gulf of Mexico, where it occurs in greatest density along and seaward of the 1,000 m (3,280 foot) depth contour and prefer steep rather than shallow depth gradients (NOAA 2010b).

Gulf of Mexico Bryde's whales are consistently located in the northeastern Gulf of Mexico, along the continental shelf break between 100 and 400 meters deep. The Gulf of Mexico Bryde's whale is the only resident baleen whale in the Gulf of Mexico and is distinct from Bryde's whales worldwide. The Gulf of Mexico Bryde's whale was petitioned to be listed as endangered on December 8, 2016 (FR. 2016).

Oceanic whitetip shark is found in tropical and subtropical seas worldwide and pelagic species (NOAA.2018). Oceanic whitetip shark generally remains offshore in open ocean, on the outer continental shelf, or around oceanic islands in water depths greater than 184 m (605 feet), occurring from surface to at least 152 m (499 feet). This shark has a strong preference for surface mixed layer in water waters above 20^{o} C (68^{o} F).

The water depth of the existing ODMDS No. 1 varies from approximately 10 m (32.8 feet) to approximately 15 m (49 feet) and is located 1 to 5 miles from the beginning of the HSC. The noise from the frequent ships entering and exiting from the HSC would be another deterrent for these whales and fish visiting the ODMDS. The bottom of the offshore disposal site is composed of various silts, sands, and clays that are not suitable habitat for corals and the disposal area is periodically impacted by additional maintenance material. It is improbable that these whales and or fish would be found in the ODMDS No. 1 area and any effect to these whales and fish species is so unlikely that it can be considered discountable.

For species using habitats potentially present in estuaries, the specific habitat required for regular use by most of those species is not present within the proposed project footprint. The open water of the proposed channel modifications of the NED or the LPP lack the mud and sand flat and sand spit habitat used by the Piping plover or Eskimo curlew for wintering in Texas. Similarly, these and other sand beach habitat used by the Red knot for wintering and stopover habitat is not present in the proposed project footprint. The project area waters are too cold during winter months and do not contain submerged or emergent aquatic vegetation required by the West Indian manatee, limiting it to rare stray, transient occurrence in Galveston Bay. Therefore, these species are unlikely to be encountered in the project area. The lack of suitable oceanic, foraging, and nesting habitat limits the likelihood of encountering sea turtles in the NED or LPP

footprint and upland PAs and beneficial use areas. Sea turtle species are considered in more detail in the sub-sections that follow.

Though it is not likely that the five species of sea turtles, Red knot, Piping plover, or West Indian manatee would be encountered within the project footprint, their presence in the project area is possible. An advisory for construction contractors to be aware of their possible presence, and contact numbers to immediately call in case of contact with any of these species for the USFWS's Houston Ecological Services Field Office in the case of Red knot or Piping plover, or the Marine Mammal Stranding Network in the case of a turtle or manatee would be added to the USACE contract specifications for this project.

The three proposed placement areas (Beltway 8, E2 Clinton, and Rosa Allen Extension) are not appropriate habitat for Texas prairie dawn. The Beltway 8 area is abandon ammunition site, first constructed for World War I and abandon since World War II. The site is overgrown with trees and shrubs and has numerous wetlands scattered throughout. Forested areas with few to no open areas and no mima mounds are appropriate habitat for Texas prairie dawn. The E2 Clinton site is currently mostly open pasture. However, E2 Clinton site has received fill in the past and has a large barrow area on the northern portion. No Texas prairie dawn habitat such as mima mounds were observed during habitat review site visits. The Rosa Allen Extension site is an abandoned parking lot and laydown area in the northern half and the southern half is forested with little to no relief. There is no habitat was observed for any of the proposed placement areas for Texas prairie dawn.

The Attwater's prairie chicken is only known to occur in the wild at three locations Attwater's Prairie Chicken National Wildlife Refuge (Colorado County, Texas), Texas City Prairie Preserve (Galveston County, Texas) and a private ranch in (Goliad County, Texas) (USFWS 2010). This species is not expected to occur on any of the proposed placement areas. The Beltway 8 area is overgrown forest and shrubs and the E2 Clinton site is open pasture that is overgrazed and/or is maintained by mowing. The Rosa Allen Extension site is an abandoned parking lot and laydown area in the northern half and the southern half is forested with little to no relief.

2.1 SEA TURTLES

Sea turtles may occur in the bay waters within and in the vicinity of the project area. Of the five turtle species listed by the NMFS and the USFWS, only the Kemp's ridley, green, and loggerhead sea turtles are likely to occur in the project area. The hawksbill and leatherback sea turtles are not likely to be found within the project area due to a lack of suitable habitats. Hawksbill sea turtles prefer clear offshore waters of mainland and island shelves and therefore are unlikely to occur in the project area. They are most common where coral reef formations are present (TPWD 2017d). Leatherback sea turtles primarily inhabit the upper reaches of the ocean where deep water comes to the surface (upwelling areas) and therefore are unlikely to occur in the project area. They also frequently descend into deep waters from 650 feet to 1650 feet in depth in search of their prey such as jellyfish, tunicates, squid, fish, crustaceans, and algae (TPWD 2017e).

2.1.1 Reasons for Protected Status

The largest threat to populations of sea turtles is the alteration of the existing environment, especially their nesting grounds, and direct contact with humans. Historically turtle populations declined worldwide due to the harvest of both sea turtles and their eggs from nesting grounds. It is illegal to harvest sea turtles or their eggs in the United States and in many other parts of the world, although these practices do continue in some parts of the world. Sea turtles are also threatened by entanglement in commercial fishing gear, ingestion of or entanglement in marine debris, environmental contamination from industrial areas, and degradation of nesting habitat due to beach re-nourishment or beach armoring activities. The green sea turtle was designated as threatened in July 1970 and currently remains threatened in Texas. The Kemp's ridley sea turtle was designated as endangered in December 1970 and currently remains endangered in Texas. The loggerhead sea turtle was designated as threatened in July 1978 and currently remains threatened in Texas.

2.1.2 Habitat

Green sea turtles are found in three distinct marine habitat types: high-energy oceanic beaches, convergence zones in pelagic habitat, and benthic feeding grounds in relatively shallow, protected waters (USFWS/NMFS 1991). The females deposit eggs on the high-energy beaches above the high water line. The hatchlings take refuge and feed in the convergence zones in the open ocean. The sub-adults feed on sea-grasses, coral, and rocky bottoms.

Kemp's ridley adults are generally found in the Gulf of Mexico waters and open ocean. Juveniles are most commonly reported in the northern Gulf of Mexico between Texas and Florida. Nesting mostly occurs on sandy beaches of Mexico. The post-pelagic stages are commonly found feeding over bottoms and juveniles are frequently found feeding in bays, coastal lagoons, and river mouths (TPWD 2017b).

Loggerhead sea turtles are found in a variety of environments such as brackish waters of coastal lagoons, river mouths, and tropical and temperate waters above 50 degrees Fahrenheit. Below 50 degrees Fahrenheit, the loggerhead sea turtles may lose their ability to swim and dive (NMFS/USFWS 2008). Loggerhead sea turtles are also found in three distinct marine habitats: oceanic beaches, pelagic convergence zones, and benthic feeding grounds of shallow waters and bays (TPWD 2017c).

2.1.3 Range

Green sea turtles are found worldwide in tropical and sub-tropical waters. In the United States Atlantic waters, green turtles are found around the U.S. Virgin Islands, Puerto Rico, and the continental U.S. from Texas to Massachusetts. Important feeding areas for green turtles are located in and around Florida. Major Green turtle nesting beaches in the United States are found on the Atlantic beaches along the southeast coast of Florida and in smaller numbers along the beaches of Puerto Rico and the US Virgin Islands (TPWD 2017a).

Kemp's ridley sea turtles have one of the most restricted distributions of any species of sea turtle, occurring mainly in coastal areas of the Gulf of Mexico and the northwestern Atlantic Ocean. The major nesting

beach for the Kemp's ridley is on the northeastern coast of Mexico near Rancho Nuevo in southern Tamaulipas (TPWD 2017b).

Loggerhead sea turtles are found worldwide throughout temperate and tropical seas. Their major nesting beaches in the United States are located primarily in the southeast along the Atlantic coasts of North Carolina, South Carolina, Georgia, and Florida (TPWD 2017c).

2.1.4 Distribution in Texas

In Texas, green sea turtles are primarily found in the Gulf of Mexico, and sub-adults are occasionally found feeding in shallow bays and estuaries where marine sea grasses, the turtle's principle food source, grow. The green sea turtle population in Texas once flourished but declined due to commercialized overfishing in the mid to late nineteenth century. Green sea turtles can still be found in Texas bays and estuaries but in much-reduced numbers (TPWD 2017a).

The Kemp's ridley migrates along the Texas coast and generally remains in near shore waters less than 165 feet deep to feed on shrimp, crab, and other invertebrates (TPWD 2017b). The smallest juveniles are found in shallow waters of bays or lagoons, often foraging in less than 3 feet of water, whereas larger juveniles and adults are found in deeper water. Almost the entire population of Kemp's ridley turtles nest near Rancho Nuevo, Tamaulipas, Mexico, although an increasing number of nests have been found along the Texas coast. According to information from the *Final Environmental Assessment Expansion of Placement Areas 14 and 15* (hereafter referred to as the "PAs 14 and 15 Expansion EA"), 10 Kemp's ridley nests have been documented on the Bolivar Peninsula and 37 Kemp's ridley nests have been documented on Galveston Island since 1999 (USACE 2010).

Loggerhead sea turtles are transient species along the Texas coast and in Texas bays and estuaries. Only minor and solitary nesting has been recorded along the coasts of the Gulf of Mexico. Only one Loggerhead nest has been documented since 1999 between both Bolivar Peninsula and Galveston Island (USACE 2010). The Kemp's ridley and Loggerhead sea turtle nesting occurrences have been on beach on the Gulf of Mexico side of these coastal barriers, and not on the Galveston Bay side.

2.1.5 Presence in Project Area

Although green sea turtle nests have not been documented on the Bolivar Peninsula or Galveston Island since 1999 (USACE 2010), and although the project area has no sea grasses, it remains possible that the green sea turtle may occur as a transient species in the project area.

It is possible that green sea turtles, Kemp's ridley sea turtles, and loggerhead sea turtles may be found in or near the project area within Galveston Bay as a transient species, since it contains and is surrounded by a warm estuarine bay. Loggerhead sea turtles are likely to be encountered in the part of the project area associated with ODMDS 1, as it is in an area of Gulf waters identified as critical habitat, as discussed in **Section 3.1**, under **Habitat**. It is unlikely that leatherback or hawksbill sea turtles would be found in or near the project area, as it does not contain suitable nesting habitat for any sea turtle species.

2.2 GIANT MANTA RAY

2.2.1 Reasons for Protected Status

The largest threat to the Giant manta ray (*Manta birorostris)* is overutilization for commercial purposes. The species is targeted as bycatch in commercial fisheries around the globe, especially with the increase of the mobulid gill-raker market that has occurred in recent years. Global abundance data is sparse but they are believed to occur in populations of between 100 – 1,500 individuals (NOAA. 2017a).

2.2.2 Habitat

Giant manta rays tend to be found offshore, in oceanic waters, and in productive coastlines. They can tolerate a wide range of temperatures, being found in waters from 19° C off the coast of California to 30º C off Indonesia. The Giant manta ray has been noted to dive to depths as deep as 1,000m, but is typically found closer to the surface (NOAA. 2017a).

2.2.3 Range

The giant manta ray is found worldwide in tropical, subtropical, and temperate bodies of water (NOAA. 2017a). It is commonly found offshore, in oceanic waters, and near productive coastlines. There is population of manta rays within the Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico. However, researchers are still trying to determine whether the manta rays in this area are only giant manta ray individuals or potentially also comprise individuals of a new, undescribed species. Other sightings have been along the northern coast of Yucatan Peninsula Mexico. This species appears to be pelagic and is highly migratory.

2.2.4 Presence in Study Area

There is population of manta rays within the Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico. However, researchers are still trying to determine whether the manta rays in this area are only giant manta ray individuals or potentially also comprise individuals of a new, undescribed species. There is potential for the giant manta ray to be present in the area of the ODMDS.

3.0 EFFECTS ANALYSIS

3.1 EFFECTS OF THE PROPOSED ACTION ON LISTED SPECIES

The following sections provide the findings of Galveston District and species-specific avoidance, minimization, and conservation measures that support the effect determinations presented. Effect determinations are presented using the language of the ESA:

> • ***No effect*** - the proposed action would not affect a federally-listed species or critical habitat;
>
> • ***May effect, but not likely to adversely affect*** - 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*** - 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.

3.2 SEA TURTLES

The sea turtles that may occur in the bay waters in or near the project area are green, Kemp's ridley, and loggerhead sea turtles. New work dredging for the proposed project would be conducted using hydraulic cutterhead and clamshell dredges, which move at sufficiently slow speeds that turtles would be able to avoid the cutterhead or clamshell bucket. Additionally, a Regional Biological Opinion (RBO), dated November 19, 2003, by the NMFS for the Galveston, New Orleans, Mobile, and Jacksonville Districts of the USACE concluded that non-hopper dredges are not known to take sea turtles. A hydraulic cutterhead dredge and the clamshell dredge are non-hopper type of dredge. There is no suitable nesting habit in the NED or LPP, existing upland disposal or beneficial use areas. Avoidance of use of transient forage habitat in the Bay by sea turtles due to dredging noise and light would be the same impact as currently occurs during periodic maintenance dredging. This may affect likely to adversely affect sea turtle species using the Bay for transient foraging habitat. However, plenty of directly adjacent habitat would be available during the temporary construction dredging. Given the transient use and the temporary nature of the construction, occurrence of the effect would be unlikely but possible.

Though most maintenance for the NED or LPP would be conducted using hydraulic cutterhead dredged, hopper dredging may be used for the maintenance dredging of sections where material and placement is more suitable to this type, which is anticipated to be limited to softer material and locations lower in the Bay, where material may be placed in the existing offshore disposal site ODMDS No. 1. This is currently practiced for the existing HSC maintenance. The use of hopper dredging may affect and likely to adversely affect sea turtle species during the maintenance dredging. The 2003 Gulf of Mexico Regional Biological Opinion (GRBO) revised twice (June 24, 2005 (Roy Crabtree/NMFS letter to BG Michael Walsh/USACE) and January 9, 2007 (Roy Crabtree/NMFS letter to BG Joseph Schroeldel/USACE))

authorizes take levels for sea turtles by hopper dredging (NMFS 2016) with reasonable and prudent measures (Best Management Practices) to reduce the impacts of hopper dredging to sea turtles. Such measures include dedicated protected species observers, inflow and outflow screening, as well as turtle deflection devices installed on dragheads, implementing strategic use of dredge pumps at the start and end of dredging operations to minimize suction from dragheads to avoid sea turtles, trawling and relocation of endangered species as necessary, and training for personnel on dredging operations that would minimize takes of sea turtles.

The use of the ODMDS No. 1, which is located within the Loggerhead critical habitat area could have an impact on Loggerhead turtles if the presence of Sargassum is dense enough to attract young loggerhead turtles. However, a 2016 NMFS memo from Roy E. Crabtree dated March 4, 2016 to Alvin B. Lee, USACE, South Atlantic Division, clarifying the activities under the 2007 GRBO (NMFS 2016) with respect to the new critical habitat found for offshore ocean disposal within the boundaries of the Sargassum critical habitat (NMFS 2016):

> "The placement of the dredged material may create temporary turbidity plumes that could potentially extend to the surface and interact with the Sargassum and its associated community, creating the potential to impact the following PCE: " available prey and other material associated with Sargassum habitat such as, but not limited to, plants and cyanobacteria and animals endemic to the Sargassum community such as hydroids and copepods." However, the sediments would be expected to settle quickly, and therefore interaction time with the Sargassum and materials associated with its habitat would be of very short duration and any effects would be insignificant. Thus, offshore ocean disposal is not likely to adversely affect the Sargassum critical habitat."

Based on the March 4, 2016 GRBO, the use of ODMDS No. 1 as a disposal site may affect but would not likely adversely affect the Sargassum critical habitat area.

The driving of sheet piles creates intense noise levels. Peng et al 2015, cites intensity levels in between 131-135 decibels referenced to 1 microPascal (dB re 1 µPa) with frequencies between 30-40 Hertz (Hz). This is within the reported range of hearing reported for sea turtles (Samuel et al 2005). The sheet piles are proposed along the land cut north shore along the BSC, the north shoreline along the BCC, along a short stretch of the HSC at Morgans Point, and at the expansion of the existing Brady Island Turning Basin. The presence of sea turtles at the Brady Island Turning Basin is unlikely because it is located more than 20 miles up the HSC from Morgan's Point, the upper part of Galveston Bay. There is a low chance of foraging turtles for the other three locations. Sound does not propagate well in shallow environments such as Galveston Bay, which has an average depth of 8 feet. The sound is scattered and attenuated by the waves on the surface and soft muddy bottom. The sound could follow the existing channels, but the continuous operations within the Bayport, Barbours Cut and the Houston Ship Channel with their high noise levels from tanker and container ships (180-205 dB re 1 µPa with frequencies between 6.8-70 Hz)

and noise from other small ship traffic such as tugboats (170-180 dB re 1 µP with frequencies between 20-1000 Hz), it would be expected that sea turtles would avoid these areas.

The creation of the sediment attenuation feature, 3-Bird Island, its associated marsh, 6-acre Bird Island, 8-acre Bird Island, and the oyster reefs would place dredge material and rock on the existing bay bottom. With the noise from the operations of the ships, dredge pipes, and placement of the material, it would be expected that sea turtles would avoid these areas. In addition the placement of dredged material for the oyster reefs would be using specific dredge placement equipment to minimize turbidity and increase precision of location and depth of the material.

With the use of the above, it is anticipated that the project would not impact nesting or non-nesting sea turtles in the NED project area, but may affect foraging turtles within Galveston Bay and loggerhead turtles in association with high densities of Sargassum within the existing loggerhead turtle Sargassum Critical Habitat area.

Effect Determination: May effect and likely to adversely affect during maintenance dredging with hopper dredges any foraging green, Kemp's ridley, and loggerhead sea turtle that may be within the maintenance dredging area and loggerhead sea turtles that are within the ODMDS No. 1 located within the existing loggerhead turtle Sargassum Critical Habitat area during times of high densities of Sargassum. Also, the use of ODMDS No. 1 as a disposal site may affect but would not likely adversely affect the Sargassum critical habitat area.

3.3 GIANT MANTA RAY

There is potential for the Giant manta ray to be present in the area of the ODMDS while material is being placed. However, because the species is pelagic and highly migratory the likelihood is low. The giant manta feeds at the surface or in the mesopelagic zone and would not likely be affected by any turbidity resulting from the placement of material at the ODMDS. The placement of material may cause individuals to temporarily disperse if they are present during dumping operations. The proposed project may effect, but is not likely to adversely affect the Giant manta ray.

4.0 SUMMARY

The proposed action could be expected to impact the foraging critical habitat for loggerhead turtle and the listed turtles that may be present therein. It is possible but less likely, for the proposed action to cause listed sea turtles to avoid using the warm estuarine water transient foraging habitat in Galveston Bay within and near the project area. The proposed project may cause Giant manta rays to temporarily disperse. The proposed action would not impact any other listed species or their critical habitat identified in this BA. Therefore, a determination that the proposed action may effect, not likely to adversely affect foraging turtles within Galveston Bay and the loggerhead turtle and its critical habitat and the Giant manta ray around the ODMDS, is anticipated.

