US Army Corps of Engineers®

Town Creek, South Carolina
Maintenance Dredging of the
Town Creek Federal Navigation Channel

Supplemental Environmental Assessment

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U.S. Army Corps of Engineers
Charleston District
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ACRONYMS

APE	Area of Potential Effects
BCE	Before Common Era
BMP	Best management practice
CAA	Clean Air Act
CPP	Comprehensive Conservation Plan
CRNWR	Cape Romain National Wildlife Refuge
CE	Common Era
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CEQ	Council on Environmental Quality
C.F.R.	Code of Federal Regulations
CBRA	Coastal Barrier Resources Act
CZMA	Coastal Zone Management Act
CWA	Clean Water Act
DMMA	Dredged Material Management Area
EA	Environmental Assessment
EFH	Essential Fish Habitat
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
f. coliform	Fecal coliform
FMC	Fisheries Management Council
FMP	Fisheries Management Plan
FONSI	Finding of No Significant Impact
FWCA	Fish and Wildlife Coordination Act
HAPC	Habitat Area of Particular Concern
HUC	Hydrologic Unit Code
HTRW	Hazardous, Toxic, and Radioactive Waste
IPaC	Information for Planning and Consultation
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Services
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SAFMC	South Atlantic Fishery Management Council
SARBO	South Atlantic Regional Biological Opinion
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USFWS	U.S. Fish and Wildlife Service
WQC	Water Quality Certification

CHAPTER 1 INTRODUCTION

1.1 Description of Document

This Supplemental Environmental Assessment (EA) has been prepared by the U.S. Army Corps of Engineers, Charleston District (Corps or USACE), pursuant to the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 – 4370f, and its implementing regulations, 40 C.F.R. §§ 1500 – 1508, and 33 C.F.R. Part 230, to evaluate the environmental impacts of the proposed excavation of material from the Town Creek Federal navigation channel, alternatives for disposal or application of dredged material, and to update previous NEPA documentation for the project. Previous NEPA documents for the Project include a 1973 Final Environmental Impact Statement (EIS) and a 1995 (supplemental) EA and Finding of No Significant Impact (FONSI). Additional coordination with federal and state resource agencies has occurred in conjunction with this EA.

The analysis concluded that the impacts are considered insignificant, and that the proposed action does not represent either a substantial change to the Project relevant to environmental concerns or present significant new circumstances or information relevant to environmental concerns; therefore, a FONSI has also been prepared.

1.2 Project Authorization

The Town Creek Project was authorized on 12 November 1974 under Section 107 of the River and Harbor Act of 1960, as amended, which provides for the development of small navigation projects not specifically authorized by U.S. Congress. The authorized project provides for a navigation channel across the [Atlantic] ocean bar to the mouth of Five Fathom Creek, a distance of 4.0 miles, that is 12 feet deep at mean low water (MLW) and 100 feet wide; and also includes a channel 10 feet deep at MLW by 80 feet wide from the mouth of Five Fathom Creek, through Town Creek, to the Atlantic Intracoastal Waterway (AIWW), a distance of 6.2 miles. The total length of the channel is 10.2 miles. The project was completed in 1975.

Authority for the Project includes channel maintenance and assumed maintenance dredging would be required every three years. USACE policy, barring exceptions, is to maintain authorized navigation projects to project dimensions when feasible and justified (ER 1130-2-520, 29 Nov 1996, 8-2.a.(5)). This iteration of maintenance dredging is funded by the Infrastructure Investment and Jobs Act, Division J, Title III of Public Law 117-58 (a/k/a Bipartisan Infrastructure Law) in conjunction with the Harbor Maintenance Trust Fund (Section 201 of WRDA 1986, 26 U.S.C. § 9505).

Throughout the lifetime of the project, maintenance dredging has been performed in segments and realignment of the entrance channel has followed natural topographic changes in the channel inlet. The Five Fathom Creek segment of the Project has naturally remained at the authorized depth of 10 feet since project construction. Maintenance dredging within the Town Creek segment of the channel was conducted in 1978 and 1995, respectively. In 1989, Hurricane Hugo breached Sandy Point and created a new inlet to the [Atlantic] ocean. This inlet continued to increase in size through erosion until 1997 when the new alignment was approved by USACE Headquarters (Figure 1). Since realignment of the entrance channel, maintenance

through side-cast dredging has occurred in 2006 and 2016, respectively, with approximately 40,000 cubic yards removed on each occasion.

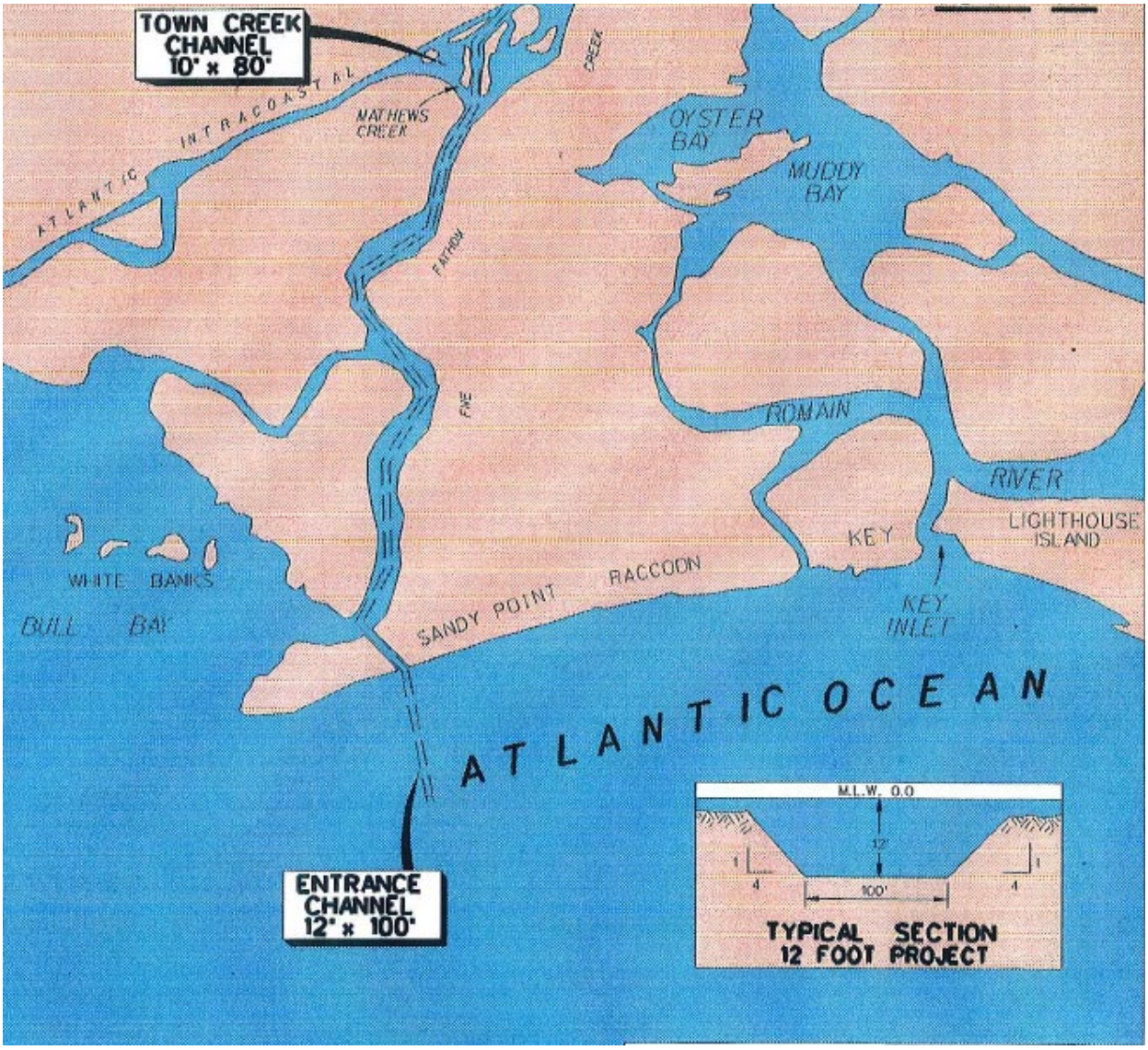

Figure 1. Town Creek Authorized Project

In making a determination of the Federal standard (see discussion below under 2.1), 33 USC § 2326g requires that the economic benefits and efficiencies from the beneficial use of dredged material must be taken into account.

1.3 Project Description and Location

The Town Creek Federal navigation channel is located on the Atlantic coast in Charleston County, South Carolina, approximately 30 miles north of Charleston, near the Town of McClellanville (Figure 2).