This page left intentionally blank

5.0 REFERENCES

Federal Register.2018. 'Endangered and Threatened Wildlife and Plants; Final Rule To List the Giant Manta Ray as Threatened Under the Endangered Species Act,' Vol. 83. No. 14, Pages 2916-2931, January 22, 2018.

_____. 2016. 'Endangered and Threatened Wildlife and Plants: Notice of 12-Month Finding on a Petition To List the Gulf of Mexico Bryde's Whale as Endangered Under the Endangered Species Act (ESA),' Vol. 81, No.236, Pages 88639-88656, December 8, 2016.

_____. 2014a 'Endangered and Threatened Species: Critical Habitat for the Northwest Atlantic Ocean Loggerhead Sea Turtle Distinct Population Segment (DPS) and Determination Regarding Critical Habitat for the North Pacific Ocean Loggerhead DPS; Final Rule', Vol. 79, No. 132, Pages 39856-39912, July 10, 2014.

_____. 2014b 'Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Rufa Red Knot; Final Rule.' Vol. 79. No. 238. Pages 73705-73748, December 11, 2014.

_____. 2009. 'Endangered and Threatened Wildlife and Plants; Removal of the Brown Pelican (Pelecanus occindentalis) From the Federal List of Endangered and Threatened Wildlife; Final Rule', Volume 74, No. 220, Pages 59443-59472, November 17, 2009.

National Marine Fisheries Service (NMFS). 2019. Endangered and Threatened Species and Critical Habitats under the Jurisdiction of the NOAA Fisheries Service – Texas. http://sero.nmfs.noaa.gov/protected_resources/section_7/threatened_endangered/Documents/texas.pdf. (Accessed March 20, 2019).

_____. 2016. Roy E. Crabtree/NOAA Fisheries March 4, 2016 Memorandum to Alvin B. Lee, SES/USACE, South Atlantic Division, Subject: Continued Operations of Maintenance Dredging and Beach Sand Placement Actions under the 2007 Gulf of Mexico Regional Biological Opinion (GRBO)(I/SER/2015/17543).

NMFS and U.S. Fish and Wildlife Service. 2008. Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (Caretta caretta), Second Revision. National Marine Fisheries Service, Silver Spring, MD, 2008.

National Oceanic and Atmospheric Administration Fisheries. 2019a. Fin Whale (*Balaenoptera physalus*). https://www.fisheries.noaa.gov/species/fin-whale (Accessed April 1, 2019).

_____. 2019b. Gulf of Mexico Brydes Whale. https://www.fisheries.noaa.gov/species/gulf-mexico-brydes-whale (Access April 2, 2019).

_____. 2018. Oceanic Whitetip Shark Recovery Outline. https://www.fisheries.noaa.gov/resource/document/oceanic-whitetip-shark-recovery-outline (Accessed March 20, 2019).

_____. 2017a. Endangered Species Act Status Review Report: Giant Manta Ray (*Manta birostris*) Reef Manta Ray (*Manta alfredi*) September 2017.

_____. 2017b. Sei Whale (*Balaenoptera borealis*). http://www.fisheries.noaa.gov/pr/species/mammals/whales/sei-whale.html (Accessed July 2017).

_____. 2011. Final Recovery Plan for the Sei Whale. NMFS NOAA.

_____. 2010a. Final Recovery Plan for the Fin Whale. NMFS NOAA.

_____. 2010b. Final Recovery Plan for the Sperm Whale. NMFS NOAA.

Peng, C., X. Zhao, and G. Liu, 2015. Noise in the Sea and Its Impacts on Marine Organisms, Int. J. Environ. Res. Public Health 2015, 12, pp. 12304-12323.

Reeves, R.R., Clapham, P.J., Brownell Jr., R.L., and Silber, G.K. Recovery Plan for the Blue Whale (*Balaenoptera musculus*). National Marine Fisheries Service, Silver Spring MD, 1998.

Samuel, Y., S.J. Marreale, C.W. Clark, C.H. Greene, and M.E. Richmond, 2005. Acoustical Society of America. Vol. 117 No. 3 Pt.1, pp. 1465-1472

Texas Parks and Wildlife Department (TPWD). 2013 http://www.tpwd.state.tx.us/gis/ris/es/ (Accessed May 2013)

TPWD. 2017a. Green Sea Turtle. http://www.tpwd.state.tx.us/huntwild/wild/species/greentur. (Accessed April 17, 2017)

_____. 2017b. Kemps Ridley Sea Turtle. http://www.tpwd.state.tx.us/huntwild/wild/species/ridley. (Accessed April 17, 2017).

_____. 2017c. Loggerhead Sea Turtle. http://www.tpwd.state.tx.us/huntwild/wild/species/logghead. (Accessed April 17, 2017).

_____. 2017d. Hawksbill Sea Turtle. http://www.tpwd.state.tx.us/huntwild/wild/species/endang/animals/reptiles_amphibians/hawkturt.phtml. (Accessed April 17, 2017).

_____. 2017e. Leatherback Sea Turtle. http://www.tpwd.state.tx.us/huntwild/wild/species/lethback (Accessed April 17, 2017).

U.S. Army Corps of Engineers (USACE). 2010. Final Environmental Assessment, Expansion of Placement Areas 14 and 15, Houston Ship Channel, Chambers County, Texas. U.S. Army Corps of Engineers – Galveston District. Galveston, Texas.

U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). 1991. Recovery Plan for U.S. Population of Atlantic Green Turtle. National Marine Fisheries Service, Washington, D.C.

USFWS. 2019a. Species by County Report, Harris County, https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=48201. (Accessed March 20, 2019).

_____.2019b. Species by County Report. Chambers County. https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=48071. (Accessed March 20, 2019).

_____.2019c. Species by County Report. Galveston County. https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=48167. (Accessed March 20, 2019).

_____.2019d. IPaC resource list. https://ecos.fws.gov/ipac/location/6UDMNMBUHZCMRHNBLD5IN3O7JM/resources. (Accessed March 20, 2019).

_____. 2010. Attwater's Prairie-Chicken Recovery Plan, Second Revision. Albuquerque New Mexico.

US Army Corps
of Engineers ®
Galveston District

USFWS BIOLOGICAL ASSESSMENT
for
Houston Ship Channel Expansion Channel Improvement Project,
Harris, Galveston, and Chambers Counties, Texas

December 2019

This page left intentionally blank

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

1.1 PURPOSE OF THE BIOLOGICAL ASSESSMENT

This Biological Assessment (BA) has been prepared to fulfill the U.S. Army Corps of Engineers (USACE), Galveston District requirements as outlined under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. This assessment is required by the USACE action for the improvements to the Houston Ship Channel (HSC) navigation system proposed by the National Economic Development (NED) or the Locally Preferred Plan (LPP) to address deep draft navigation problems under the Houston Ship Channel Expansion Channel Improvement Project (HSC ECIP) Federal feasibility study, as this study and NED or the LPP are considered a major Federal action under ESA. These plans would consist of channel modification measures to widen the HSC, Bayport Ship Channel (BSC), and Barbours Cut Channel (BCC), ease channel bends, expand existing turning basins and constructing new ones, and a possible anti-shoaling feature. These measures are geographically spread along the entire length of the HSC navigation system from Bolivar Roads near the entrance into Galveston Bay, to the Main Turning Basin in the Buffalo Bayou reach of the HSC near the center of Houston. **Figure 1** illustrates the NED and the LPP. The LPP includes features of the NED Plan, additional widening of the HSC from Barbours Cut to south of Red Fish Island and the proposed shoaling attenuation feature. The LPP includes four bend easings on the main HSC channel with associated relocation of the barge lanes, widening of the HSC main channel between Bolivar Roads and BCC from the existing 530-foot width to 700 feet with associated relocation of barge lanes, widening of the BSC on north side of channel to 455 feet, widening the BCC on north side of channel to 455 feet, widening the BCC flare on the north and south to create a 1,800-foot diameter turning basin, deepening the HSC main channel from Boggy Bayou to Hunting Turning Basin to 46.5 feet MLLW, widening the HSC main channel from Boggy Bayou to Greens Bayou from the existing 400-foot wide channel up to 530 feet, deepening the HSC main channel from Sims Bayou to Main Turning Basin up to 41.5 feet MLLW, and improving Brady Island turning basin to 900-foot diameter.

Currently, the study has completed the Tentatively Selected Plan Milestone phase of the Specific, Measurable, Attainable, Risk-Informed, and Timely (SMART) planning process and is currently completing the Feasibility-Level Analysis phase, following the Agency Decision Milestone (ADM) approving the continued study of the NED or LPP presented previously. Several aspects of the NED or LPP have been refined through more detailed economic analysis, engineering and cost data, and refinement of design. The proposed channel width was determined to be 700 feet, using ship simulation conducted with the participation of the Houston Pilots Association (HPA) during two simulation rounds during the previous planning phases. Sufficient width to realize the economic benefits necessary to justify the plan depends on having enough width for safe two-way traffic meeting of design vessels. The Bay widening is also divided lengthwise into the 3 straight segments of the existing HSC alignment. The need to replace the existing shallow draft barge lanes directly adjacent to the main channel of the HSC and shift them outward of the revised channel is also accounted. The measures have been shown to either be economically justified during more detailed economic analysis, or identified as a navigation safety feature that warrants detailed engineering analysis during the Preconstruction Engineering and Design (PED) phase that follows this phase.

The lower segment of the Bay widening (shown as CW1_BR-Redfish) is part of the NED and the upper and middle segments (shown as CW1_Redfish-BSC, and CW1_BSC-BCC) the additional sections of the LPP. The LPP includes all of the measures of the NED. With the LPP BE1_28+605 and BE2_BSCFlare would not be needed as separate measures because the widening would include these two measures. Previously, a range of widening larger and smaller than the 700-foot wide channel was analyzed for NEPA purposes in the Draft Integrated Feasibility Report and EIS (DIFR-EIS) for this study, and in the previous version of the BA. This is the final BA report that would be included in the Final IFR-EIS.

Because the feasibility and cost of dredge material placement are highly dependent on the specifics of the channel modifications and very quantity and distance dependent, and in the highly developed region of the study very location dependent, a specific dredge material placement plan has been developed. The Dredged Material Management Plan (DMMP) for the NED or LPP is examined the feasibility of using three new upland tracts of land for the upper HSC, constructing new beneficial use (BU) features in Galveston Bay, and very limited use of existing PAs, to accommodate new work material. The BU features evaluated are variants of tidal marsh, bird/rookery islands, oyster reef, and a dike-like channel shoaling attenuation feature. This BA has been updated for inclusion in the Final IFR-EIS to incorporate assessment of the final dredge material placement plan effects on Federally-listed species. For this version of the BA, the effects of the NED channel modifications, the effects of the LPP channel modifications, and use of the proposed upland confined placement areas and the existing upland confined placement areas, beneficial use sites, possible sediment attenuation feature, and ocean dredged material disposal site (ODMDS) have been assessed.

This BA evaluates the potential impacts the proposed action may have on federally listed threatened and endangered species identified by the U.S. Fish and Wildlife Service (USFWS) for Chambers, Galveston, and Harris Counties, Texas and the National Marine Fisheries Service (NMFS) for the State of Texas. Species included in this BA are listed in **Table 1-1**. These species were identified from lists obtained from databases managed by the USFWS and NMFS (USFWS 2019a-d; NMFS 2019). Additional federally protected species are listed by the Texas Parks and Wildlife Department (TPWD) as potentially occurring in Chambers, Galveston, and Harris Counties. However, these additional species are not covered in this BA as they were not identified on the lists obtained from the databases managed by the jurisdictional Federal agencies (USFWS and NMFS).

The bald eagle has been delisted from the Federal list of threatened and endangered species in 2007. The bald eagle still remains federally protected under both the Bald and Golden Eagle Protection Act (16 United States Code (U.S.C. 668-668c) and the Migratory Bird Treaty Act [16 U.S.C. 703-712]. The bald eagle is not included in this BA as they are no longer protected under the ESA.

The brown pelican was removed from the Federal list of endangered and threatened species on December 17, 2009 (*Federal Register*. 2009), but still receives protection under the Migratory Bird Treaty Act and the Lacey Act (16 U.S.C. 3371-3378). The brown pelican is not included in this BA as they are no longer protected under the ESA.

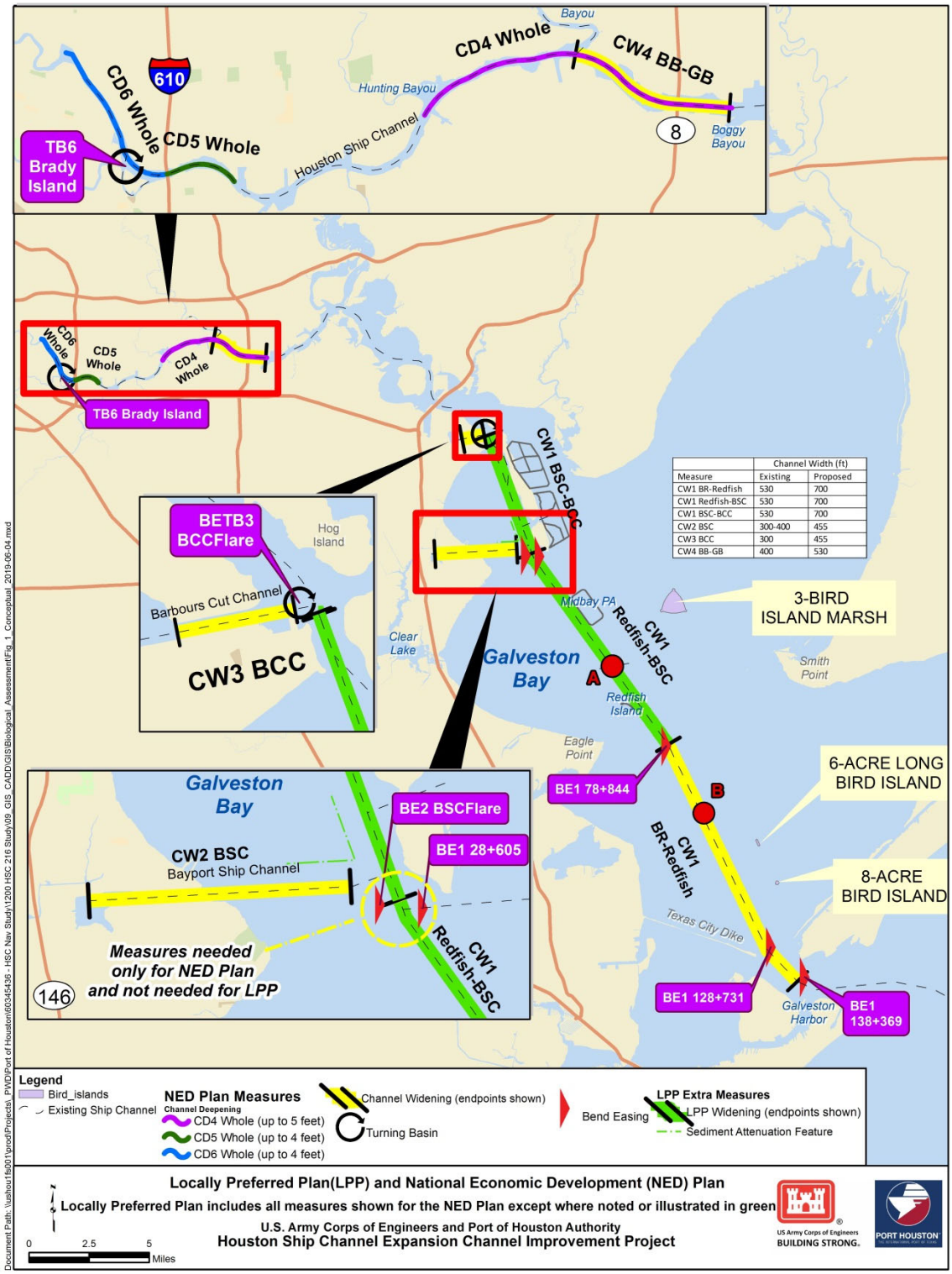


Figure 1 – Conceptual Map of the Locally Preferred and National Economic Development Plans

Table 1-1 – Federally-Listed Threatened and Endangered Species in Chambers, Galveston, and Harris Counties, Texas

Common Name	Scientific Name	USFWS[1] County by County List and IPaC List[3]	NMFS[2] List for State of Texas
Birds			
Attwater's Greater Prairie-Chicken[4]	*Tympanuchus cupido attwateri*	E	NA
Eskimo curlew[5]	*Numenius borealis*	E	NA
Piping Plover	*Charadrius melodus*	T, CH	NA
Red Knot	*Calidris canutus rufa*	T	NA
Invertebrates			
Lobed star coral	*Orbicella annularis*	NA	T
Mountainous star coral	*Orbicella faveolata*	NA	T
Boulder star coral	*Orbicella franksi*	NA	T
Elkhorn coral	*Acropora palmata*	NA	T, CH[6]
Mammals			
Fin whale	*Balaenoptera physalus*	NL	E
Sei whale	*Balaenoptera borealis*	NL	E
Sperm whale	*Physeter macrocephalus*	NL	E
Gulf of Mexico Bryde's whale	*Balaenoptera edeni - subspecies*	NL	Proposed E
West Indian manatee	*Trichechus manatus*	T	E
Fish			
Oceanic whitetip shark	*Carcharhinus longimanus*	NL	T
Giant manta ray	*Manta birostris*	NL	T
Reptiles			
Loggerhead sea turtle	*Caretta*	T	T, CH[7]
Green sea turtle	*Chelonia mydas*	T	T
Hawksbill sea turtle	*Eretmochelys imbricata*	E	E
Leatherback sea turtle	*Dermochelys coriacea*	E	E, CH[6]
Kemp's Ridley sea turtle	*Lepidochelys kempii*	E	E
Plants			
Texas prairie dawn	*Hymenoxys texana*	E	NA

1. USFWS 2019a, USFWS 2019b, USFWS 2019c
2. NMFS 2019
3. USFWS 2019d
4. Listed only within USFWS 2019d
5. Listed only with the USFWS County-by-County, USFWS 2019c
6. Critical Habitat is listed, but not present within or near the project area
7. Critical habitat is listed for Gulf of Mexico that includes the offshore disposal area ODMDS No. 1

1.2 DESCRIPTION OF THE PROPOSED PROJECT AND EXISTING HABITATS

Proposed Project Description

The purpose of the feasibility study is to evaluate Federal interest in alternative plans (including the No-Action Plan) for reducing transportation costs and addressing navigation safety issues on the HSC system and assess the effects of the alternatives on the natural system and human environment, including the economic development of existing inefficiencies. The study is being conducted to address problems with deep draft navigation in the HSC system to ensure these ship channels can more efficiently and more safely handle current and future vessel sizes and traffic, both of which have increased due to trends in the shipping industry, regional growth, and national and global demand for products and cargo originating in, or shipping through, Houston.

The proposed project is the National Economic Development (NED) for this study, which is considered a major Federal action for purposes of the Section 7. The NED is located within the HSC navigation system that traverses Galveston Bay to the tidal portions of the San Jacinto River and Buffalo Bayou in Galveston, Chambers, and Harris Counties, Texas. The HSC is currently maintained by the USACE to depths of -37.5 feet to -46.5 feet mean lower low water (MLLW) [-36 to -40 feet mean low tide (MLT)] plus between one to two feet of advanced maintenance and two feet of allowable overdepth. Currently, the majority of the HSC is 530 feet wide through its length in the Bay, with some relatively short discontinuous sections of 600 feet and 700 feet-wide channel between Morgans Point and the Battleship Texas, and a narrowing down above that from 530 feet to 400 feet, down to 300 feet wide. The side channels to the HSC, the Bayport Ship Channel (BSC) and Barbours Cut Channel (BCC) have been recently deepened to match the -46.5 ft MLLW depth of the HSC, and widened to address navigation deficiencies and inefficiencies associated with the current vessel fleet and berths, with the BSC widened to between 350 and 400 feet wide, and the 300 foot-wide BCC shifted 75 feet northward. The NED proposes a variety of measures to modify the HSC, BSC and BCC, summarized in **Table 2.1** and as follows:

- Widen the lower section of the HSC channel and ease bends of the HSC in Galveston Bay to provide a wider channel of approximately 700 feet wide.
- Widen one segment (CW4 BB-GB) in the HSC above Morgans Point to address places where the channel narrows down from its existing widths.
- Deepen the HSC above Boggy Bayou by between 4 and 5 feet
- Expand the Bradys Island turning basin.
- Widen the BSC to approximately 455 feet, expand the existing flare at its confluence with the HSC, and provide a turning basin at the entrance to the landcut.
- Provide a shoaling attenuation feature (e.g. dike-like groin) for the Bayport Flare, to be planned in the next phases when a hydrodynamic and sediment transport model is ready.
- Widen the BCC to approximately 455 feet, and expand the existing flare in combination with providing a turning basin, at its confluence with the HSC.
- Create two bird islands east of HSC with approximately 18 acres of oyster mitigation.
- Create three bird islands associated with beneficial marsh with approximately 14 acres of oyster mitigation east of HSC and east of MidBay placement area.
- Create approximately 67 acres of oyster reef mitigation southeast of Eagle Point

The LPP proposes the following additional measures:

- Widen the HSC channel in Galveston Bay to provide a wider channel of approximately 700 feet wide. Widening would remove two of the NED ease bends associated with the Bayport Channel.
- Create approximately 321 acres of Oyster reef Mitigation north and southeast of Eagle Point.
- Create two new beneficial use marshes.
- Create a proposed sediment attenuation feature

Figure 1 shows a conceptual map that illustrated the measures that make up the NED and the LPP. As discussed at the beginning of this BA, the study is at a point where the NED and the LPP would be refined in the next planning phase and may change the size or inclusion of some measures that make up the NED and LPP. Specific design details would be developed in later planning phases, and the Preconstruction Engineering Design (PED) phase once the final NED or LPP are approved. Therefore, construction techniques and details can only be discussed generally at this point.

The channel modifications of the NED and LPP would be constructed by dredging to widen and deepen channels, and expand the Brady Island turning basin. The depths of widened features would be in the range of -41.5 feet to -46.5 feet MLLW. **Table 1-2** provides the proposed methods for dredging new work material by general dredging segments and measures involved. **Figure 1** shows the dividing points or limits of these segments as Point A and Point B. The NED and the LPP would be constructed primarily using hydraulic dredging to remove new work material and hydraulically pump it via pipelines to placement sites to be selected in detail in the next planning phase. It is anticipated that some new work dredging using clamshell (aka mechanical) dredges would also be used to remove softer new work materials more suitable for that type of dredge within a segment between Point B near Moses Lake and the Point A. This dredged material would be transported via scow (essentially a barge with bottom doors) to the existing approved ODMDS No. 1, located at the Entrance Channel (reference **Figure 2**).

Table 1-2 – Proposed New Work Dredging Methods by Segment and Measure

Dredging Segment	Extent Description	NED Measures	LPP Measures	New Work Dredging and Placement Method
Lowest segments	Entrance Channel to Point B	BE1_128+731 BE1_138+369 CW1_BR-Redfish (lower)		Hydraulic cutterhead and pipeline
Station 57+00 to 100+00	Point B to Point A	CW1_BR-Redfish (upper) BE1_78+844	CW1_Redfish-BSC (lower)	Clamshell bucket and scow
Upper segments	Point A to Main Turning Basin	BE1_28+605 BE2_BSCFlare CW2_BSC CW3 BCC BETB3 BCCFlare CW4 BB-GB CD4 Whole CD5 Whole CD6 Whole TB6_Brady_Island	CW1_Redfish-BSC (upper) BE1_28+605 and BE2_BSCFlare are incorporated in channel widening and not needed as separate measures	Hydraulic cutterhead and pipeline

For long-term maintenance dredging, hydraulic cutterhead, clamshell, and suction hopper dredging would be used to maintain the channels long term, with material deposited at the selected placement sites. Both hydraulic cutterhead and Trailing suction hopper have been used to maintain the existing HSC. Other types of work expected would be installing sheet piling and mooring dolphins. Sheet piling would be limited to a few areas where existing shoreline and bank would be supported where channel slopes are intended to be dredged steeper to minimize land impacts. Currently these areas are limited to the land cut north shore along the BSC [**Figure 1**, bottom inset], the north shoreline along the BCC [**Figure 1**, middle inset], along a short stretch of the HSC at Morgans Point [**Figure 1**, middle inset], and at the expansion of the existing Brady Island Turning Basin [**Figure 1**, top inset]. The construction for the channel modifications would be accessed by water via a dredge. Construction for sheet piling has not been determined, but could be either by the adjacent shore or by water. The project would not be constructed until the study and NED and or the LPP are approved, and Congress appropriates funding for this project. Construction is expected to last several years. Further details of construction would be determined at a later planning phase of the study.

The NED and the LPP have been refined and the LPP has been adopted as the Recommended Plan (RP). The Planning Development team (PDT) has conservatively identified the longest extent of channel widening, which widening the full length of the HSC in Galveston Bay is the largest component of the RP. Primarily, the number of measures is expected to be tailored at the end of this phase. A DMMP has been developed in the current planning phase. However, it is the PDT's intention to use existing PAs used to maintain the current HSC system as much as possible. Given the existing capacities, it is expected that some new placement features would be needed for long term maintenance of the revised channels. Potential locations of the new placement features are shown in **Figure 2** (Future without Project). The Future without Project planning is not included in the current RP and is not included in this BA. The future planning would include consideration of BU features and upland placement. This BA includes the review of the existing upland confined placement areas, BU marsh cells and islands, 3 new upland placement areas, proposed sediment attention feature, and the one existing ODMDS (**Table 1-2** and **Figure 2**).

The action area is generally the area of dredging, the dredge pipelines, and the PAs that would accept the material. It would consist of the existing PAs listed in **Table 1-3** and any new placement features determined for the DMMP as called out in **Figure 2**. The action area regarding indirect effects from turbidity from dredging is expected to be less than 1,000 meters, considering the literature for studies that have examined turbidity plume dispersal through detailed monitoring studies. These studies are discussed in Section 2.1.5.1, Water Quality, of Appendix G in the FIFR-EIS.

The creation of the 3 bird islands and 3-bird island marsh would cover the existing bay bottom with new material. These islands and marsh would create beneficial areas. The placement of the new material would temporarily create areas of turbidity which would be expected to be less than 1,000 meters. The placement of the dredge and new cultch materials for the proposed oyster reefs would temporarily create areas of turbidity and would be less than 500 feet. The placement of the oyster reef materials are discussed in Appendix P Mitigation for Oyster Reef Habitat.

The placement of the materials for the proposed sediment attainment feature would temporarily create areas of turbidity around the proposed feature. The feature would alter the local currents to reduce sedimentation within the HSC. The location and design of the attainment feature would be determined in the next phase of planning.

Table 1-3 Placement Areas Proposed for New Work and O&M for the NED or LPP

	Placement Area	Type	New Work	O&M
1	3 Bird Island Marsh	Beneficial Use	x	x
2	3 Bird Island	Beneficial Use	x	
3	6-acre Bird lsland	Beneficial Use	x	
4	8-acre Bird Island	Beneficial Use	x	
5	Alexander Island	Upland Placement		x
6	BABUS	Future without Project		
7	Beltway 8	Upland Placement	x	
8	E2 Clinton	Upland Placement	x	
9	East Clinton	Upland Placement		x
D10	Filter Bed	Upland Placement	x	
11	Glendale	Upland Placement	x	
12	House-Stimson	Upland Placement		x
13	Lost Lake	Upland Placement		x
14	M10	Beneficial Use		x
15	M11	Beneficial Use	x	x
16	M12	Beneficial Use	x	x
17	M7/8/9	Beneficial Use		x
18	Midbay PA	Upland Placement		x
19	ODMDS No.1	Ocean Dredged Material Disposal	x	x
20	PA 14/15	Beneficial Use		x
21	PA14	Beneficial Use		x
22	PA15	Beneficial Use		x
23	Rosa Allen	Upland Placement		x
24	Rosa Allen Expansion	Upland Placement		x
25	Sediment Attenuation Feature	Beneficial Use	x	
26	Spilmans Island	Upland Placement		x
27	West Clinton	Upland Placement		x

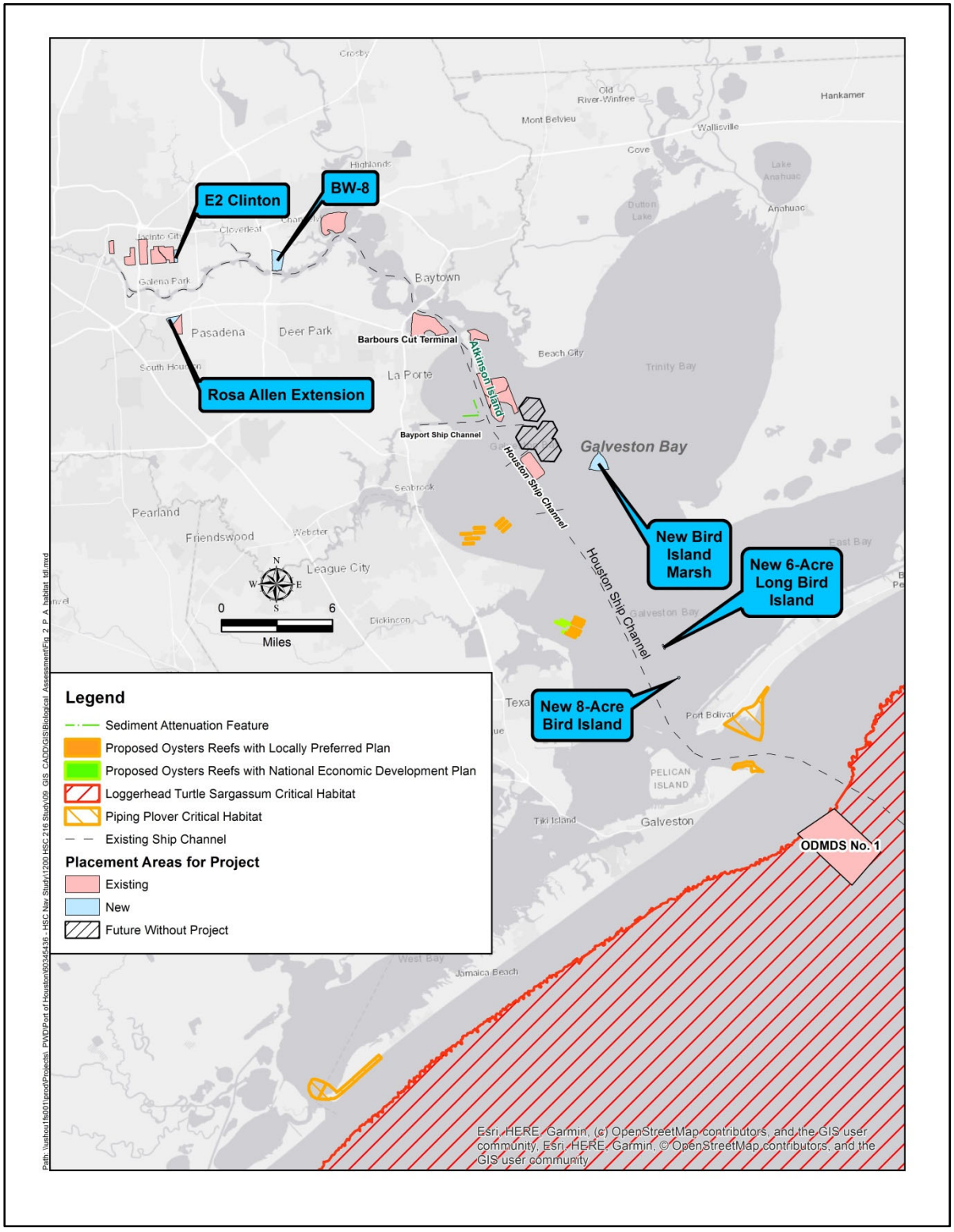


Figure 2 – NED and LPP, Placement Areas, and Critical Habitat

2.0 EXISTING HABITAT

The existing environment within the proposed project footprint is composed of the existing channel, the adjacent shallow estuarine waters with a few very small areas of developed, urbanized land with armored shoreline and various existing upland, offshore, and beneficial use disposal areas. Relevant natural resources data was reviewed to determine if natural resources may be located in or around the project area. Geographic Information Systems (GIS) data obtained from the Texas Parks and Wildlife Department and the Texas General Land Office (TxGLO) indicate oyster reefs within the proposed RP footprint lining the HSC from approximately Redfish Reef to Morgans Point. For terrestrial areas where the RP footprint overlaps land, a combination of TPWD Natural Resources Information System and 2014 aerial imagery were reviewed to confirm the urbanized nature of impacts on or near land.

2.1 ATTWATER'S GREATER PRAIRIE CHICKEN

2.1.1 Reasons for Status

The Attwater's greater prairie chicken (*Tympanuchus cupido attwateri)* was listed as endangered in 1967 and grandfathered in to the Endangered Species Act in 1973. Their primary threats include habitat degradation and destruction which have led to low population numbers. The small population numbers and habitat fragmentation have led to genetic isolation. The species has not bred well in captivity and reintroductions of surviving captive-bred individuals have not been successful breeders in the wild (USFWS, 2010).

2.1.2 Habitat

Attwater's greater prairie chickens require well-drained grasslands which support weeds and shrubs with density varying from light to heavy. A surface supply of water in the summer is essential (Lehmann, 1941). No critical habitat has been designated for the species.

2.1.3 Range

The Attwater's greater prairie chicken is the southernmost variant of the *Tympanuchus* genus. Historically the species could be found in coastal prairies in southwest Louisiana down the Gulf coast to Brownsville, Texas. Drought conditions likely reduced the range of the species to north of the Nueces River. The species was extirpated from Louisiana in 1919 and its range has decreased in Texas steadily through the 20th century. A 2009 survey found free-ranging individuals only in Colorado, Galveston, and Goliad Counties, Texas (USFWS, 2010).

2.1.4 Presence in Study Area

Within the study area Attwater's greater prairie chickens are only known to occur at the Texas City Prairie Preserve in Galveston County. There is very little suitable habitat available for the species within the study area as coastal prairie is a habitat that is itself dwindling along the Gulf coast.

2.2 ESKIMO CURLEW

2.2.1 Reasons for Status

The Eskimo curlew (*Numenius borealis)* was listed as endangered in 1966 and grandfathered in to the Endangered Species Act in 1973. The conversion of tallgrass prairie and eastern mixed-grass prairie in the1800's to agricultural lands likely led to the decline in population as these habitats were important stopovers on the migration route for the species (USFWS, 2016).

2.2.2 Habitat

The Eskimo curlew has been confirmed to breed on the barren grounds in the Northwest Territories, Canada. Post-breeding individuals have overwintered in the Pampas in South America and migrated through the Midwestern United States prairie habitats in the spring (USFWS, 2016).

2.2.3 Range

The range of the Eskimo curlew extends from the Northwest Territories, Canada during the breeding season to the Pampas of South America during the overwintering period. Very little is known of the biology of the species and this has led to gaps in the complete distribution accounting of the species. There have been 39 potential sightings of the species since 1963, with the most recent occurring in 2006. However, none of these sightings have been confirmed by physical evidence (USFWS, 2016).

2.2.4 Presence in the Study Area

The Eskimo curlew is believed to have occurred within the study area and utilized the coastal prairies during its spring migration northward. However, no sightings of the species have been confirmed in the study area in more than 50 years.

2.3 PIPING PLOVER

2.3.1 Reasons for Status

USFWS listed the piping plover (*Charadrius melodus*) as threatened on 11 December 1985 (50 FR 50726). The piping plover is a federally listed endangered species 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 and Louisiana are part of the northern Great Plains and Great Lakes populations and, therefore, are listed as threatened.

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, damming and channelization of rivers (eliminating sandbars, encroachment of vegetation, and altering water flows), and wetland drainage have further contributed to the decline of the species (USFWS, 1995). Additional threats include human disturbances through recreational use of habitat, and predation of eggs by feral pets (USFWS, 1995).

2.3.2 Habitat

General habitat includes shorelines or oceans, rivers, and inland lakes. Within the Great Plains, breeding habitat includes sandy beaches (between dunes and high tide line), spoil islands and sandbars in rivers,

and sandy or alkaline shorelines along shallow lakes (AOU, 1998; Haig and Elliot-Smith, 2004). Gravel and sand pits, as well as industrial ponds, are also occasionally used (Haig and Elliot-Smith, 2004). Along the Great Lakes and the Atlantic Coast, piping plovers typically breed on open, sparsely vegetated, sand, gravel, and cobble beaches (Haig and Elliot-Smith, 2004). Beach width appears to be an important factor in nest site selection (Haig and Elliot-Smith, 2004; USFWS, 2003). Within their wintering range, which includes the Texas Gulf Coast, piping plovers inhabit beaches and bay margins, particularly tidal mudflats and sandflats, algal flats, sandy beaches, and spoil islands (AOU, 1998; Haig and Elliot-Smith, 2004).

2.3.3 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 Texas, and, less commonly, in the Bahamas and West Indies (AOU, 1998; 50 FR 50726, 11 December 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.

2.3.4 Presence in Study Area

Critical habitat for the piping plover coastal wintering grounds was designated July 10, 2001 (66 FR 36038), and this designation was challenged on March 20, 2006, by the Texas GLO. The court ordered the USFWS to vacate 19 of the 37 designated units in Texas and reevaluate them for possible redesignation. On May 20, 2008 (73 FR 29294), the Service revised and proposed the redesignation of critical habitat for wintering piping plovers in Texas in 18 units, none of which occur within the proposed project area. Units 35 and 36 occur in the project area, and remain designated critical habitat. Critical habitat includes the land from the seaward boundary of mean lower low water to where densely vegetated habitat, not used by the species, begins and where the constituent elements no longer occur.

Critical Habitat Unit TX-35 occurs on Big Reef (117 acres [ac]) in Galveston County. These lands are infrequently inundated by seasonal winds and are on lands managed by the City of Galveston (66 FR 36037). Unit TX-36 occurs on southwest end of Bolivar Peninsula (1,114 ac) in Galveston County. The landward side is defined by dense dune vegetation and the gulfside is defined by the MLLW. The upland areas are used as roosting grounds for the plovers. The area is leased by the Houston Audubon Society from the Texas General Land Office. This area is a wind tidal flat that is infrequently inundated by seasonal winds (66 FR 36037). A review of ebird shows multiple sightings of piping plovers at Bolivar Flats Shorebird Sanctuary, as many as 150 on one occasion in 1996, as well as sightings at Appfel Park and along a beach next to Bodekker Road between 2007 and 2018 (ebird.org).