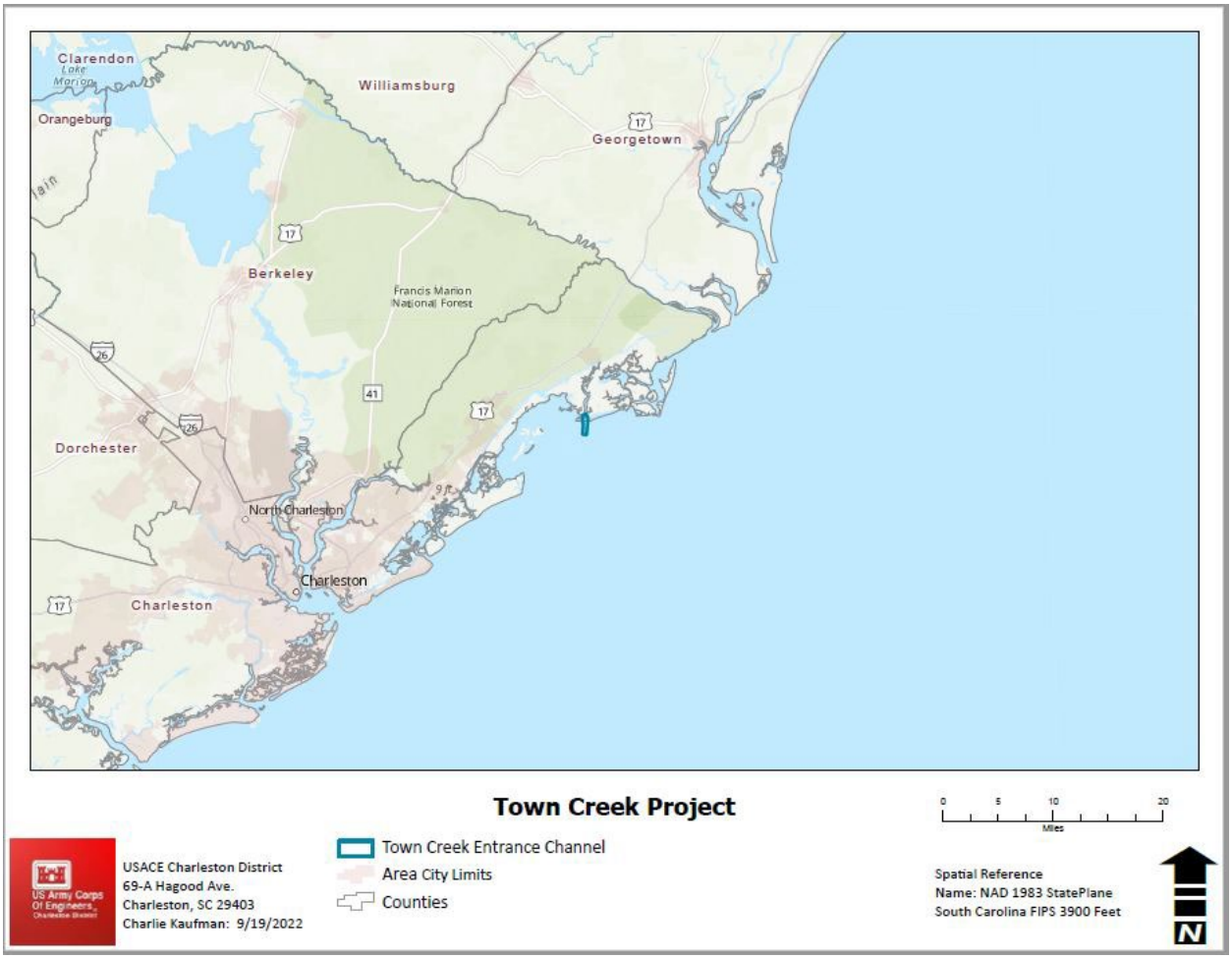

Figure 2. Town Creek Location Map

This EA updates previous NEPA analysis for continued operation and maintenance (O&M) of the Town Creek Federal Navigation Channel and evaluates impacts associated with the proposed advanced maintenance dredging of the Town Creek Navigation Channel, potential future realignment of the entrance channel to follow deep water, and placement of the excavated material nearshore Lighthouse Island.

1.4 Purpose and Need

The purpose of this iteration of maintenance dredging is to continue to provide safe navigation for existing and prospective vessel traffic. Shoaling tends to occur within the entrance channel, which impacts navigation. When this shoaling occurs, vessels navigate outside the federal channel to access deeper areas. Therefore, there is a need to conduct regular maintenance dredging of the entrance channel to improve access to and from McClellanville (Figure 3).