2.4 RED KNOT

2.4.1 Reasons for Status

The red knot (*Calidris canutus rufa*) was federally listed as endangered on 12 January 2015 (79 FR 73706). The primary factor threatening the red knot is destruction and modification of its habitat, particularly the

reduction in key food resources resulting from reductions in horseshoe crabs, which are harvested primarily for use as bait and secondarily to support a biomedical industry.

Counts of red knots within the principal wintering areas in Chile and Argentina declined by nearly 75 percent from 1985 to 2007 and declined by an additional 15 percent in the past year (2007 to 2008).

2.4.2 Habitat

Red knots use marine habitats during their migration through South and North America. They prefer sandy coasts near tidal inlets or at the mouths of bays or estuaries. The beach habitats are preferable due to the higher concentration of benthic bivalves which are an important food source (Harrington and Flowers, 1996). During the northbound migration red knots can be found feeding on clams along the coast of Virginia (Cohen et al, 2009, 2010) and on horseshoe crab eggs on Delaware Bay beaches (Tsipoura and Burger, 1999).

Red knots winter in on the sandy beaches of Texas and Florida, though they may also use peaty bank areas in Georgia or mangroves in Florida. They have been noted to move from the sandy beaches to intertidal mud flats to feed on benthic invertebrates (Rodrigues, 2000).

2.4.3 Range

Red knots of the *rufa* subspecies (*Calidris canutus rufa*) are medium-sized shorebirds that breed only in Arctic Canada and migrate approximately 18,500 miles annually between Arctic breeding grounds and primary wintering areas in Tierra Del Fuego, at the southern tip of South America. They also winter in three other distinct coastal areas of the Western Hemisphere: the southeastern United States (mainly Florida and Georgia, with smaller numbers in South Carolina), the Gulf of Mexico coast of Texas, and Maranhão in northern Brazil (USFWS, 2011).

In South American wintering areas, red knots are found principally in intertidal marine habitats, especially near coastal inlets, estuaries, and bays, or along intertidal earthen shelf formations. The Delaware Bay area (in Delaware and New Jersey) is the largest known spring migration stopover area, with far fewer migrants congregating elsewhere along the Atlantic coast. The concentration in the Delaware Bay area occurs from the middle of May to early June, corresponding to the spawning season of horseshoe crabs. The knots feed on horseshoe crab eggs, rebuilding energy reserves needed to complete migrations to the Arctic. Surveys at wintering areas and at Delaware Bay during spring migration indicate a substantial decline in the red knot in recent years. Research shows that since 1998, a high proportion of red knots leaving the Delaware Bay failed to achieve threshold departure masses needed to fly to breeding grounds and survive an initial few days of snow cover, and this corresponded to reduced annual survival rates (73 FR 75176).

2.4.4 Presence in Study Area

Along the Texas coast, red knots forage on beaches, oyster reefs, and exposed bay bottoms and roost on high sand flats, reefs, and other sites protected from high tides (NatureServe, 2018). They are believed to use the beaches in Chambers and Galveston Counties but not in the project area. Ebird.org notes six sightings of red knots in the study area between 2013 and November 2019, with the highest number of birds seen per sighting not exceeding ten (9 was the highest in May 2019) (ebird.org). In wintering and migration habitats, red knots commonly forage on bivalves, gastropods, and crustaceans. It has been reported that Coquina clams (*Donax variabilis*) serve as a frequent and often important food resource for

red knots along Gulf beaches. Reports of the size of flocks along the Gulf of Mexico coast vary considerably, from highs of about 700 to 2,800 (USFWS, 2011).

2.5 TEXAS PRAIRIE DAWN

2.5.1 Reasons for Status

The Texas prairie dawn (*Hymenoxys texana)* was federally listed as endangered on 10 March 2010 (51 FR 8681). The primary factor threatening the Texas prairie dawn is the loss of habitat. The coastal prairie region where the plant could be found is being converted into agricultural or pasture land and the pimple mounds associated with the prairie dawn have been leveled (USFWS, 2015).

2.5.2 Habitat

The Texas prairie dawn is found in coastal prairies with fine, compact, sandy soils and patches of small, conspicuous areas of vegetation. These sites are typically located on the lower slopes of pimple mounds, which are low, circular or elliptical, dome-shaped mounds of unstratified sandy loam soils. These mounds can range from one to 30 meters in height (USFWS, 2015).

2.5.3 Range

The prairie dawn was known to be found in only a single population in northern Houston until 1992. Since then researchers have begun finding more populations around the region and have confirmed sites in five Texas counties: Fort Bend, Gregg, Harris, Trinity, and Waller (USFWS, 2015).

2.5.4 Presence in Study Area

The existence of coastal prairies within the study area has been diminishing over the past decades. The predominance of the project occurs within the water, but there are seven placement areas that will be utilized in upland areas: Glendale, Filterbed, East Clinton, West Clinton, Rosa Allen, Rosa Allen Expansion, and Beltway 8. Of these Glendale, Filterbed, East Clinton, West Clinton, and Rosa Allen are existing placement areas that are routinely disturbed and do not provide habitat for the Texas prairie dawn. Rosa Allen Expansion has an existing parking lot and storage area in the northern section with forested areas, utility and pipeline corridors throughout the remainder of the proposed placement area. Beltway 8 placement area was an ammunition depot with numerous bunkers and roads constructed in World War I and abandoned after World War II. The site has become dominated by invasive trees and shrubs. The project area does not overlap with any of these coastal prairies and the Texas prairie dawn is not expected to be found in the study area.

2.6 WEST INDIAN MANATEE

2.6.1 Reasons for Status

USFWS listed the West Indian manatee (*Trichechus manatus*) as endangered on 11 March 1967 (32 FR 4001). Later it received protection under the ESA of 1973. The largest known human-related cause of manatee mortality is collisions with hulls and/or propellers of boats and ships. The second-largest human-related cause of mortality is entrapment in floodgates and navigation locks. Other known causes of human-related manatee mortality include poaching and vandalism, entrapment in shrimp nets and other fishing gear, entrapment in water pipes, and ingestion of marine debris (USFWS, 2001). Hunting and fishing pressures were responsible for much of its original decline because of the demand for meat, hides, and bones, which resulted in near extirpation of the specie (USFWS, 1995).

A prominent cause of natural mortality in some years is cold stress, and major die-offs associated with the outbreaks of red tide have occurred, where manatees appear to have died because of ingestion of filterfeeding tunicates that had accumulated the neurotoxin-producing dynoflagellates responsible for causing the red tide (USFWS, 2001). The low reproductive rate and habitat loss make it difficult for manatee populations to recover.

2.6.2 Habitat

The West Indian manatee inhabits shallow coastal waters, estuaries, bays, rivers, and lakes. Throughout most of its range, it appears to prefer rivers and estuaries to marine habitats, although manatees inhabit marine habitats in the Greater Antilles (Lefebvre et al., 1989). It is not averse to traveling through dredged canals or using quiet marinas. Manatees are apparently not able to tolerate prolonged exposure to water colder than 68 degrees Fahrenheit (°F) (20 degrees Celsius [°C]). In the northern portions of their range, during October through April, they congregate in warmer water bodies, such as spring-fed rivers and outfalls from power plants. They prefer waters that are at least 3.3 to 6.6 ft (1 to 2 m) in depth; along coasts, they are often in water 9.8 to 16.4 ft (3 to 5 m) deep. They usually avoid areas with strong currents (NatureServe, 2018).

Manatees are primarily dependent upon submergent, emergent, and floating vegetation, with the diet varying according to plant availability. They may opportunistically eat other foods such as acorns in early winter in Florida or fish caught in gill nets in Jamaica (O'Shea and Ludlow, 1992).

2.6.3 Range

The manatee ranges from the southeastern U.S. and coastal regions of the Gulf of Mexico, through the West Indies and Caribbean, to northern South America. U.S. populations occur primarily in Florida (NatureServe, 2018), where they are effectively isolated from other populations by the cooler waters of the northern Gulf of Mexico and the deeper waters of the Straits of Florida (Domning and Hayek, 1986).

2.6.4 Presence in Study Area

The West Indian manatee historically inhabited the Laguna Madre, Gulf of Mexico, and tidally influenced portions of rivers. It is currently, however, extremely rare in Texas waters, and the most recent sightings are likely individuals migrating or wandering from Mexican waters. Historical records from Texas waters include Cow Bayou, Sabine Lake, Copano Bay, the Bolivar Peninsula, and the mouth of the Rio Grande (Schmidly, 2004). While manatee sightings in the study area are not common they do occur. Sightings within the area have been noted in October 2012 (Rice, 2012) and August 2019 (Dawson, 2019) in Galveston Bay. Another manatee was sighted in November 2019 within Salt Lake in Brazoria County. Although the West Indian manatee is chiefly a marine species, its occurrence in the study area is unlikely, though possible.

2.7 OCEAN WHITETIP SHARK

Oceanic whitetip shark is a pelagic species found in tropical and subtropical seas worldwide (NOAA.2018). Oceanic whitetip shark generally remains offshore in open ocean, on the outer continental shelf, or around oceanic islands in water depths greater than 184 m (605 feet), occurring from surface to

at least 152 m (499 feet). This shark has a strong preference for the surface mixed layer in waters above 20° C (68° F). It is unlikely that this species would occur in the study area.

2.8 GIANT MANTA RAY

The giant manta ray is found worldwide in tropical, subtropical, and temperate bodies of water (NOAA. 2017a). It is commonly found offshore, in oceanic waters, and near productive coastlines. A population of manta rays exists within the Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico. Researchers are still trying to determine whether the manta rays in the area of the Flower Garden Banks belong to the giant manta ray species or are a potentially new, undescribed species. Other sightings have been made along the northern coast of the Yucatan Peninsula, Mexico. This species appears to be pelagic and is highly migratory. It is unlikely that this species would occur in the study area.

2.9 CORALS

NMFS identifies four invertebrate coral species of potential occurrence in the Gulf. These are the lobed star (*Orbicella annularis*), mountainous star (*Orbicella faveolata*), boulder star (*Orbicella franksi*), and elkhorn coral (*Acropora palmata*). These species are generally restricted to deeper offshore waters; therefore, it is unlikely that any of these four species would regularly occur in the study area.

2.10 WHALES

NMFS identifies four whale species of potential occurrence in the Gulf. These are the sei whale (*Balaenoptera borealis*), fin (or finback) whale (*Balaenoptera physalus*), Bryde's whale (*Balaenoptera edeni - subspecies*), and sperm whale (*Physeter macrocephalus*). These species are generally restricted to deeper offshore waters; therefore, it is unlikely that any of these four species would regularly occur in the study area (NMFS, 2003)

2.11 GREEN SEA TURTLE

2.11.1 Reasons for Protected Status

The green sea turtle (*Chelonia mydas*) was listed on 28 July 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 for 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 TED 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, 2006). Epidemic outbreaks of fibropapilloma or "tumor" infections recently have occurred on green sea 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 negative impacts shared by sea turtles in general.

2.11.2 Habitat

The green sea 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 sea plants (e.g., rafts of sargassum) 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 more invertebrates. Foods consumed 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, they will 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 at the same beach, which is apparently their natal beach (Allard et al., 1994; Meylan et al., 1990), although an individual might switch to a different nesting beach within a single nesting season.

2.11.3 Range

The green sea 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 (Hirth, 1997; NMFS and USFWS, 1991).

2.11.4 Distribution in Texas

The green sea turtle in Texas inhabits shallow bays and estuaries where its principal foods, the various marine grasses, grow (Bartlett and Bartlett, 1999). Its population in Texas has suffered a decline similar to that of its world population. In the mid- to late nineteenth century, Texas waters supported a green sea turtle fishery. Most of the turtles were caught in Matagorda Bay, Aransas Bay, and the lower Laguna Madre, although a few also came from Galveston Bay. Many live turtles were shipped to places such as New Orleans or New York and from there to other areas. Others were processed into canned products such as meat or soup prior to shipment. By 1900, however, the fishery had virtually ceased to exist. Turtles continued to be hunted sporadically for a while, the last Texas turtler hanging up his nets in 1935. Incidental catches by anglers and shrimpers were sometimes marked prior to 1963, when it became illegal to do so (Hildebrand, 1982).

Green sea turtles still occur in these same bays today but in much-reduced numbers (Hildebrand, 1982). While green turtles prefer to inhabit bays with seagrass meadows, they may also be found in bays that are devoid of seagrasses. The green sea turtles in these Texas bays are mainly small juveniles. Adults, juveniles, and even hatchlings are occasionally caught on trotlines or by offshore shrimpers or are washed ashore in a moribund condition (Shaver, 2000; STSSN, 2018).

Green sea turtle nests are rare in Texas. One nest was recorded at the Padre Island National Seashore in 1987, five in 1998, none in 1999, and one in 2000 (NPS, 2007; Shaver, 2000). Between 2001 and 2005, up to five nests per year have been recorded from the Texas coast. In 2006, two green sea turtle nests were recorded at Padre Island National Seashore (NPS, 2007). In 2014 no nests were found in Texas (NPS,

2015), whole only four were found in Texas in 2015, all in the Padre Island area (NPS, 2016). Green sea turtles, however, nest more in Florida and in Mexico. Since long migrations of green sea turtles from their nesting beaches to distant feeding grounds are well documented (Green, 1984; Meylan, 1982), the adult green sea turtles occurring in Texas may be either at their feeding grounds or in the process of migrating to or from their nesting beaches. The juveniles frequenting the seagrass meadows of the bay areas may remain there until they move to other feeding grounds or, perhaps, once having attained sexual maturity, return to their natal beaches outside of Texas to nest.

2.11.5 Presence in Study Area

Although green sea turtle nests have not been documented on the Bolivar Peninsula or Galveston Island since 1999 (USACE 2010), and although the project area has no sea grasses, it remains possible that the green sea turtle may occur as a transient species in the project area.

2.12 HAWKSBILL SEA TURTLE

2.12.1 Reasons for Protected Status

The hawksbill sea turtle (*Eretmochelys imbricata*) was federally listed as endangered on 2 June 1970 (35 FR 8495) with critical habitat designated in Puerto Rico on 24 May 1978 (43 FR 22224). The greatest threat to this species is harvest to supply the market for tortoiseshell and stuffed turtle curios (Meylan and Donnelly, 1999). Hawksbill shell (bekko) commands high prices. Japanese imports of raw bekko between 1970 and 1989 totaled 1,573,770 pounds (713,850 kilograms), representing more than 670,000 turtles. The hawksbill is also used in the manufacture of leather, oil, perfume, and cosmetics (NMFS, 2006).

Other threats include destruction of breeding locations by beach development, incidental take in lobster and Caribbean reef fish fisheries, pollution by petroleum products (especially oil tanker discharges), entanglement in persistent marine debris (Meylan, 1992), and predation on eggs and hatchlings. See USFWS (1998) for 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 Mona Island and Isla Monito, Puerto Rico, seaward to 3.5 miles (63 FR 46693–46701).

2.12.2 Habitat

Hawksbills generally inhabit coastal reefs, bays, rocky areas, passes, estuaries, and lagoons, where they occur at depths of less than 70 ft (21.5 m). 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 reenter coastal waters when they reach a carapace length of approximately 7.9 to 9.8 inches (20 to 25 centimeters). Coral reefs are widely recognized as the resident foraging habitat of juveniles, subadults, and adults. This habitat association is undoubtedly related to their diet of sponges, which need solid substrate for attachment. Hawksbills also occur around rocky outcrops and high-energy shoals, which are also optimum sites for sponge growth. In Texas, juvenile hawksbills are associated with stone jetties (NMFS, 2006).

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 and fish, and plant material such as algae, sea grasses and mangroves have been reported as food items for this turtle (Carr, 1952; Mortimer, 1982; Musick, 1979; Pritchard, 1977; Rebel, 1974). 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, which is typically a solitary nester, nests on undisturbed, deep-sand beaches, from high-energy ocean beaches to tiny pocket beaches several meters wide bounded by crevices of cliff walls. Typically, the sand beaches are low energy, with woody vegetation, such as sea grape (*Coccoloba uvifera*), near the waterline (NRC, 1990).

2.12.3 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 sea turtle 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 and the northern Gulf (especially Texas), south to Brazil (NMFS, 2006). In the continental U.S., the hawksbill largely nests in Florida where it is sporadic at best (NFWL, 1980). However, a major nesting beach exists 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).

2.12.4 Distribution in Texas

Texas is the only state outside of Florida where hawksbills 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, 2006). On 13 June 1998, the first hawksbill nest recorded on the Texas coast was found at Padre Island National Seashore. This nest remains the only documented hawksbill nest on the Texas coast (NPS, 2007).

2.12.5 Presence in Study Area

As previously noted, the hawksbill sea turtle occurs along the Texas coast. However, this species has not been recorded from the study area and no hawksbills have been taken during hopper dredging activities in Texas (USACE, 2019). Nevertheless, this species is of potential occurrence in the study area.

2.13 KEMP'S RIDLEY SEA TURTLE

2.13.1 Reasons for Protected Status

Kemp's ridley sea turtle (*Lepidochelys kempii*) was listed as endangered throughout its range on 2 December 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 the result of 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, 2006; USFWS and NMFS, 1992). The National

Research Council's (NRC) Committee on Sea Turtle Conservation estimated in 1990 that 86% of the human-caused deaths of juvenile and adult loggerheads and Kemp's ridleys resulted from shrimp trawling (Campbell, 1995). It is estimated that before the implementation of turtle excluder devices (TED), the commercial shrimp fleet killed between 500 and 5,000 Kemp's ridleys each year (NMFS, 2006). 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 sea turtles is the ingestion of manmade debris and garbage. Postmortem examinations of sea turtles found stranded on the south Texas coast from 1986 through 1988 revealed 54% (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 the sea turtles examined. 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 poses additional threats (Campbell, 1995).

Further threats to this species include collisions with boats, explosives used to remove oil rigs, and entrapment in coastal power plant intake pipes (Campbell, 1995). Dredging operations affect Kemp's ridley turtles through incidental take and by degrading the habitat. Incidental take of ridleys 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 dredged material placement, degraded water quality/clarity, and altered current flow (USFWS and NMFS, 1992).

Sea 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 sea turtle populations. In many cases, prime sea turtle 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 hatchling sea turtles, causing them to head inland by mistake, often with fatal results. Adult females also may avoid brightly lit areas that would otherwise provide suitable nesting sites.

Kemp's ridley appears to be in the earliest stages of recovery. Approximately 6,000 Kemp's ridley nests were recorded on Mexican beaches during the 2000 nesting season; just over 10,000 nests were recorded there during the 2005 nesting season. Similarly, increased nesting activity has been recorded on the Texas beaches in the last decade or so from four nests in 1995 to 51nests in 2005 (NPS, 2007). In 2014 there were 119 Kemp's ridley nests on Texas beaches (NPS, 2015) and 159 nests in 2015 (NPS, 2016). The increase likely can 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, 2006).

2.13.2 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, 1992). In some regions, the 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 (Campbell, 1995, Pritchard and Marquez, 1973; Shaver, 1991).

2.13.3 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 ridleys 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. Several scattered isolated nesting attempts have occurred from North Carolina to Colombia.

Because of the dangerous population decline at the time, a head-starting program was carried out from 1978 to 1988. Eggs were collected from Rancho Nuevo and placed into polystyrene foam boxes containing Padre Island sand so that the eggs never touched the Rancho 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 for rearing. They were fed a diet of high-protein commercial floating pellets for 7 to 15 months before being released into Texas (mainly) or Florida waters (Caillouet et al., 1995). This program has shown some results. The first nesting from one of these head-started individuals occurred at Padre Island in 1996, and more nesting has occurred since.

2.13.4 Distribution in Texas

Kemp's ridley occurs in Texas in small numbers and in many cases may well be in transit between crustacean-rich feeding areas in the northern Gulf and breeding grounds in Mexico. It has nested sporadically in Texas in the last 50 years. According to Hildebrand (1982, 1987), sporadic ridley nesting in Texas has always been the case.

2.13.5 Presence in Study Area

Between 1999 and 2010 ten Kemp's ridley nests were documented on the Bolivar Peninsula and 37 Kemp's ridley nests were documented on Galveston Island (USACE 2010). In the 2017 season, three nests were found on Bolivar and five were found on Galveston Island. In 2018, four nests were found on Galveston Island. Through November of 2019, three nests were found on Bolivar and four were found on Galveston Island (Anderson, pers. comm.).

2.14 LEATHERBACK SEA TURTLE

2.14.1 Reasons for Protected Status

The leatherback sea turtle (*Dermochelys coriacea*) was listed as endangered throughout its range on 2 June 1970 (35 FR 8495), with critical habitat designated in the U.S. Virgin Islands on 26 September 1978

and 23 March 1979 (43 FR 43688–43689 and 44 FR 17710–17712, respectively). Its decline is attributable to overexploitation by man and incidental mortality associated with commercial shrimping and fishing activities. Use of turtle meat for fish bait and the consumption of litter by turtles are also causes of mortality, the latter phenomenon apparently occurring when plastic is mistaken for jellyfish (Rebel, 1974). Nesting populations of leatherback sea turtles are especially difficult to estimate because the females frequently change nesting beaches; however, Spotila et al. (1996) estimated the 1995 worldwide population of nesting female leatherbacks at 26,000 to 42,000. The major threat is egg collecting, although they are jeopardized to some extent by destruction or degradation of nesting habitat (NatureServe, 2018). This species is probably more susceptible than other turtles to drowning in shrimp trawlers equipped with TEDs because adult leatherbacks are too large to pass through the TED exit opening. 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).

Critical Habitat: St. Croix, Virgin Islands; Santa Rosa NP., Costa Rica; sites in Mexico. NMFS (*Federal Register*, 12 May 1995) established a leatherback conservation zone extending from Cape Canaveral to the Virginia-North Carolina border and including all inshore and offshore waters; this zone is subject to shrimping closures when high abundance of leatherbacks is documented. Mortality associated with the swordfish gillnet fisheries in Peru and Chile represents the single largest source of mortality for East Pacific leatherbacks (Eckert and Sarti, 1997).

2.14.2 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 (TPWD, 2006), when it can be found in inshore waters, bays, and estuaries. It dives almost continuously, often to great depths.

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 seaweed (NFWL, 1980). The leatherback typically nests on beaches with a deepwater approach (Pritchard, 1971).

2.14.3 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, the Cape of Good Hope, and Argentina; and in other water bodies 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, 2006).

The leatherback 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, leatherbacks tend to occur along the east coast of the U.S. from the Gulf of Maine south to the middle of Florida.

2.14.4 Distribution in Texas

Apart from occasional feeding aggregations such as the large one of 100 animals reported by Leary (1957) off Port Aransas in December 1956, or possible concentrations in the Brownsville Eddy in winter (Hildebrand, 1983), leatherbacks are rare along the Texas coast, tending to keep to deeper offshore waters where their primary food source, jellyfish, occurs. In the Gulf, the leatherback is often associated with two species of jellyfish: the cabbagehead (*Stomolophus* sp.) and the moon jellyfish (*Aurelia* sp.) (NMFS and USFWS, 1992). According to USFWS (1981), leatherbacks never have been common in Texas waters. No nests of this species have been recorded in Texas for at least 70 years (NPS, 2007). The last two, one from the late 1920s and one from the mid-1930s, were both from Padre Island (Hildebrand, 1982).

2.14.5 Presence in Study Area

No leatherbacks have been taken by dredging activities in Texas (USACE, 2019). This species is unlikely to occur in the study area.

2.15 LOGGERHEAD SEA TURTLE

2.15.1 Reasons for Protected Status

USFWS listed the loggerhead turtle (*Caretta caretta*) as threatened throughout its range on 28 July 1978 (43 *Federal Register* [FR] 32808). The decline of the loggerhead, 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, 2006).

2.15.2 Habitat

The loggerhead 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 (*Sargassum* sp.). They may remain associated with sargassum for perhaps 3 to 5 years (NMFS and USFWS, 1991a).

Commensurate with their use of varied habitats, loggerheads consume a wide variety of both benthic and pelagic food items, which they crush before swallowing. Conches, shellfish, horseshoe crabs, prawns and other crustacea, squid, sponges, jellyfish, basket starts, fish (carrion or slow-moving species), and even hatchling loggerheads have all been recorded as loggerhead prey (Hughes, 1974; Mortimer, 1982; Rebel, 1974). 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-tide mark 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).

2.15.3 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 (Iverson, 1986, Rebel, 1974; Ross, 1982). 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, 2006).

2.15.4 Distribution in Texas

The loggerhead is the most abundant turtle in Texas marine waters, preferring shallow inner continental shelf waters and occurring only 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. Loggerheads constitute a major portion of the dead or moribund turtles washed ashore (stranded) on the Texas coast each year (Sea Turtle Stranding and Salvage Network [STSSN], 2018). A large proportion of these deaths are the result of accidental capture by shrimp trawlers, where caught turtles drown and then are thrown overboard. Before 1977, no positive documentation of loggerhead nests in Texas existed (Hildebrand, 1982). Since that time, several nests have been recorded along the Texas coast. In 1999, two loggerhead nests were confirmed in Texas, while in 2000, five loggerhead nests were confirmed. Between 2001 and 2005, up to five loggerhead nests per year have been recorded from the Texas coast. Two loggerhead nests were recorded in 2006: one on Padre Island National Seashore and the other on South Padre Island (National Park Service [NPS], 2007). During the 2008 nesting season, four loggerheads were observed nesting on Texas beaches, two on Padre Island National Seashore, one on Bolivar Peninsula, and one on Mustang Island (NPS, 2008). In 2014 only two nests were found along Texas beaches (NPS, 2015) while in 2015 this number increased to eight nests (NPS, 2016). All but two of the nests were found in the Padre Island area. Like the worldwide population, the population of loggerheads in Texas has declined. Prior to World War I, the species was taken in Texas for local consumption and a few were marketed (Hildebrand, 1982). Today, even with protection, insufficient loggerheads exist to support a fishery.

2.15.5 Presence in Study Area

Critical habitat for the loggerhead turtle was designated on 10 July 2014 (79 FR 39856). Critical habitat was designated for areas of breeding, migration, and feeding (*Sargassum* habitat). Only the *Sargassum* habitat is present off the Texas coast. This habitat is described as "developmental and foraging habitat for young loggerheads where surface waters form accumulations of floating material, especially *Sargassum*." The areas identified as *Sargassum* habitat include the western Gulf of Mexico to the eastern edge of the Loop Current and the Atlantic ocean from the Gulf of Mexico along the northern/western boundary of the Gulf Stream and east to the outer edge of the U.S. Exclusive Economic Zone (EEZ) (79 FR 39881).

"Specifically, the Gulf of Mexico area has as its northern and western boundaries the 10 m depth contour starting at the mouth of South Pass of the Mississippi River and proceeding west and south to the outer boundary of the U.S. EEZ. The southern boundary of the area is the U.S. EEZ from the 10 m depth contour

off of Texas to the Gulf of Mexico-Atlantic border (83° W. long.). The eastern boundary follows the 10 m depth contour from the mouth of South Pass of the Mississippi River at 28.97° N. lat., 89.15° W. long., in a straight line to the northernmost boundary of the Loop Current (28° N. lat., 89° W. long.) and along the eastern edge of the Loop Current roughly following the velocity of 0.101–0.20 m/second as depicted by Love *et al.* (2013) using the Gulf of Mexico summer mean sea surface currents from 1993–2011, to the Gulf of Mexico Atlantic border (24.58° N. lat., 83° W. long.). The delineation between the Gulf of Mexico and the Atlantic Ocean starts at 24.58° N. lat., 83° W. long. (near the Dry Tortugas), and proceeds southward along 83° W. long. to the outer boundary of the EEZ (23.82° N. lat.) (79 FR 39882-39883).

Loggerhead nests are uncommon in Texas. In 2014 only two nests were found along Texas beaches (NPS, 2015) while in 2015 this number increased to eight nests (NPS, 2016). All but two of the nests were found in the Padre Island area. The two found outside of Padre Island were located on San Jose Island in 2015 (NPS, 2016). One nest was found on Galveston Island in 2018 (Anderson, pers. comm.).

3.0 EFFECTS ANALYSIS

3.1 EFFECTS OF THE PROPOSED ACTION ON LISTED SPECIES

The following sections provide the findings of Galveston District and species-specific avoidance, minimization, and conservation measures that support the effect determinations presented. Effect determinations are presented using the language of the ESA:

- ***No effect*** - the proposed action would not affect a federally-listed species or critical habitat;

- ***May effect, but not likely to adversely affect*** - 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*** - 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.

3.2 ATTWATER'S GREATER PRAIRIE CHICKEN

Because the Attwater's greater prairie chicken is not expected to occur in the project area, no impacts and no effects are anticipated as a result of the proposed project.

3.3 ESKIMO CURLEW

The Eskimo curlew has not been documented in the project area in more than 50 years. Because the Eskimo curlew is not expected to occur in the project area, no impacts and no effects are anticipated as a result of the proposed project.

3.4 PIPING PLOVER

Designated critical habitat occurs in the vicinity of the project area in Texas Units 35 and 36. The primary constituent elements (PCEs) for the piping plover wintering habitat are those components that are essential for the primary biological needs of foraging, sheltering, and roosting, and only those areas containing these PCEs within the designated boundaries are considered critical habitat. The PCEs are found in coastal areas that support intertidal beaches and flats (between annual low and high tide) and associated dune systems and flats above annual high tide (65 FR 41781–41812, 6 July 2000). No placement of dredged material will occur within areas of designated critical habitat or in areas that include PCEs for this species.

The designated critical habitat for the piping plover would not be directly affected by construction or dredging activities. The piping plover has been recorded at Big Reef, Apffel Park, Texas City Dike, and Bolivar Flats Shorebird Sanctuary, which are all in the vicinity of the project area (ebird.org). There is not expected to be a significant increase in ship wake activity in the area of the critical habitat. The channel in that area would be widened to increase efficiencies in vessel traffic, but not deepened to allow for larger vessels. A ship wake study has not been done to date, but is scheduled to occur during the planning, engineering and design phase of the study. USACE will continue to coordinate with the Service regarding the results of this study and revise the effects determination on piping plover critical habitat if the study indicates results other than those expected. Unit TX-36 is behind the eastern jetty for the entrance channel and would unaffected by ship wakes. The channel adjacent to Unit TX-35 is not being modified under the proposed project. The starting point of the project is approximately 3.3 miles into the bay from the northernmost edge of TX-35. In addition, the area of TX-35 is on the eastern end of Galveston Island, a portion of the island that has been accreting land from longshore sediment transport (Bolleter, 1985). A 3D ADH model of circulation was conducted by ERDC to determine changes in water velocities as a result of the project. The study indicated the bottom water velocity near TX-35 would be virtually unchanged while the surface water velocity would be reduced by an average of 0.02 m/s (McAlpin et al., 2019). This reduction in velocities would likely lead to accretion of material at the Big Reef site (TX-35). The design team can work with the Service to refine and identify any areas that may require surveys to avoid impacts to piping plovers during construction operations. Therefore the project may effect, not likely to adversely affect piping plover critical habitat.

3.5 RED KNOT

The red knot occurs in limited numbers in the project area, though is known to utilize similar habitat to that of the piping plover. There is not expected to be a significant increase in ship wake activity in the area of the red knot habitat. The channel in that area would be widened to increase efficiencies in vessel traffic, but not deepened to allow for larger vessels. A ship wake study has not been done to date, but is scheduled to occur during the planning, engineering and design phase of the study. USACE will continue to coordinate with the Service regarding the results of this study and revise the effects determination on

red knot if the study indicates results other than those expected. The design team can work with the Service to refine and identify any areas that may require surveys to avoid impacts to red knots during construction operations. There is not expected to be any impacts or direct or indirect effects to the red knot as a result of the proposed project.

3.6 TEXAS PRAIRIE DAWN FLOWER

Because the Texas prairie dawn flower is not expected to occur in the project area, no impacts and no effects are anticipated as a result of the proposed project.

3.7 WEST INDIAN MANATEE

This species is highly unlikely to occur in the project area; therefore, the project may affect, but is not likely to adversely affect manatees. Several measures will be taken to ensure avoidance and pertain to dissemination of appropriate information to the project construction and operations employees. The following recommendations will be included in the plans and specifications for the project: 1) All personnel associated with the project shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act.; 2) All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.; 3) Siltation or turbidity barriers shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers must not impede manatee movement.; 4) All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shut down if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.; and 5) Any collision with or injury to a manatee shall be reported immediately to the Texas Marine Mammal Stranding Network (TMMSN) Hotline at 1-888-9-MAMMAL and also reported to the U.S. Fish and Wildlife Service in Houston (1-281-286-8282).

3.8 OCEAN WHITETIP SHARK

Because the ocean whitetip shark is not expected to occur in the project area, no impacts and no effects are anticipated as a result of the proposed project.

3.9 GIANT MANTA RAY

Because the Giant manta ray is not expected to occur in the project area, no impacts and no effects are anticipated as a result of the proposed project.

3.10 CORALS

None of the four coral species are expected to occur in the project area; therefore, no effects to the four coral species are anticipated from the proposed action.

3.11 WHALES

None of the four whale species are expected to occur in the project area; therefore, no effects to the four whale species are anticipated from the proposed action.

3.12 MARINE (SEA) TURTLES

The responsibility for agency consultation on marine reptiles is divided between two federal agencies: the NMFS for sea turtles in the water, and the USFWS for nesting sea turtles.

Sea turtles may be present in the water within the project dredging sites during certain times of the year. Thus, construction and post-construction maintenance activities could result in impacts to sea turtles. Five species of sea turtle occur in Texas waters: Kemp's ridley sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle, and green sea turtle. Since 2013, one loggerheads, and one Kemp's ridleys, have been taken during maintenance dredging in the Galveston Bay (ODESS, 2019). Since 2017 19 Kemp's ridley nests have been found on Bolivar and Galveston Island beaches. One loggerhead nest was found on Galveston Island in that time. No leatherback, loggerhead, or green sea turtle nests were observed on Bolivar or Galveston Islands during that time (Anderson, pers. comm.).

3.12.1 Channel Construction Dredging (New Work) and Maintenance

The proposed project calls for the use of pipeline, mechanical dredges for new work construction. Hopper dredges may be utilized for maintenance work if they are deemed the most efficient. It has been well documented that hopper dredging activities occasionally result in sea turtle entrainment and death, even with seasonal dredging windows, V-shaped turtle-deflector dragheads, and concurrent relocation trawling (NMFS, 2003, 2005). Between February 1995 and November 2006, hopper dredging activities within the USACE, Galveston District resulted in 60 lethal takes of sea turtles: 26 loggerheads, 21 green turtles, and 13 Kemp's ridleys (USACE, 2007). Sea turtles easily avoid pipeline dredges due to the slow movement of the dredge. Apart from direct mortality, dredging activities could have an impact on sea turtles through an increase in sedimentation, turbidity, and resuspension of toxic sediments.

The sedimentation resulting from dredging activities may affect food sources for the turtles, and the turbidity could affect primary productivity. This would be short term, however. The increased possibility of chemical or oil spills could pose a threat to turtles both directly and indirectly through their food source. While adult sea turtles may be mobile enough to avoid areas of high oil or chemical concentrations, hatchlings, posthatchlings, and juveniles in the area would be more susceptible. An increase in marine traffic may result in a higher incidence of collision with sea turtles. Other potential impacts as a result of the project include disorientation because of lighting on vessels, and increased accumulation of plastic detritus.

As noted above, hopper dredging may result in mortality of individual Kemp's ridleys. Since 2013, one Kemp's ridleys and one loggerhead have been taken during maintenance dredging in Galveston Bay (ODESS, 2019). This Kemp's ridley is seasonal in nearshore waters of Texas. During the onset of colder waters in December, Kemp's ridley will move away from inshore waters into deeper waters, returning in March with warmer waters, ready to nest on the Texas coast and to forage in tidal passes and bays (NMFS, 2003). Restriction of hopper dredging activities to between December 1 and March 31, whenever possible, would reduce the likelihood of direct mortality. Hopper dredging impacts on sea turtles will be minimized by following the reasonable and prudent measures included in the BO prepared by the NMFS for construction and the most recent BO for maintenance dredging in the Gulf of Mexico.

As with the Kemp's ridley sea turtle, the green and the loggerhead could be negatively impacted by dredging activities. The green sea turtle is known to move into warmer waters during the winter (Shaver, 2000). Two green sea turtles captured at Magnolia Beach in the Matagorda Bay and tracked using satellite telemetry moved 112 miles south into south Texas offshore waters during the winter (Williams and Renaud, 1998). Working within similar windows as described for Kemp's ridleys, and having relocation trawlers working ahead of the dredges, would help to reduce these impacts.

The hawksbill sea turtle has not been recorded from the study area, and no hawksbills have been taken during hopper dredging activities in Texas (USACE, 2007). Nevertheless, the proposed hopper dredging activity can be considered as causing potential adverse effects to hawksbill sea turtle.

Of the five species of sea turtles occurring in Texas waters, the leatherback is the species least likely to be affected by the proposed project because of its rare occurrence and pelagic nature. It is unlikely to occur in the action area and has not been caught in hopper dredges.

3.12.2 Placement of Dredged Materials

The sedimentation resulting from placement of dredged material may affect food sources for turtles, and turbidity could affect primary productivity. PAs would result in the direct loss of bay bottom over the course of the project. This bay bottom may be foraging or resting habitat for sea turtles. If sea turtles are present at disposal sites, they may be affected by sedimentation and turbidity. They could also be exposed to trash and debris; however, turtles should be easily able to overcome a descending plume, and available food sources should not be seriously reduced.

No material would be placed on Gulf beaches as part of the proposed project. Because Kemp's ridleys nest during daylight hours, no disorientation for adults from boat lighting would occur. Hatchlings, however, emerge from the nest at night and may be adversely affected by lighting on the boats. Under natural conditions, hatchlings typically take the shortest route to the water's edge. Bright lights on a nearshore hopper dredge may cause the hatchlings to move toward the lights, resulting in a more circuitous route to the water or open ocean, thereby exposing them to more danger. While nesting in the project area is uncommon, dredging outside of the nesting/emergence season, turning off/lowering/ shielding unessential lighting, and use of shielded, low-sodium vapor lights for those that cannot be safely eliminated would reduce this potential disorientation impact.