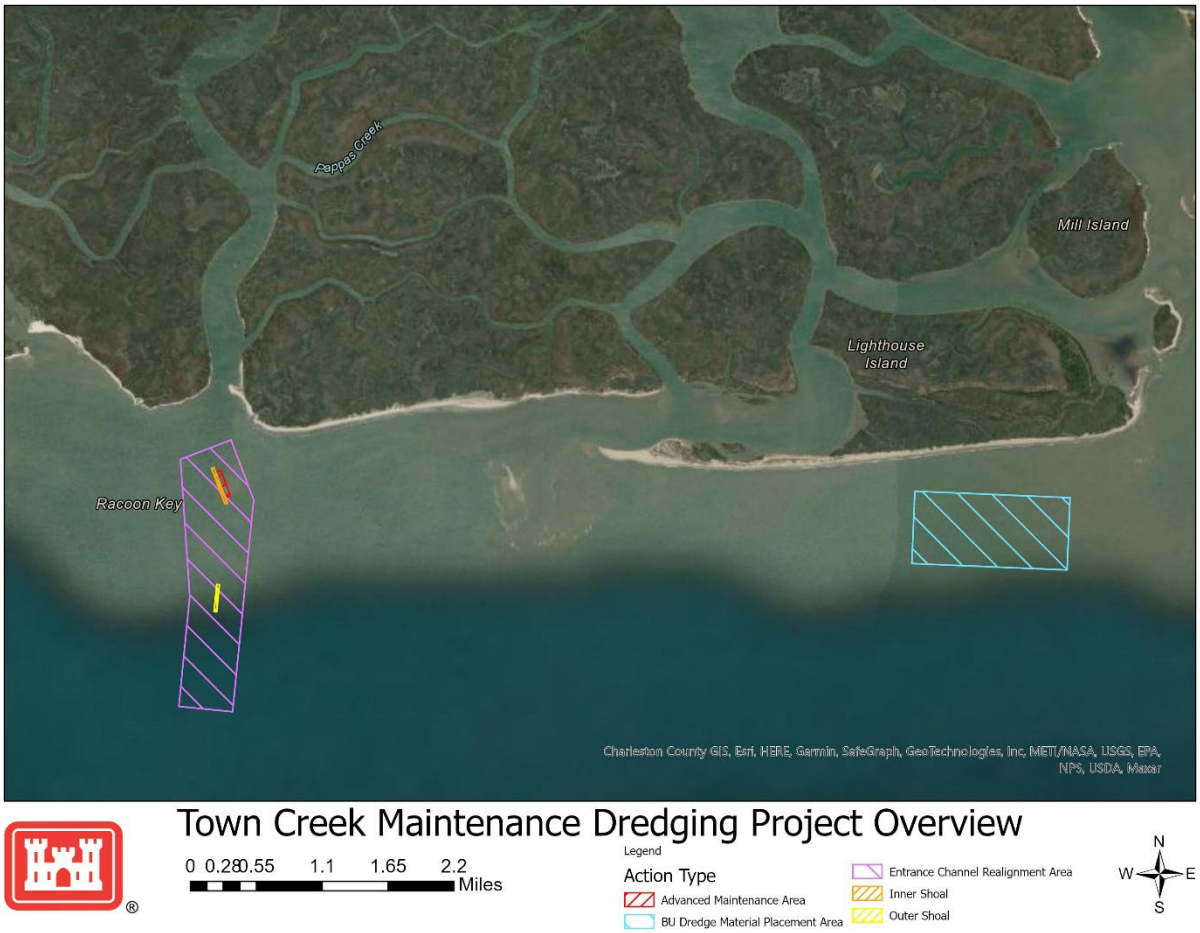

Figure 2. Town Creek entrance channel shoaling areas and proposed beneficial use placement area.

Based on the alternatives considered below, dredged material will be placed either adjacent to the existing channel (100' from vessel) on the downdrift side or within a designated nearshore (approximately 13' MLW) placement area along Lighthouse Island within Cape Romain National Wildlife Refuge (CRNWR). Section 125 of the Water Resources Development Act (WRDA) of 2020 requires the Assistant Secretary of the Army for Civil Works to maximize the beneficial use of dredged material obtained from construction and O&M of USACE water resource development projects. Therefore, there is a need to use dredged material to benefit the nearby coastal resources.

1.5 Scope of the Environmental Assessment

USACE has prepared this EA in compliance with NEPA and associated implementing regulations to supplement and update previous NEPA documentation. This EA evaluates alternatives for environmental impacts to following environmental resources:

- Water Quality
- Wetlands
- Terrestrial Biological Resources

- Aquatic Biological Resources
- Essential Fish Habitat
- Threatened and Endangered Species
- Coastal Barrier Resources System
- Visual Resources (Aesthetics)
- Cultural Resources
- Air and Noise
- Hazardous, Toxic, and Radioactive Waste
- Socioeconomics and Environmental Justice
- Climate Change
- Natural Areas, Parks, and Recreation

The following resources were eliminated from detailed analysis because they were not considered relevant to the proposed action and alternatives:

- Soils
- Transportation
- Geological Resources

1.6 Related Environmental Reviews

The following environmental reviews have been completed as part of the overall Town Creek Project:

- *Final Environmental Impact Statement for Town Creek Project* (USACE 1973). This EIS evaluated impacts associated with initial construction, including dredging to enlarge the channel in Town Creek and dredging an entrance channel to the Atlantic Ocean. The EIS also evaluated impacts associated with O&M of the project, including maintenance dredging approximately every 3 to 5 years.

- *Final Environmental Assessment and FONSI Town Creek Navigation Project Maintenance.* (USACE 1995). This EA evaluated impacts associated with continued maintenance dredging of the Town Creek Project, including utilizing a small side-casting dredge to maintain both the Five Fathom Creek segment and entrance channel to the ocean.

- *Environmental Considerations for Town Creek Maintenance Dredging*. (USACE 2016). A Memorandum for Record was documented to assess impacts associated with dredging approximately 125,000 cubic yards of material from the relocated entrance channel utilizing a side-caster dredge.

- *South Atlantic Regional Biological Opinion* (USFWS 2020) This Biological Opinion responds to USACE South Atlantic Division's request for consultation with National Marine Fisheries Service pursuant to Section 7 of the Endangered Species Act and considers dredging and placement activities associated with USACE projects.

CHAPTER 2 ALTERNATIVES

2.1 Alternative Analysis

Alternatives considered for maintenance dredging of the Town Creek entrance channel were evaluated based on compliance with environmental laws and regulations, compliance with executive orders, and impacts to the environment including those to climate, land use, water resources and aquatic habitat, terrestrial resources and wildlife, air quality and noise, cultural resources, endangered species, hazardous toxic and radioactive waste, socioeconomics, cost effectiveness, engineering feasibility, and the ability of the alternative to meet the purpose and need of the project. Alternatives were also evaluated to determine whether they met *the Federal standard* (see 33 C.F.R. Parts 335-338) – the Federal standard is the dredged material disposal alternative or alternatives identified by USACE which represent the least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process or ocean dumping criteria. Alternatives to the proposed action included: use of a dredged material management area, use of a cutterhead suction dredge, maintaining the Town Creek entrance channel using a side-cast dredge only, and a "No-Action" alternative. In reviewing alternatives, the USACE considered whether they would be technically feasible (engineering); cost effective; and compliant with applicable environmental laws, regulations, and executive orders; and whether they would have less than significant environmental impacts. Only two of the alternatives (i.e., Alternative A and Alternative B) were found to meet the criteria outlined above. A No Action Alternative, while it would not meet the purpose and need for the action, is also evaluated to provide a baseline for environmental impacts, as required by NEPA.