The use of the ODMDS No. 1, which is located within the Loggerhead critical habitat area could have an impact on Loggerhead turtles if the presence of Sargassum is dense enough to attract young loggerhead turtles. However, a 2016 NMFS memo from Roy E. Crabtree dated March 4, 2016 to Alvin B. Lee, USACE, South Atlantic Division, clarifying the activities under the 2007 GRBO (NMFS 2016) with respect to the new critical habitat found for offshore ocean disposal within the boundaries of the Sargassum critical habitat (NMFS 2016):

> "The placement of the dredged material may create temporary turbidity plumes that could potentially extend to the surface and interact with the Sargassum and its associated community, creating the potential to impact the following PCE: " available prey and other material associated with Sargassum habitat such as, but not limited to, plants and cyanobacteria and animals endemic to the Sargassum community such as hydroids and copepods." However, the sediments would be expected to settle quickly, and therefore interaction time with the Sargassum and materials associated with its habitat would be of very short duration and any effects would be insignificant. Thus, offshore ocean disposal is not likely to adversely affect the Sargassum critical habitat."

Based on the March 4, 2016 GRBO, the use of ODMDS No. 1 as a disposal site may affect but would not likely adversely affect the Sargassum critical habitat area.

3.12.3 Additional Effects

The driving of sheet piles creates intense noise levels. Peng et al 2015, cites intensity levels in between 131-135 decibels referenced to 1 microPascal (dB re 1 μPa) with frequencies between 30-40 Hertz (Hz). This is within the reported range of hearing reported for sea turtles (Samuel et al 2005). The sheet piles are proposed along the land cut north shore along the BSC, the north shoreline along the BCC, along a short stretch of the HSC at Morgans Point, and at the expansion of the existing Brady Island Turning Basin. The presence of sea turtles at the Brady Island Turning Basin is unlikely because it is located more than 20 miles up the HSC from Morgan's Point, the upper part of Galveston Bay. There is a low chance of foraging turtles for the other three locations. Sound does not propagate well in shallow environments such as Galveston Bay, which has an average depth of 8 feet. The sound is scattered and attenuated by the waves on the surface and soft muddy bottom. The sound could follow the existing channels, but the continuous operations within the Bayport, Barbours Cut and the Houston Ship Channel with their high noise levels from tanker and container ships (180-205 dB re 1 μPa with frequencies between 6.8-70 Hz) and noise from other small ship traffic such as tugboats (170-180 dB re 1 μP with frequencies between 20-1000 Hz), it would be expected that sea turtles would avoid these areas.

The creation of the sediment attenuation feature, 3-Bird Island, its associated marsh, 6-acre Bird Island, 8-acre Bird Island, and the oyster reefs would place dredge material and rock on the existing bay bottom. With the noise from the operations of the ships, dredge pipes, and placement of the material, it would be expected that sea turtles would avoid these areas. In addition the placement of dredged material for the oyster reefs would be using specific dredge placement equipment to minimize turbidity and increase precision of location and depth of the material.

3.12.4 Avoidance, Minimization, and Conservation Measures

Avoidance measures would include an avoidance plan for hopper dredge impacts to sea turtles. This avoidance plan includes reasonable and prudent measures that have largely been incorporated in USACE civil works projects throughout the Gulf for more than a decade. These measures include use of temporal dredging windows, when possible; intake and overflow screening; use of sea turtle deflector dragheads; observer reporting requirements; and sea turtle relocation/abundance trawling:

- *Hopper Dredging*: hopper dredging activities in Gulf waters from the Mexico-Texas border to Key West, Florida, up to 1 mile into rivers shall be completed, whenever possible, between 1 December and 31 March, when sea turtle abundance is lowest throughout Gulf coastal waters. National Oceanic and Atmospheric Administration (NOAA) should be contacted should dredging need to occur outside of this window.
- *Nonhopper-type Dredging*: pipeline or hydraulic dredges, which are not known to take turtles, must be used whenever possible between 1 April and 30 November in Gulf waters up to 1 mile into rivers.
- *Observers*: Arrangements shall be made for NOAA Fisheries–approved observers to be aboard the hopper dredges to monitor the hopper soil, screening, and dragheads for sea turtles and their remains. Observer coverage sufficient for 100% monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges in Texas waters between 1 April and 30 November, and whenever surface water temperatures are 51.8°F (11°C) or greater.
- *Screening*: When observers are required on hopper dredges, 100% inflow screening of dredged material is required and 100% overflow screening is recommended. If conditions prevent 100% inflow screening, screening may be reduced gradually, but 100% overflow screening is then required.
- *Sea Turtle Deflecting Draghead*: A state-of-the-art rigid deflector draghead must be used on all hopper dredges in all Gulf channels and sand-mining sites at all times of the year.
- *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges must be reported to NOAA Fisheries by onboard endangered species observers within 24 hours of any observed sea turtle take. A preliminary report summarizing the results of the hopper dredging and any documented sea turtle takes must be submitted to NOAA Fisheries within 30 working days of completion of any dredging project. In addition, an annual report (based on fiscal year) must be submitted to NOAA Fisheries summarizing hopper dredging projects and documented incidental takes.
- *Relocation Trawling*: Relocation trawling shall be undertaken if two or more turtles are taken in a 24-hour period in the project or if other conditions outlined in the BO are met. Handling of sea turtles captured during relocation trawling in association with a hopper dredging project in Gulf navigation channels shall be conducted by NOAA Fisheries–approved endangered species observers.
- *Lighting*: Unnecessary lighting on dredges should be turned off, shielded, or lowered to prevent hatchlings from moving towards the light sources. In addition, low-sodium vapor lights should be used whenever possible.

3.12.5 Nesting Sea Turtles

No material would be placed on Gulf beaches as part of the proposed project. There is no suitable nesting habit in the existing upland disposal or beneficial use areas. The proposed project should have no effect on nesting sea turtles.

3.12.6 Effects Determinations

Project activities are expected to have no effect on nesting sea turtles (Kemp's ridley, loggerhead, green, and hawksbill) in the project area. No effect is anticipated for nesting leatherback sea turtles; however, the placement of dredged material may affect, but is not likely to adversely affect, leatherback sea turtles because of secondary impacts potentially associated with the placement of dredged material in the bay. Effect determinations due to hopper dredging activities are likely to adversely affect Kemp's ridley, loggerhead, green, hawksbill, and leatherback sea turtles. Placement activities may effect, but is not likely to adversely affect the critical *Sargassum* habitat of loggerhead turtles. Effect determinations, based on the information presented in this document and in the EIS, are presented in **Table 3**-1.

In summary, construction dredging activities may effect, but are not likely to adversely affect sea turtles, although upland and ocean placement of dredged materials are not expected to impact sea turtles. Maintenance dredging activities will be covered under the Gulf Regional Biological Opinion. Feeding opportunities within the proposed channel and nearby nesting beaches could attract sea turtles, where they might be exposed to additional cumulative risks from boat traffic, contaminants, fishing and fishing gear, and accumulated plastic debris. The likelihood of adverse effects, including incidental take, during construction and maintenance are greatly reduced by full implementation of the avoidance, minimization, and conservation measures outlined above. Incidental take, if it occurs, may effect but is not likely to adversely affect these species.

4.0 SUMMARY

The proposed project may affect a few federally listed endangered or threatened species. The Attwater's greater prairie chicken, Eskimo curlew, Texas prairie dawn flower, ocean whitetip shark, giant manta ray, listed whale species, and listed coral species are unlikely to occur in the project area, and therefore, no effects are expected for these species. The project is also is expected to have no effect on the following species: piping plover, red knot, and nesting sea turtles. Construction activities may effect, but not are not likely to adversely affect the West Indian manatee. Placement of dredged material may affect, but not likely adversely affect sea turtle species (green, hawksbill, Kemp's ridley, leatherback and loggerhead). Dredging activities may affect, but not likely adversely affect sea turtle species. The project may affect, not likely to adversely affect critical habitat for piping plover. The project is expected to have no effect on critical habitat for loggerhead turtles. Species effect determinations are summarized in **Table 3-1**.

Table 3-1. Effect determinations for threatened and endangered wildlife species of possible occurrence in Chambers, Galveston and Harris Counties, Texas

Common Name	Construction Activities	Placement Activities
Birds		
Attwater's Greater Prairie-Chicken	No effect	No effect
Eskimo curlew	No effect	No effect
Piping Plover	No effect	No effect
Red Knot	No effect	No effect
Invertebrates		
Lobed star coral	No effect	No effect
Mountainous star coral	No effect	No effect
Boulder star coral	No effect	No effect
Elkhorn coral	No effect	No effect
Mammals		
Fin whale	No effect	No effect
Sei whale	No effect	No effect
Sperm whale	No effect	No effect
Gulf of Mexico Bryde's whale	No effect	No effect
West Indian manatee	May effect, not likely to adversely affect	May effect, not likely to adversely affect
Fish		
Oceanic whitetip shark	No effect	No effect
Giant manta ray	No effect	No effect
Reptiles		
Loggerhead sea turtle	May effect, not likely to adversely affect	May effect, not likely to adversely affect
Green sea turtle	May effect, not likely to adversely affect	May effect, not likely to adversely affect
Hawksbill sea turtle	May effect, not likely to adversely affect	May effect, not likely to adversely affect
Leatherback sea turtle	May effect, not likely to adversely affect	May effect, not likely to adversely affect
Kemp's Ridley sea turtle	May effect, not likely to adversely affect	May effect, not likely to adversely affect
Nesting Sea Turtles		
Loggerhead sea turtle	No effect	No effect
Green sea turtle	No effect	No effect
Hawksbill sea turtle	No effect	No effect
Leatherback sea turtle	No effect	No effect
Kemp's Ridley sea turtle	No effect	No effect
Plants		
Texas Prairie Dawn Flower	No effect	No effect

This page left intentionally blank

5.0 REFERENCES

Allard, M.W., M.M. Miyamoto, K.A. Bjorndal, A.B. Bolton, and B.W. Bowen. 1994. Support for natal homing in green turtles from mitochondrial DNA sequences. Copeia 1994:34–41.

American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. Allen Press, Inc., Lawrence, Kansas.

Balazs, G. 1980. Synopsis of biological data on the green turtle in the Hawaiian Islands. NOAA Technical Memorandum. NMFS-SWFC-7.

Bolleter, J.M. (1985) Galveston Island and erosion. Master's thesis. Texas A&M University. College Station, TX.

Barrett, S. 1996. Disease threatens green sea turtles. Endangered Species Bulletin 21(2):8–9. Bartlett, R.D., and P.P. Bartlett. 1999. A field guide to Texas reptiles and amphibians. Gulf Publishing Company. Houston.

Bent, A.C. 1929. Life histories of North American shorebirds. Pt. 2. U.S. Natl. Mus. Bull. No. 146

Brongersma, L.D. 1972. European Atlantic turtles. Zool. Verhl. 121.

Caillouet, C.W. Jr., C.T. Fontaine, S.A. Manzella-Tirpak, and D.J. Shaver. 1995. Survival of head-started Kemp's ridley sea turtles (*Lepidochelys kempii*) released into the Gulf of Mexico or adjacent bays. Chelonian Conservation and Biology 1(4):285–292.

Campbell, L. 1995. Endangered and threatened animals of Texas, their life history and management. Texas Parks and Wildlife Department, Resource Protection Division, Endangered Resources Branch, Austin.

Carr, A.F. 1952. Handbook of turtles: the turtles of the United States, Canada and Baja California. Comstock Publ. Assoc., Cornell Univ. Press, Ithaca, New York

Cohen, J. B., M. Karpanty, J. D. Fraser and B. R. Truitt. 2009. The effect of benthic prey abundance and size on Red Knot (*Calidris canutus*) distribution at an alternative migratory stopover site on the US Atlantic Coast. Journal of Ornithology no. 151 (2):355-364.

Cohen, J. B., S. M. Karpanty and J. D. Fraser. 2010. Habitat selection and behavior of Red Knots on the New Jersey Atlantic coast during spring stopover. Condor no. 112 (4):655-662

Dawson, P. 2019. 'Molly' the manatee spotted in Galveston Bay, third sighting along the Texas coast within a month. Houston Chronicle. August 2, 2019.

Domning, D.P., and L.C. Hayek. 1986. Interspecific and intraspecific variation in manatees (*Sirenia*: *Trichechus*). Marine Mammal Sci. 2:87–144.

Ebird.org (2019) Species map. https://ebird.org/map Accessed 17Nov2019

Eckert, S.A. 1992. Bound for deepwater. Natural History, March 1992, pp. 28–35.

Eckert, S.A., and M.L. Sarti. 1997. Distant fisheries implicated in the loss of the world's largest leatherback nesting population. Marine Turtle Newsletter 78:2–7.

Ernst, C.H., and R.W. Barbour. 1972. Turtles of the United States. University of Kentucky Press, Lexington.

Federal Register. 2018. 'Endangered and Threatened Wildlife and Plants; Final Rule To List the Giant Manta Ray as Threatened Under the Endangered Species Act,' Vol. 83. No. 14, Pages 2916-2931, January 22, 2018.

_____. 2016. 'Endangered and Threatened Wildlife and Plants: Notice of 12-Month Finding on a Petition To List the Gulf of Mexico Bryde's Whale as Endangered Under the Endangered Species Act (ESA),' Vol. 81, No.236, Pages 88639-88656, December 8, 2016.

_____. 2014a 'Endangered and Threatened Species: Critical Habitat for the Northwest Atlantic Ocean Loggerhead Sea Turtle Distinct Population Segment (DPS) and Determination Regarding Critical Habitat for the North Pacific Ocean Loggerhead DPS; Final Rule', Vol. 79, No. 132, Pages 39856-39912, July 10, 2014.

_____. 2014b 'Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Rufa Red Knot; Final Rule.' Vol. 79. No. 238. Pages 73705-73748, December 11, 2014.

_____. 2009. 'Endangered and Threatened Wildlife and Plants; Removal of the Brown Pelican (Pelecanus occindentalis) From the Federal List of Endangered and Threatened Wildlife; Final Rule', Volume 74, No. 220, Pages 59443-59472, November 17, 2009.

Green, D. 1984. Long-distance movements of Galapagos green turtles. Journal of Herpetology 18:121–130.

Haig, Susan M., and E. Elliott-Smith. 2004. Piping plover. The birds of North America Online. (A. Poole, editor) Cornell Laboratory of Ornithology, Ithaca, New York; Retrieved from The birds of North America online database: http://bna.birds.cornell.edu/BNA/account/Piping_Plover/.

Harrington, B. and C. Flowers. 1996. The flight of the Red Knot. New York: W. W. Norton.

Hildebrand, H. 1963. Hallazgo del area de anidacion de la tortuga marina "lora" *Lepidochelys kempi* (Garman) en la costa occidental del Golfo de Mexico. Ciencia (Mexico) 22:105–112.

Hildebrand, H. 1982. A historical review of the status of sea turtle populations in the western Gulf of Mexico. In: Biology and conservation of sea turtles (K. Bjorndal, ed.), 447–453. Smithsonian Institution Press, Washington, D.C.

Hildebrand, H. 1983. Random notes on sea turtles in the Western Gulf of Mexico. In: D. Owens et al. (editors) Proc. Western Gulf of Mexico Turtle Workshop, Texas A&M University, College Station. Pp. 34– 40. TAMU 56-84-105. 74 pp.

Hildebrand, H. 1987. A reconnaissance of beaches and coastal waters from the border of Belize to the Mississippi River as habitats for marine turtles. Report prepared for National Marine Fisheries Service, Southeast Fisheries Center, Panama City Laboratory, Panama City, Florida. Purchase Order No. NA-84-CF-A-134.

Hirth, H.F. 1997. Synopsis of the biological data on the green turtle *Chelonia mydas* (Linnaeus 1758). Biological Report 97(1). U.S. Fish and Wildlife Service, Washington, D.C.

Hughes, G.R. 1974. The sea turtles of Southeast Africa. II. The biology of the Tongaland loggerhead turtle *Caretta caretta* L. with comments on the leatherback turtle *Dermochelys coriacea* L. and the green turtle *Chelonia mydas* L. in the study region. South African Association for Marine Biological Research, Oceanographic Research Institute, Investigational Report No. 36. Durban, South Africa.

Iverson, J.B. 1986. A checklist with distribution maps of the turtles of the world. Paust Printing, Richmond, Indiana.

Leary, T. 1957. A schooling of leatherback turtles, *Dermochelys coriacea*, on the Texas coast. Copeia 3:232.

Lefebvre, L.W., T.J. O'Shea, G.B. Rathbun, R.C. Best. 1989. Distribution, status, and biogeography of the West Indian manatee. In: Biogeography of the West Indies (C.A. Woods, editor), 567–610. Sandhill Crane Press, Gainesville, Florida.

Lehmann, V.W. 1941. Attwater's prairie chicken, its life history and management. United States Fish and Wildlife Service, North American Fauna Series 57. United States Government Printing Office, Washington, D. C., USA.

McAlpin, J, J McKnight, and C Ross (2019) Houston Ship Channel Expansion Channel Improvement Project (ECIP) Numerical Modeling Report. ERDC/CHL TR-19-12. US Army Corps of Engineers. Vicksburg, MS.

Meylan, A. 1982. Sea turtle migration – evidence from tag returns. In: K. Bjorndal (editor), Biology and Conservation of Sea Turtles. Pp. 91–100. Smithsonian Institution Press, Washington, D.C. 583 pp.

Meylan, A. 1992. Hawksbill turtle *Eretmochelys imbricata* (Linnaeus). In Rare and endangered biota of Florida. Vol. III. Amphibians and reptiles (P.E. Moler, editor). University Press of Florida, Gainesville.

Meylan, A.B., B.W. Bowen, and J.C. Avise. 1990. A genetic test of the natal homing versus social facilitation models for green turtle migration. Science 248:724–727.

Meylan, A.B., and M. Donnelly. 1999. Status justification for listing the hawksbill turtle (*Eretmochelys imbricata*) as critically endangered on the 1996 IUCN red list of threatened animals. Chelonian Conservation and Biology 3(2):200–224.

Mortimer, J.A. 1982. Feeding ecology of sea turtles. In: Biology and conservation of sea Turtles (K. Bjorndal, editor), 103–109. Smithsonian Institution Press, Washington, D.C.

Musick, J. 1979. The marine turtles of Virginia with notes on identification and natural history. Educational Series No. 24. Sea Grant Program, Virginia Institute of Marine Science, Gloucester Point.

National Fish and Wildlife Laboratory (NFWL). 1980. Selected vertebrate endangered species of the seacoast of the United States. U.S. Fish and Wildlife Service, Biological Services Program, Washington, D.C. FWS/OBS-80/01.

National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration. 2006. Information on sea turtles. http://www.nmfs.noaa.gov/pr/species/turtles.html.

National Marine Fisheries Service and U.S. Fish and Wildlife Service (NMFS and USFWS). 1991. Recovery plan for U.S. population of Atlantic green turtle. National Marine Fisheries Service, Washington, D.C.

National Marine Fisheries Service and U.S. Fish and Wildlife Service (NMFS and USFWS). 1992. Recovery plan for leatherback turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C.

National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration. 2005. Revision No. 1 to November 19, 2003, Gulf of Mexico Regional Biological Opinion on Hopper Dredging of Navigation Channels and Borrow Areas in the U.S. Gulf of Mexico (effective June 24, 2005).