2.2 Alternative A (Side-Cast Only)

Alternative A would continue with the previously approved and evaluated routine maintenance of the Town Creek entrance channel as described in previous NEPA documents. Approximately 130,000 cubic yards of sandy material would be dredged using a side-cast dredge, with the material being side-cast outside the federal channel downdrift. Dredging could occur any time of year and would be anticipated to occur every 3-5 years depending on extent of shoaling and available funds.

2.3 Alternative B (Proposed Action)

Alternative B is similar to Alternative A, but also includes 4.5 acres of advanced maintenance dredging of the Town Creek Federal navigation channel (up to an additional 60,000 cubic yards of material) and realignment of the entrance channel to follow deep water, as well as the potential use of a modified hopper dredge. Advanced maintenance dredging can take many forms, but in this instance, the problematic area is dredged wider (approximately 200 feet to the east of the defined navigation channel) within the shoaled area. Because sediment migrates from this area, removing additional material extends the amount of time before maintenance dredging is needed. Realignment consists of "following the deep" where the channel alignment is adjusted within the project limits to follow the natural deeper waters. "Following the deep" would not require future maintenance dredging or would occur at times when funding is unavailable to conduct maintenance dredging within the existing alignment.

Table 1.: Town Creek Dredging Units and Amounts

Dredging Unit	Area	Shoaling (cubic yards/event)	Sediment Type
Town Creek Inner Shoal	3.2 acres	100,000	Beach Compatible Sand
Town Creek Outer Shoal	2.5 acres	30,000	Beach Compatible Sand
Town Creek Advanced Maintenance	4.5 acres	60,000	Beach Compatible Sand

Shoaling will either be excavated by a side-cast dredge, with placement adjacent to the channel downdrift; or by a modified hopper dredge, with dredged material being placed nearshore along Lighthouse Island within CRNWR. The next cycle of dredging is anticipated in spring 2024 and will require approximately one to two months barring poor weather or unforeseen circumstances.

2.3.1 Dredge Types and Placement Options

Various dredge types may be used to maintain the Town Creek Federal navigation channel.

Side-cast Dredge

Side-cast dredging would be carried out using a government-owned and operated vessel called the “Merritt.” (Figure 4). The Merritt is capable of dredging in water between 5’ and 25’ but is usually used in shallow areas for shoal removal. It has two adjustable drag arms with drag heads, a 12-inch discharge pipe that is 80 feet long equipped with a 10-footpipe extension, and a 160-horsepower suction pump. This dredge casts material approximately 100 feet from the centerline of the vessel into adjacent open waters where the predominant currents carry the sediments away from the channel. A side-cast dredge has smaller draghead sizes and openings, as well as lower suction horsepower than conventional hopper dredges.

Figure 3. Side-cast Dredge MERRITT at Oregon Inlet. Photo by: Hand Heusinkveld

Modified Hopper Dredge

Another option for dredge plant to be used is either the government-owned and operated "Murden" or "Currituck" (Murden is pictured in Figure 5). These vessels are characterized as a "modified" hopper dredge under the 2020 South Atlantic Regional Biological Opinion (2020 SARBO). These smaller vessels are self-propelled and drag a pipe with a "draghead" along the sediment surface, between 5.5 feet and 8 feet deep, pumping material at 100-110 horsepower into a storage "hopper" that allows for dredged material to be stored on the boat and transported for placement. The hopper can hold between 300 and 500 cubic yards of material. This type of dredge is typically used for small and/or isolated shoaling locations. Unlike traditional hopper dredge equipment, the modified equipment has small dragheads (2-feet by 2-feet to 2-feet by 3-feet), small openings (5-inch by 5-inch to 5-inch by 8-inch, small suction intake pipe diameters (10-14 inches), and limited draghead suction.

Nearshore Placement

Once the hopper has reached capacity, the dredge would transit to the proposed nearshore placement location along Lighthouse Island where the split-hull hopper would open for the material to be placed at approximately 8-13 feet mean low water (MLW). This depth and location ensure placement within the active littoral system where natural wave activity will eventually transport the material toward the shoreline. Material would be deposited as a "feeder berm" comprised of individual deposits in an array of elongated mounds with a maximum height of approximately 2 feet. Further, as conditions of both SCDHEC-OCRM's Coastal Zone Consistency Determination Concurrence and SCDHEC's Section 401 WQC, nearshore placement of material would be limited to October 1st through June 15th to minimize potential impacts to sea turtle hatchlings leaving the beach.

Figure 4. Modified Hopper Dredge, MURDEN dredging the Barnegat Inlet, N.J. in April 2014. Photo by: Tim Boyle

2.4 Alternative C (No Action)

A No Action Alternative is required under NEPA. The No Action Alternative is the most probable future condition if no action is taken. Under the No Action Alternative, USACE would not conduct maintenance dredging, and passage through the Town Creek Federal navigation channel would become increasingly restricted as sedimentation continues. Vessels would need to navigate outside of the channel to deeper waters, as feasible, as the channel becomes impassable to larger vessels. If the channel becomes completely impassable, larger vessels will need to use the closest port which would be Charleston, 40 miles to the south, or Winyah Bay Entrance (Georgetown), 30 miles to the north.