_____. 2016. Roy E. Crabtree/NOAA Fisheries March 4, 2016 Memorandum to Alvin B. Lee, SES/USACE, South Atlantic Division, Subject: Continued Operations of Maintenance Dredging and Beach Sand Placement Actions under the 2007 Gulf of Mexico Regional Biological Opinion (GRBO)(I/SER/2015/17543).

_____. 2019. Endangered and Threatened Species and Critical Habitats under the Jurisdiction of the NOAA Fisheries Service – Texas. http://sero.nmfs.noaa.gov/protected_resources/section_7/threatened_endangered/Documents/texas.pdf. (Accessed March 20, 2019).

NMFS and U.S. Fish and Wildlife Service. 2008. Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (Caretta caretta), Second Revision. National Marine Fisheries Service, Silver Spring, MD, 2008.

National Oceanic and Atmospheric Administration Fisheries. 2019a. Fin Whale (*Balaenoptera physalus*). https://www.fisheries.noaa.gov/species/fin-whale (Accessed April 1, 2019).

_____. 2019b. Gulf of Mexico Brydes Whale. https://www.fisheries.noaa.gov/species/gulf-mexico-brydes-whale (Access April 2, 2019).

_____. 2018. Oceanic Whitetip Shark Recovery Outline. https://www.fisheries.noaa.gov/resource/document/oceanic-whitetip-shark-recovery-outline (Accessed March 20, 2019).

_____. 2017a. Endangered Species Act Status Review Report: Giant Manta Ray (*Manta birostris*) Reef Manta Ray (*Manta alfredi*) September 2017.

_____. 2017b. Sei Whale (*Balaenoptera borealis*). http://www.fisheries.noaa.gov/pr/species/mammals/whales/sei-whale.html (Accessed July 2017).

_____. 2011. Final Recovery Plan for the Sei Whale. NMFS NOAA.

_____. 2010a. Final Recovery Plan for the Fin Whale. NMFS NOAA.

_____. 2010b. Final Recovery Plan for the Sperm Whale. NMFS NOAA.

National Park Service (NPS). 2007. Information on sea turtles. http://www.nps.gov/pais/website/.htm.

National Park Service (NPS). 2008. Sea Turtle Nesting Information. http://www.nps.gov/pais/naturescience/current-season.htm

National Park Service (NPS). 2015. 2015 Nesting Season. https://www.nps.gov/pais/learn/nature/nesting2014.htm Accessed 16May2019

National Park Service (NPS). 2016. Sea Turtle Nesting Season 2015. http://home.nps.gov/pais/learn/nature/2015-nesting-season.htm Accessed 16May2019

National Research Council (NRC). 1990. Decline of the sea turtles: causes and prevention. National Academy Press, Washington, D.C.

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life. http://www.natureserve.org/explorer. NatureServe, Arlington, Virginia.

O'Shea, T.J., and M.E. Ludlow. 1992. Florida manatee (*Trichechus manatus latirostris*). In: Rare and endangered biota of Florida. Volume 1: Mammals (S.R. Humphrey, editor). University Press of Florida, Gainesville.

Peng, C., X. Zhao, and G. Liu, 2015. Noise in the Sea and Its Impacts on Marine Organisms, Int. J. Environ. Res. Public Health 2015, 12, pp. 12304-12323.

Pritchard, P.C.H. 1971. The leatherback or leathery turtle *Dermochelys coriacea*. IUCN Monograph No. 1. International Union for Conservation of Nature and Natural Resources, Morges, Switzerland.

Pritchard, P.C.H. 1977. Marine turtles of Micronesia. Chelonia Press, San Francisco, California.

Pritchard, P.C.H., and R. Marquez. 1973. Kemp's ridley turtle or Atlantic ridley, *Lepidochelys kempi*. IUCN Monograph 2, Morges, Switzerland.

Rebel, T.P. 1974. Sea turtles and the turtle industry of the West Indies, Florida, and the Gulf of Mexico. Rev. Ed. University of Miami Press, Coral Gables, Florida.

Reeves, R.R., Clapham, P.J., Brownell Jr., R.L., and Silber, G.K. Recovery Plan for the Blue Whale (*Balaenoptera musculus*). National Marine Fisheries Service, Silver Spring MD, 1998.

Rice, H. 2012. Rare manatee sighting in Galveston Bay. Houston Chronicle. October 15, 2012.

Rodrigues, A. A. F. 2000. Seasonal abundance of Neartic shorebirds in the Gulf of Maranhão, Brazil. Journal of Field Ornithology no. 71 (4):665-675.

Ross, J.P. 1982. Historical decline of loggerhead, ridley, and leatherback sea turtles. In: Biology and conservation of sea turtles (K. Bjorndal, editor), 189–195. Smithsonian Institution Press, Washington, D.C.

Salmon, M., R. Reiners, C. Lavin, and J. Wyneken. 1995. Behavior of loggerhead sea turtles on an urban beach. 1. Correlates of nest placement. Journal of Herpetology 29:560–567.

Samuel, Y., S.J. Marreale, C.W. Clark, C.H. Greene, and M.E. Richmond, 2005. Acoustical Society of America. Vol. 117 No. 3 Pt.1, pp. 1465-1472

Schmidly, D.J. 2004. The mammals of Texas, revised edition. University of Texas Press, Austin.

Schwartz, F. 1976. Status of sea turtles, Cheloniidae and Dermochelidae, in North Carolina. Abstr. In Proceedings and abstracts from the 73rd meeting of the North Carolina Academy of Science, Inc., April 2–3, 1976, at the Univ. N. Carolina, Wilmington, N. Carolina. J. Elisha Mitchell Sci. Soc. 92(2):76–77.

Sea Turtle Stranding and Salvage Network (STSSN). 2018. Monthly turtle stranding by year, species, and state. http://www.sefsc.noaa.gov/STSSN/JDBCSTSSN/YearSpeciesStateMonth/ViewReport.jsp?yearSelections=&speciesselections.

Shaver, D. 1991. Feeding ecology of wild and head-started Kemp's ridley sea turtles in south Texas waters. Journal of Herpetology 25(3):327–334.

Shaver, D. 2000. Distribution, residence, and seasonal movements of the green sea turtle, *Chelonia mydas* (Linnaeus, 1758), in Texas. Unpublished PhD Dissertation, Texas A&M University, College Station. 273 pp.

Spotila, J.R., A.E. Dunham, A.J. Leslie, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 1996. Worldwide population decline of *Dermochelys coriacea*: are leatherback turtles going extinct? Chelonian Conservation and Biology 2(2):209–222.

Texas Parks and Wildlife Department (TPWD). 2006. Information on the leatherback sea turtle. http://www.tpwd.state.tx.us/huntwild/wild/species/endang/animals/reptiles_amphibians/leathback.html.

Texas Parks and Wildlife Department (TPWD). 2013 http://www.tpwd.state.tx.us/gis/ris/es/ (Accessed May 2013)

TPWD. 2017a. Green Sea Turtle. http://www.tpwd.state.tx.us/huntwild/wild/species/greentur. (Accessed April 17, 2017)

_____. 2017b. Kemps Ridley Sea Turtle. http://www.tpwd.state.tx.us/huntwild/wild/species/ridley. (Accessed April 17, 2017).

_____. 2017c. Loggerhead Sea Turtle. http://www.tpwd.state.tx.us/huntwild/wild/species/logghead. (Accessed April 17, 2017).

_____. 2017d. Hawksbill Sea Turtle. http://www.tpwd.state.tx.us/huntwild/wild/species/endang/animals/reptiles_amphibians/hawkturt.phtml. (Accessed April 17, 2017).

_____. 2017e. Leatherback Sea Turtle. http://www.tpwd.state.tx.us/huntwild/wild/species/lethback (Accessed April 17, 2017).

Tsipoura, N. and J. Burger. 1999. Shorebird diet during spring migration stopover on Delaware Bay. Condor no. 101 (3):635-644.

U.S. Army Corps of Engineers (USACE). 2010. Final Environmental Assessment, Expansion of Placement Areas 14 and 15, Houston Ship Channel, Chambers County, Texas. U.S. Army Corps of Engineers – Galveston District. Galveston, Texas.

USACE. 2019. Operations and Dredging Endangered Species System (ODESS).https://dqm.usace.amry.mil/odes/#/dashboard Accessed 16May2019

U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). 1991. Recovery Plan for U.S. Population of Atlantic Green Turtle. National Marine Fisheries Service, Washington, D.C.

USFWS. 1981. Endangered species assessments and surveys in Hidalgo and Willacy counties, Texas. Final report to USACE, Galveston by USFWS, Denver Wildlife Research Center. 84 pp.

USFWS. 1995. Threatened and endangered species of Texas. U.S. Fish and Wildlife Service, Austin.

USFWS. 1998. Multi-species recovery plan for the threatened and endangered species of South Florida. Technical/Agency draft, U.S. Fish and Wildlife Service, Atlanta, Georgia.

USFWS. 2001. Florida manatee recovery plan, (*Trichechus manatus latirostris*), third revision. U.S. Fish and Wildlife Service, Atlanta, Georgia.

USFWS. 2003. Recovery plan for the Great Lakes Piping Plover (*Charadrius melodus*). U.S. Fish and Wildlife Service, Ft. Snelling, Minnesota.

USFWS. 2010. Attwater's Prairie-Chicken Recover Plan, Second Revision. Albuquerque, New Mexico.

USFWS. 2011. U.S. Fish and Wildlife Service Species Assessment and Listing Priority Assignment Form "*Calidris canutus ssp. rufa*". http://ecos.fws.gov/docs/candidate/assessments/2012/r5/B0DM_V01.pdf

USFWS. 2015. Texas prairie-dawn flower (*Hymenoxys texana*) 5-year Review: Summary and Evaluation. Houston, Texas.

USFWS. 2016. Eskimo Curlew (*Numenius borealis)* 5-Year Review: Summary and Evaluation. Fairbanks, Alaska.

USFWS. 2019a. Species by County Report, Harris County, https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=48201. (Accessed March 20, 2019).

_____.2019b. Species by County Report. Chambers County. https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=48071. (Accessed March 20, 2019).

_____.2019c. Species by County Report. Galveston County. https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=48167. (Accessed March 20, 2019).

_____.2019d. IPaC resource list. https://ecos.fws.gov/ipac/location/6UDMNMBUHZCMRHNBLD5IN3O7JM/resources. (Accessed March 20, 2019).

_____. 2010. Attwater's Prairie-Chicken Recovery Plan, Second Revision. Albuquerque New Mexico.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
https://www.fisheries.noaa.gov/region/southeast

11/27/2019

F/SER31:JC
SER-2019-00037

Chief, Environmental Compliance Branch
Galveston District Corps of Engineers
Department of the Army
P.O. Box 1229
Galveston, Texas 77553-1229

Dear Mr. Sims:

This letter responds to your request for consultation with us, the National Marine Fisheries Service (NMFS), pursuant to Section 7 of the Endangered Species Act (ESA) for the following action.

Permit Number	Applicant	SERO Number	Project Type
SWG-2016-00441	City of Houston, Texas	SERO-2019-00037	Dredging – Deepening Widening Shipping Channel

Consultation History
We received your letter requesting consultation on August 30, 2017. We first requested additional information on September 25, 2017. We sent additional requests for information regarding several aspects of the project design that were addressed in a revised Biological Assessment (BA) NMFS received on May 31, 2018. Subsequent to receiving the revised BA, NMFS awaited a final determination by the applicant on the type of dredging that would be used for the proposed action. A revised BA including the proposed dredging method was received by NMFS on October 24 2018. Consultation was held in abeyance for 38 days due to a lapse in appropriations and resulting partial government shutdown, and resumed on January 28, 2019. Subsequent requests for additional information were sent ending with a final response received on November 20, 2019 and consultation was initiated that day. This project was originally assigned a tracking number (SER-2017-18866) in our now obsolete tracking system. The project has been assigned a tracking number in our new NMFS Environmental Consultation Organizer (ECO), SERO-2017-00037. Please refer to this number in any future inquiries regarding this project.

Project Location

Address	Latitude/Longitude	Water body
Galveston Bay, Texas	Approximate Center Point of Project Area 29.521701ºN, 94.876519ºW (North American Datum 1983)	Galveston Bay, San Jacinto River, Buffalo Bayou, Gulf of Mexico

Existing Site Conditions

The project is located in the Houston Shipping Channel (HSC) navigation system that traverses Galveston Bay to the tidal portions of the San Jacinto River and Buffalo Bayou in Galveston, Chambers, and Harris Counties, Texas. Water depths within the HSC are currently maintained at 37.5 feet (ft) to 46.5 ft deep at mean lower low water (MLLW). The majority of the HSC is 530 ft wide through its length in Galveston Bay with some short, discontinuous sections of 600- and 700-ft-wide channel areas between Morgans Point and Battleship Texas. The side channels to the HSC, the Bayport Ship Channel (BSC) and Barbours Cut Channel (BCC) have been recently deepened to match the 46.5 ft MLLW depth of the HSC, and widened to address navigation deficiencies and inefficiencies associated with the current vessel fleet and berths, with the BSC widened to between 350 and 400 ft wide, and the 300-ft-wide BCC shifted 75 ft northward. Water bottom habitat throughout the HSC is comprised of soft mud. Bottom habitat within the HSC is devoid of seagrasses and other bottom resources (e.g., oysters) and is significantly deeper than the surrounding Galveston Bay which has an average depth of 8 ft.

A portion of the dredged material will be placed in the Ocean Dredged Material Disposal Site (ODMDS) No. 1 administered by the Environmental Protection Agency. ODMDS No. 1 is currently permitted for placement of maintenance material from a lower segment of the HSC and is located approximately 5 miles from the southern most portion of the HSC. The water depth of the existing ODMDS No. 1 varies from approximately 10 meters (m) (32.8 ft) to approximately 15 m (49 ft). Bottom habitat within the ODMDS No. 1 is composed of various silts, sands, and clays, and the disposal area is periodically impacted by placement of dredged material since the area is used primarily by the USACE for offshore disposal from multiple projects. No seagrasses or corals are documented in the ODMDS No. 1. ODMDS No. 1 also overlaps with loggerhead critical habitat as *Sargassum* habitat.

Other in-water disposal areas include “beneficial use” and “oyster mitigation” sites within Galveston Bay (see image). These areas currently have unvegetated water bottom and have been designated as either existing or new sites in need of new fill material for habitat enhancement. These bottom habitats are generally comprised of a mixture of sand and silt.. There are no areas of submerged aquatic vegetation (SAV) or corals in any of either the beneficial use or oyster mitigation sites per the USACE (H. Brown III, USACE, pers. comm. to J. Cavanaugh, NMFS, November 22, 2019).

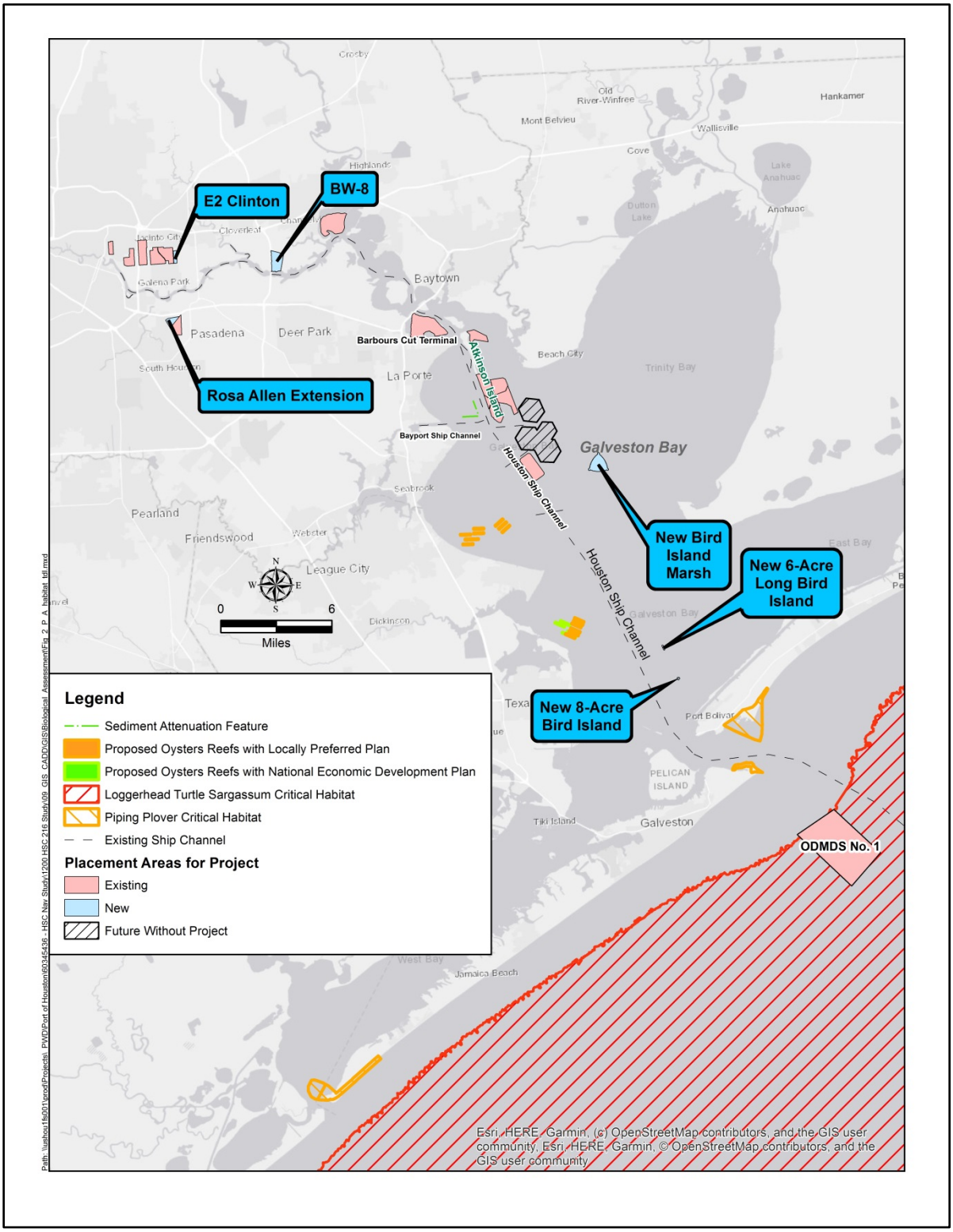


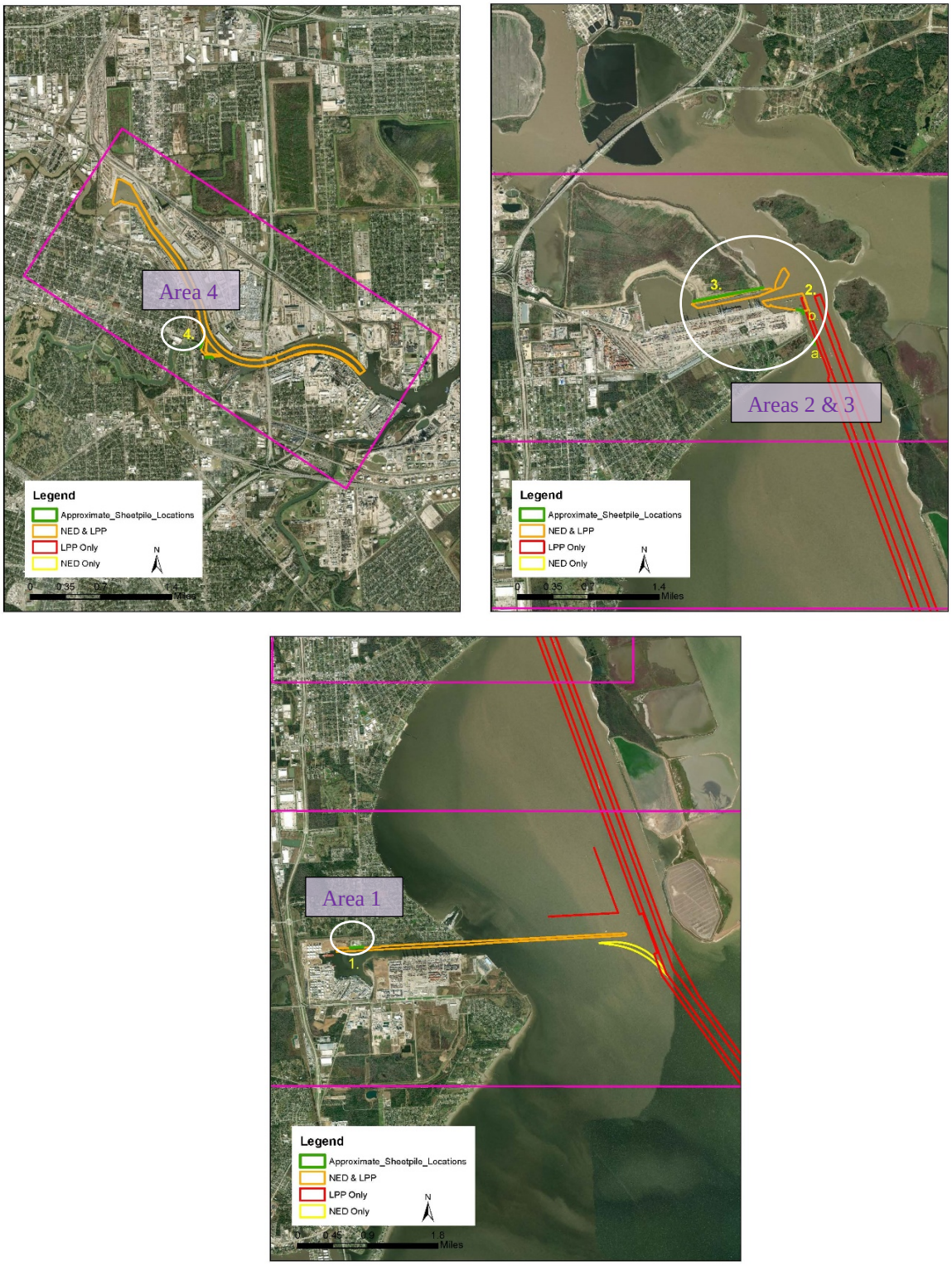
Image showing project area and dredge disposal areas inside Galveston Bay and the ODMDS No. 1 within the Gulf of Mexico (Source: USACE 2019 BA)

Project Description
The applicant proposes to deepen and widen existing portions of the HSC using hydraulic dredging (e.g., cutterhead and pipeline) as well as mechanical (e.g., clamshell bucket) dredging. No hopper dredging is associated with the proposed action (H. Brown III, USACE, pers. comm. to J. Cavanaugh, NMFS, via e-mail on October 5, 2018). Dredged materials from the HSC project will be transported either for offloading in the ODMDS No. 1, within Galveston Bay for the creation of oyster reef mitigation and tidal marsh restoration sites, or disposed of in upland areas. A total of approximately 5.5 million cubic yards (cy) are anticipated for disposal from the HSC project into the ODMDS. Approximately 15,449,000 cubic yards (cy) of dredge material will be offloaded in several beneficial use (e.g., Bird Island) areas to rebuild nearshore sandy-bottom and estuarine marsh habitat. Another 2,030,000 cy of dredge materials will be placed in areas for oyster mitigation. Approximately 3,092,000 cy of the remaining spoil will be placed on upland areas. There are no SAV resources at in-water project locations (H. Brown, USACE, confirmed by pers. comm. to J. Cavanaugh, NMFS, November 22, 2019).

A summary of the proposed dredging and ancillary work is described in the following bullets and the table below.

- Widen the HSC channel and ease bends to 700 ft wide of the HSC in Galveston Bay
- Widen two segments in the HSC above Morgans Point to address places where the channel narrows down from its existing widths
- Deepen the HSC above Boggy Bayou by between 4 and 5 ft
- Build a new turning basin and expand two existing ones in the HSC above Beltway 8
- Widen the BSC to approximately 455 ft, expand the existing flare at its confluence with the HSC, and provide a turning basin at the entrance to the landcut
- Install sheet pile/king pile walls at 3 main locations (see table below)
- Create two bird islands east of HSC with approximately 18 acres of oyster mitigation
- Create three bird islands associated with beneficial marsh with approximately 14 acres of oyster mitigation east of HSC and east of MidBay placement area
- Create approximately 67 acres of oyster reef mitigation southeast of Eagle Point
- Create approximately 321 acres of oyster reef mitigation north and southeast of Eagle Point
- Create two new beneficial use marshes

In addition to the dredging, the proposed action includes steel sheet pile installation that is described in the table below. The table details the type and total linear feet (lin ft) of sheet piles proposed, and the images show the locations of the sheet piles in relation to Galveston Bay and the HSC.



Images above show the locations 1-4 of sheet pile installation outside of the HSC (© AECOM)

Summary of Sheet Pile Installation for Houston Ship Channel

Areas (1-4)	Total Sheet Pile Wall Lengths Linear Feet (lin ft)	Installation Method
Area 1 Bayport Ship Channel	430 lin ft	Conventional either impact hammer or vibratory – *installation on dry land*
Area 2 (a,b) HSC through Morgans Point	850 lin ft	Conventional either impact hammer or vibratory – *installation on dry land*
Area 3 Barbours Cut Channel	3,700 lin ft	Hydraulic Press-in pile driving (jetting)
Area 4 Brady Island Turn Basin	525 lin ft	Conventional – either impact hammer or vibratory
*14-in steel sheet pile/king pile combination		

Construction Conditions

The applicant has also agreed to adhere to NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions.*[1] All impact hammering of metal sheet piles will occur on land to mitigate potential noise impacts to sea turtles. Dedicated protected species observers will be used aboard all dredges for the duration of dredging operations. A baffle will be used on clamshell dredge buckets for in-water disposal areas to slow the movement of seawater and sediment and minimize turbulent plumes when offloading dredge sediment.

Effects Determination(s) for Species the Action Agency or NMFS Believes May Be Affected by the Proposed Action

Species	ESA Listing Status[2]	Action Agency Effect Determination	NMFS Effect Determination
Sea Turtles			
Green (North Atlantic [NA] distinct population segment [DPS])	T	NLAA	NLAA
Green (South Atlantic [SA] DPS)	T	NLAA	NLAA
Kemp's ridley	E	NLAA	NLAA
Loggerhead (Northwest Atlantic [NWA] DPS)	T	NLAA	NLAA
Fish			
Giant manta ray	T	NLAA	NLAA

[1] NMFS. 2006. Sea Turtle and Smalltooth Sawfish Construction Conditions revised March 23, 2006. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, Saint Petersburg, Florida. https://www.fisheries.noaa.gov/webdam/download/92937961

[2] E = endangered; T = threatened; NLAA = may affect, not likely to adversely affect

[3] NMFS. 2007b. ESA Section 7 Regional Biological Opinion on Hopper Dredging of Navigational Channels and Borrow Areas within the Gulf of Mexico

Critical Habitat

A portion of the the project (ODMDS No. 1) is located in loggerhead sea turtle (NWA DPS) critical habitat (Nearshore Reproductive Habitat, Unit LOGG-S-2, Gulf of Mexico *Sargassum*). The physical biological feature (PBF) of loggerhead *Sargassum* habitat functions as developmental and foraging habitat for young loggerheads where surface waters form accumulations of floating material, especially *Sargassum.* Primary Constituent Elements (PCEs) that support this habitat are the following: (i) Convergence zones, surface-water downwelling areas, the margins of major boundary currents (Gulf Stream), and other locations where there are concentrated components of the *Sargassum* community in water temperatures suitable for the optimal growth of *Sargassum* and inhabitance of loggerheads; (ii) *Sargassum* in concentrations that support adequate prey abundance and cover; (iii) Available prey and other material associated with *Sargassum* habitat including, but not limited to, plants and cyanobacteria and animals native to the *Sargassum* community such as hydroids and copepods; and (iv) Sufficient water depth and proximity to available currents to ensure offshore transport (out of the surf zone), and foraging and cover requirements by *Sargassum* for post-hatchling loggerheads, i.e., > 10-m depth. We believe only PCE ii and PCE iii may be affected by the proposed action.

Analysis of Potential Routes of Effects to Species

Effects to loggerhead, green, and Kemp's ridley sea turtles include the risk of direct physical injury from dredging and other in-water construction activities. We expect direct physical injury from dredging and in-water construction to be discountable due to the species' ability to move away from the project site. NMFS has previously determined in dredging Biological Opinions[3] that, while oceangoing hopper-type dredges may lethally entrain protected species including sea turtles, non-hopper type dredging methods, such as the hydraulic cutterhead and mechanical clamshell dredges proposed in this project, are slower and extremely unlikely to overtake or adversely affect them. Additionally, the applicant's implementation of NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions* will require all construction workers to observe water-related activities for the presence of sea turtles. If a sea turtle is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle. Operation of any mechanical construction equipment shall cease immediately if a sea turtle is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

Sea turtles might be adversely affected by their inability to access the project area for foraging and refuge due to their avoidance of construction activities and related noise. We believe any effects to sea turtles from short-term displacement or exclusion from the project area will be insignificant. There are no nesting beaches in or near to the project area. The HSC lacks SAV that may be used by some sea turtles for foraging. We believe that the potential impacts to sea turtles caused by temporary exclusion from the possible foraging/resting areas within the dredging footprint would not result in measurable effects to sea turtles. They will have equal to better quality available foraging habitat outside of the shipping channels. There is alternate

[3] NMFS. 2007b. ESA Section 7 Regional Biological Opinion on Hopper Dredging of Navigational Channels and Borrow Areas within the Gulf of Mexico

foraging habitat with areas of SAV within the greater Galveston Bay outside of the shipping channels that will be available during dredging activities.

Sea turtles and giant manta rays may be affected by the placement of dredged materials within ODMDS No.1 as a part of the proposed action. We believe that risk of sea turtles and manta rays being caught in the dredge spoil discharge through the water column and buried on the sea floor is so low as to be discountable. These mobile species would be able to detect the presence of the material being deposited and avoid being harmed by its placement. Placement in an open ocean environment such as an ODMDS would allow room for species to move away from and around the placement. In addition, the general vessel guidance for dredge disposal inside the ODMDS requires that crew members be aware of the species that could occur in the work area and to monitor for their presence. The applicant's implementation of NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions* will require all construction workers to observe water-related activities for the presence of sea turtles and manta rays. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or giant manta ray. Operation of dredge disposal equipment shall cease immediately if ESA-listed species are seen within a 50-ft radius of the equipment and activities may not resume until the protected species has departed the project area of its own volition. These measures will help further minimize the risk to sea turtles and manta rays from from possible exposure to dredge spoil discharge.

Sea turtles may be affected by the placement of dredged materials in portions of Galveston Bay as part of the proposed action involving beneficial use and oyster mitigation areas. We believe the risk to sea turtles being caught in the dredge spoil discharge through the water column and buried on the sea floor is so low as to be discountable. Sea turtles would be able to detect the presence of the material being deposited and avoid being harmed by its placement. As with the placement of dredge materials in the ODMDS, during dredge spoil placed for creation of oyster reefs and beneficial use areas, the applicant will also implement NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions* that requires all construction workers to observe water-related activities for the presence of sea turtles. Operation of dredge disposal equipment shall cease immediately if ESA-listed species are seen within a 50-ft radius of the equipment and activities may not resume until the protected species has departed the project area of its own volition.

Noise created by pile driving activities can physically injure animals or change animal behavior in the affected areas. Injurious effects can occur in 2 ways. First, immediate adverse effects can occur to listed species if a single noise event exceeds the threshold for direct physical injury. Second, effects can result from prolonged exposure to noise levels that exceed the daily cumulative exposure threshold for the animals, and these can constitute adverse effects if animals are exposed to the noise levels for sufficient periods. Behavioral effects can be adverse if such effects interfere with animals migrating, feeding, resting, or reproducing, for example. Our evaluation of effects to listed species as a result of noise created by construction activities is based on the analysis prepared in support of the Opinion for SAJ-82.[4] The noise analysis in this

[4] NMFS. Biological Opinion on Regional General Permit SAJ-82 (SAJ-2007-01590), Florida Keys, Monroe County, Florida. June 10, 2014.

consultation evaluates effects to ESA-listed fish and sea turtles identified by NMFS as potentially affected in the table above.

Steel sheet piles will be installed at 4 locations as indicated in the previous table. In 2 of the locations (Area 1 Bayport Ship Channel and Area 2 [a,b] HSC through Morgans Point), sheet piles will be installed in the dry with a land buffer between the toe of the sheet pile wall and the water. This will prevent any potential acoustic impacts to sea turtles. Therefore, there is no potential for noise impacts to sea turtles at those locations. In Area 4 (Brady Island Turn Basin) where potential sheet pile installation may involve impact hammering, sea turtles would not be present that far up the channel cut. For Area 3 (Barbours Cut Channel), sheet piles will be installed via jetting. Based on our noise calculations, the use of a water jet to create pilot holes or install piles will not result in injurious noise effects or behavioral noise effects.

Analysis of Potential Routes of Effects to Critical Habitat

Vessel transit to access ODMDS No. 1 may effect PCEs ii and iii. We believe the proposed project will have an insignificant effect on the PCEs of loggerhead critical habitat - (LOGG-S-2, Gulf of Mexico *Sargassum*). Although the vessels proposed for the project may drive through the *Sargassum*, the vessel tracks resulting from these activities are not expected to scatter *Sargassum* mats or harm organisms in the *Sargassum* to the point of affecting the functionality of the loggerhead critical habitat PCEs. The wakes and surface water disruption associated with these vessels may temporarily disturb a *Sargassum* mat (for a few minutes, up to a few hours). However, any potential disturbance would not be expected to result in measurable effects to the distribution, size, or composition of mats or their ability to support loggerheads or their prey resources.

Conclusion

Because all potential project effects to listed species and critical habitat were found to be discountable, insignificant, or beneficial, we conclude that the proposed action is not likely to adversely affect listed species and critical habitat under NMFS's purview. This concludes your consultation responsibilities under the ESA for species under NMFS's purview. Consultation must be reinitiated if a take occurs or new information reveals effects of the action not previously considered, or if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action. NMFS's findings on the project's potential effects are based on the project description in this response. Any changes to the proposed action may negate the findings of this consultation and may require reinitiation of consultation with NMFS.

We look forward to further cooperation with you on other projects to ensure the conservation of our threatened and endangered marine species and designated critical habitat. If you have any questions on this consultation, please contact Joseph Cavanaugh, Consultation Biologist, at (727) 551-5097, or by email at joseph.cavanaugh@noaa.gov.

Sincerely,

for David Bernhart
Assistant Regional Administrator
for Protected Resources

File: 1514-22.f.8

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Texas Coastal Ecological Services Field Office
17629 El Camino Real, Suite 211
Houston, Texas 77058
281/286-8282 / (FAX) 281/488-5882

In Reply Refer To:
FWS/R2/02ETT
X00-2018-I-
01050

December 10, 2019

Colonel Timothy R. Vail
District Commander
Galveston District, U.S. Army Corps of Engineers
Attention: Mr. Harmon Brown
Post Office Box 1229
Galveston, Texas 77553-1229

Dear Colonel Vail:

Thank you for submitting a request for concurrence and Biological Assessment (BA) dated November 13, 2019, for proposed channel improvements associated with the deepening and widening of the Houston Ship Channel (HSC). The U.S. Army Corps of Engineers (Corps) proposes to construct as part of the Recommended Plan channel improvements to deepen and widen portions of the HSC, ease channel bends, and construct improvements to Hunting and Main Turing Basins. Specifically, the Corps proposes to widening portions of the channel to 700 feet and deepen upper portions to 46.5ft. The Corps determined the project will have no effect on the federally listed piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), Attwater's greater prairie chicken (*Tympanuchus cupido attwateri*), Eskimo curlew (*Numenius borealis*), or five nesting sea turtle species [green (*Chelonia midas*), Hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), and loggerhead (*Caretta Caretta*)] but may effect, not likely to adversely affect the West Indian manatee (*Trichechus manatus*). Additionally, the Corps determined the project *may effect, but is not likely to adversely affect* piping plover critical habitat TX Units 35 or 36.

Under section 7(a)(2) of the Endangered Species Act (Act), the federal action agency, or its designated representative, is responsible for determining the effects of their actions on listed species or critical habitat (50 CFR § 402.14 [a]) and is ultimately responsible for Section 7 obligations. If the action agency determines its proposed action will have no effect on federally listed species or critical habitat, no contact with the Service is necessary. However, you should maintain a complete record of your evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles. The Service's Consultation Handbook (http://endangered.fws.gov/consultations/s7hndbk/s7hndbk.htm) is available online for further information on definitions and process.

Per the U.S. Fish and Wildlife Service (Service) Memorandum of Understanding with National Marine Fisheries Service (NMFS) dated July 18, 1977, the Service has jurisdiction on sea turtles when on land only. The Service recommends the Corps contact NMFS for additional sea turtle requirements while in the marine environment.

The Corps' analysis indicates construction actions resulting from the proposed HSC improvements "*may affect but is not likely to adversely affect*" the West Indian manatee *Trichechus manatus*. The Corps has agreed to implement the following list of **best management practices** specific to the West Indian manatee:

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

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

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

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

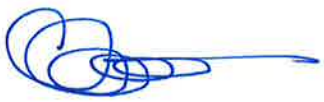
5) Any collision with or injury to a manatee shall be reported immediately to the Texas Marine Mammal Stranding Network (TMMSN) Hotline at 1-888-9-MAMMAL and also reported to the U.S. Fish and Wildlife Service (1-281-286-8282).

Based on the Corps' experience with similar projects, the utilization of the management practices, and the incorporation of the recommended conservation measures, the Service concurs with the Corps determination that the project may affect but not likely to adversely affect the West Indian manatee. Our concurrence with the Corps' determination regarding the West Indian manatee is based upon a review of the Service's files, our knowledge of the area and the species biology, communication with species experts and others, and is contingent upon adherence to the conservation measures enumerated herein.

The Service understands the Corps will conduct a ship wake and sediment analysis during the planning, engineering, and design phase of the study assessing potential affects to piping plover critical habitat shoreline disturbance and sediment transport resulting from the HSC improvements. Once the data is available, the Service will work with the Corps and review the study results pursuant to consultation procedures specific to Section 7 of the Act. In order for the Service to concur with a may affect not likely to adversely affect determination, the ship wake study would need to demonstrate that the effects of the project on piping plover critical habitat are insignificant or discountable.

In the event the project changes or additional information on listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered. Our response is provided in accordance with the provisions of the Act of 1973 (16 U.S.C. 1531 et seq.). If you have any questions, or need additional information, please contact staff biologist Donna Anderson or myself at 281/286-8282.

Sincerely,



Charles Ardizzone
Field Supervisor