2.5 Alternatives Considered but Eliminated

Cutterhead Suction Dredge

This alternative would require that the material is either pumped via a pipeline to a disposal location or placed in a scow for transport to a disposal site. There are no upland Dredged Material Management Areas (DMMAs) within close proximity and the closest nearshore placement would require nearly five miles of pipe or additional equipment for transportation. Therefore, USACE has eliminated this alternative from further consideration due to technical and economic infeasibility.

CHAPTER 3 EXISTING CONDITIONS

3.1 Water Quality

The South Carolina Department of Health and Environmental Control (SCDHEC) tests the waters to protect the health of consumers of fish and shellfish, and for recreation. Specific monitoring criteria include bacteria, dissolved oxygen, pH, nutrients, and temperature. The state uses these criteria to designate the use of the water bodies. Classifications include drinking water, recreation, fishing, propagation of fish, shellfish, game and other aquatic life, wild river, scenic river, and coastal fishing (U. S. Environmental Protection Agency [EPA] 2022).

The Town Creek Federal navigation channel is within the Bulls Bay Watershed (hydrologic unit code (HUC) 0305020902) and the proposed nearshore placement area is within Cape Romain Harbor watershed (0305020901), both of which are part of the Santee River Basin. There are no known pollution sources in the general vicinity of the project area. On August 10, 2022, sediment samples were collected from the shoaling areas. Based on a particle size analysis, the sediment in the area is 90% or greater sand. The waters within the Town Creek Federal navigation channel, are classified as Shellfish Harvesting (SFH) Waters by SCDHEC (SCDHEC 2020b). The SFH rating applies to tidal saltwater protected for shellfish harvesting and is considered suitable for recreation, crabbing, and fishing. It is also considered "suitable for the survival and propagation of a balanced indigenous aquatic community of marine fauna and flora."

Bulls Bay Watershed

The Bulls Bay Watershed is approximately 108,748 acres and drains portions of the Francis Marion National Forest and Mount Pleasant. A search of EPA's website, How's My Waterway (http://mywaterway.epa.gov/) revealed there are 26 waterbodies associated with Bulls Bay watershed. Of the 26 waterbodies, 13 are impaired and included on the 2018 303(d) list (SCDHEC 2020a), two of which are adjacent to the federal channel and are considered impaired and classified as "murky waters." Murky waters refer to suspended soils and other organic matter in the water which can reduce oxygen levels impacting aquatic animals and plants. The impaired source is considered as natural conditions and not from contamination (EPA 2022). All segments within the federal channel are rated as having good water conditions and are not included on the list.

Cape Romain Harbor

The Cape Romain Watershed is approximately 26,735 acres and includes the majority of CRNWR. A search of EPA's website, How's My Waterway (http://mywaterway.epa.gov/) revealed there are 31 waterbodies associated with Cape Romain watershed. Of the 31 waterbodies, ten are impaired and included on the 2018 303(d) list (SCDHEC 2020a), two of which are within two miles of the proposed placement area and are considered impaired and classified as "murky waters."

3.2 Wetlands

Coastal wetlands within the project vicinity include tidal salt marshes that occur along the shorelines and the islands in the area. The marshes are comprised mostly of smooth cordgrass (*Spartina alterniflora*) and are generally more extensive where they are protected from wind and wave action.

Under Executive Order 11990 (Protection of Wetlands), Federal policy recognizes that wetlands have unique and significant public values and calls for the protections of wetlands. Policy directives set forth in Executive Order 11990 are (a) avoid long and short-term adverse impacts associated with the destruction or modification of wetlands; (b) avoid direct or indirect support of new construction in wetlands; (c) minimize the destruction, loss, or degradation of wetlands; (d) preserve and enhance the natural and beneficial values served by wetlands; and (e) involve the public throughout the wetlands protection decision-making process.

3.3 Terrestrial Biological Resources

The biological resources found within the project area are primarily of marine, open water environments; however, some terrestrial biological resources may be potentially impacted along nearby shorelines of Lighthouse Island and/or Raccoon Key within the CRNWR. The shorelines of Lighthouse Island and Raccoon Key consist of highly erosional beaches with low elevations, intertidal sand or mud flats, sand bars, sand dunes, while CRNWR also bounds abundant salt marsh, estuaries, and maritime forests.

Upland from the shoreline and sand dunes, southern magnolia (*Magnolia grandiflora*) and cabbage palm (*Sabal palmetto*) dominate maritime forest. Understory species consists of red bay (*Persea borbonia*), yaupon (*Ilex vomitoria*), American holly (*Ilex opaca*), wax myrtle (*Myrica cerifera*), and saw palmetto (*Serenoa repens*). A number of mammals may frequent forest edges within the refuge, (although may not be present on Lighthouse Island or Raccoon Key, specifically) including nine bat species, white-tailed deer (*Odocoileus virginianus*), bobcat (*Lynx rufus*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), Eastern cottontail (*Sylvilagus floridanus*), long-tailed weasel (*Mustela frenata*), gray fox (*Urocyon cinereoargenteus*), and several sciurids and rodents.

Along the shoreline, efforts to increase the presence of seabeach amaranth (*Amaranthus pumilis*) have been ongoing for years and some individuals may be present. Algal species may also be found in layers along mud flats.

The dunes, beaches and sand bars throughout the CRNWR provide rich loafing, roosting, and foraging habitat for a list of migratory shorebirds. Among them, dunlin (*Calidris alpina*) account for over half while other abundant shorebird species include short-billed dowitcher (*Limnodromus griseus*), American oystercatcher (*Haematopus palliatus*), semipalmated plover (*Charadrius semipalmatus*), Western sandpiper (*Calidris mauri*), sanderling (*Calidris alba*), black-bellied plover (*Pluvialis squatarola*), ruddy turnstone (*Arenaria interpres*), red knot (*Calidris canutus*), willet (*Tringa semipalmata*), and semipalmated sandpiper (*Calidris pusilla*), respectively (Wallover et al. 2015). Thirty-eight or more species of shorebirds, gulls, terns and allied species are known to occur in CRNWR (USFWS 1982). American oystercatchers, black skimmers (*Rynchops niger*), laughing gulls (*Leucophaeus atricilla*), gull-billed terns (*Gelochelidon nilotica*), and least (*Sternula antillarum*), sandwich (*Thalasseus sandvicensis*) and

royal terns (*Thalasseus maximus*) are some of the more common annual nesters in the refuge (USFWS 1982). Red-shouldered hawk (*Buteo lineatus*) and red-tailed hawk (*Buteo jamaicensis*) may also utilize airspace near the project area, as they are the most common of 16 or more raptor species known to occur in the refuge (USFWS 1982).

Horseshoe crabs (*Limulus polyphemus*) spawn within the intertidal zone and provide nutritional resources for migrating birds that utilize the area as stopover sites. A variety of other invertebrates play important roles in the shoreline food web, including *Donax* spp., surf clam *Mulina*, angelwing, arc, and other small bivalves. Above the sediment, crustaceans including fiddler crabs (*Ocypodidae* spp.), ghost shrimp (*Biffarius biformis*), and other small shrimp provide for shorebirds at CRNWR (USFWS 2010).

The beaches and dunes along Lighthouse Island provide for large numbers of nesting loggerhead sea turtles (*Caretta caretta*), annually averaging two-hundred nests. Rarely, nesting efforts by green sea turtles (*Chelonia mydas*), leatherback sea turtles (*Dermochelys coriacea*), and Kemp's ridley sea turtles (*Lepidochelys kempii*) occur.

A variety of smaller herpetofauna likely occupy upland areas such as maritime forests and may be present at times in dunes. The CRNWR Comprehensive Conservation Plan (CCP) (USFWS 2010) lists dozens of amphibians and reptiles known to occur refuge wide.

3.4 Aquatic Biological Resources

The Town Creek project area is within the coastal marsh zone near McClellanville and supports diverse communities of benthos (bottom-dwelling organisms) planktons (drifting organisms in the water column), and fish as described below.

3.3.1 Benthos

Aquatic organisms that live in close association with the bottom, or substrate, of a body of water, are collectively called benthos. The benthic environment includes a number of communities correlated largely with substratum type. The benthic fauna is divided into two groups: epifauna, living on the substratum; and infauna, living within the substratum. Infaunal communities are dominated by a great diversity of burrowing and tube dwelling crustaceans (e.g., amphipods), polychaete worms, and by burrowing bivalve mollusks. Some infaunal invertebrates, especially among the crustaceans, are capable of a high degree of lateral mobility, but the majority are essentially sedentary. The infauna is, with rare exception, comprised of filter and detritus feeding invertebrates. The epifauna and flora of sandy bottoms such as those in the project area tend to be much lower in diversity, and most inhabitants are microscopic. These surfaces are unsuitable for attachment by sessile invertebrates. In addition, sand bottoms such as those found in the project area are depositional and the continual rain of sediment quickly buries attached animals. Thus, these substrata support diatoms, other unicellular algae, protistans, and attached multicellular algae. Invertebrates primarily include motile deposit feeders, such as polychaete worms, sea cucumbers, and sand dollars. Some fish and crabs also graze on the bottom. Attached organisms are restricted largely to the occasional bit of shell or small rock lying at the surface. The development of oyster reefs on muddy intertidal bottoms, for example, is dependent on the presence of bits of shell or rock for initial larval attachment (Howie and Bishop 2021). Intertidal oysters are found on mud flats of sufficient firmness and along the banks of the Town Creek channel before it crosses the ocean bar.

3.3.2 Plankton Community

Plankton are organisms that cannot swim or move on their own but rely on tides and currents. The plankton community within the project area is mainly composed of unicellular algae, larval stages of many fish and invertebrates and the adult stages of several microscopic invertebrates. Adult stages of several macro invertebrates such as jellyfish (*Chrysaora, Cyanea, Stomolophus, and Rhopilema*) and comb jellies (*Mnemiopsis*) that are carried by current and tides are also an important part of the plankton community.

3.3.3 Nekton

Nekton collectively refers to aquatic organisms capable of controlling their location through active moment and do not rely on the water current or tide for movement. Fish are the principal nektonic species, although some crustaceans such as portunid crabs, penaeid shrimp and some mollusks, such as the squid spend at least a portion of their life as nekton. The South Carolina Department of Natural Resources (SCDNR) conducts annual coastal trawl surveys to assess the health and trends of inshore coastal species. According to a review of historical data, the twelve most abundant species caught in inshore fisheries surveys in the area are red drum (*Sciaenops ocellatus*), striped mullet (*Mugil cephalus*), spot (*Leistomus xanthurus*), spotted seatrout (*Cynoscion nebulosus*), pinfish (*Lagodon rhomboides*), southern flounder (*Paralichthys lethostigma*), Atlantic croaker (*Micropogonias undulatus*), menhaden (*Brevoortia tyrannus*), Atlantic stingray (*Dasyatis sabina*), black drum (*Pogonias cromis*), and silver perch (*Bidyanus bidyanus*) (Jennings and Kracker 2003).

3.3.4 Commercial Shellfish

The entire project area falls within shellfish management area 07, which is monitored by SCDHEC to ensure appropriate sanitary and bacteriological conditions for shellfish harvesting. The navigation channel flows through one recreational shellfish ground (R292) and one culture lease permit area (C298). Portions of the R292 are restricted due to higher levels of fecal coliform concentrations. The proposed placement area is adjacent to a commercial culture lease permit, C302. These leases are issued and overseen by SCDNR.

3.5 Essential Fish Habitat

The 1996 Congressional amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (16 U.S.C. § 1802(10)) set forth requirements for the National Marine Fisheries Service (NMFS), regional fishery management councils (FMC), and other federal agencies to identify and protect important marine and anadromous fish habitat. These amendments established procedures for the identification of Essential Fish Habitat (EFH) and a requirement for interagency coordination to further the conservation of federally managed fisheries.

EFH is defined in the act as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” The definition for EFH may include habitat for an individual species or an assemblage of species, whichever is appropriate within each Fisheries Management Plan (FMP).

Town Creek, Five Fathom Creek, and the entrance channel of the Town Creek Federal navigation channel are designated as EFH managed by the South Atlantic Fisheries Management Council (SAFMC), the Mid-Atlantic Fisheries Management Council (MAFMC), and NMFS. Additionally, the section of the channel that serves as the coastal inlet is designated as habitat areas of particular concern (HAPC) for penaeid shrimp and snapper grouper complex.

EFH within the project area includes estuarine and marine water column, unconsolidated bottoms, intertidal flats, oyster reefs/shell banks, and estuarine emergent wetlands. Information regarding designated EFH habitats can be found in the *Users Guide to Essential Fish Habitat Designations* found at https://safmc.net/documents/2022/05/efh-user-guide.pdf.

Table 2 lists the species for which the South Atlantic Fishery Management Council (SAFMC) manages or has developed fishery management plans and that may occur in the study area.

Table 2. Managed Species for the South Atlantic that may occur in the Project Area

Common Name	Scientific Name	Management Plan Agency	Fishery Management Plan (FMP)
White Shrimp	*Lytopenaeus setiferus*	SAFMC	Shrimp
Brown Shrimp	*Farfantepenaeus aztecus*	SAFMC	Shrimp
Gag Grouper	*Mycteroperca microlepis*	SAFMC	Snapper Grouper
Gray Snapper	*Lutjanus griseus*	SAFMC	Snapper Grouper
Lane Snapper	*Lutjanus synagris*	SAFMC	Snapper Grouper
Black Sea Bass	*Centropristis striata*	SAFMC	Snapper Grouper
Spanish Mackerel	*Scomberomorus maculatus*	SAFMC	CMP
King Mackerel	*Scomberomorus cavalla*	SAFMC	CMP
Summer Flounder	*Paralichthys dentatus*	MAFMC	Summer Flounder
Bluefish	*Pomatomus saltatrix*	MAFMC	Bluefish
Scalloped Hammerhead Shark	*Sphyrna lewini*	NMFS	HMS
Bonnethead Shark	*Sphyma tiburo*	NMFS	HMS
Bull Shark	*Carcharhinus leucas*	NMFS	HMS
Sandbar Shark	*Carcharhinus plumbeus*	NMFS	HMS
Finetooth Shark	*Carcharhinus isodon*	NMFS	HMS
Dusky Shark	*Carcharhinus obscures*	NMFS	HMS
Blacktip Shark	*Carcharhinus limbatus*	NMFS	HMS
Atlantic Sharpnose	*Rhyzoprionodon terranovae*	NMFS	HMS
Lemon Shark	*Negaprion brevirostris*	NMFS	HMS

3.6 Threatened and Endangered Species

The Endangered Species Act of 1973, as amended (ESA) (16 U.S.C. §§ 1531 – 1543) was passed to conserve the ecosystems upon which endangered and threatened species depend,

and to conserve and recover those species. An endangered species is defined by the ESA as any species in danger of extinction throughout all or a significant portion of its range. A threatened species is likely to become endangered within the foreseeable future throughout all or a significant part of its range. Critical habitats, essential to the conservation of listed species, also can be designated under the ESA. The ESA establishes programs to conserve and recover endangered and threatened species and makes their conservation a priority for federal agencies. Section 7 of the ESA requires federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) and NMFS Protected Resources Division (PRD) when their proposed actions may affect endangered or threatened species or their critical habitats.

Table 3 contains a list of species that have been listed by either the USFWS or National Oceanic and Atmospheric Administration (NOAA) as occurring or possibly occurring in Charleston County.

Table 3. USFWS and NOAA Fisheries Listed Species in Charleston County. Critical habitat designations are only listed if critical habitat occurs within the county.

CATEGORY	COMMON NAME	SCIENTIFIC NAME	Status	Project Area Occupancy
Amphibians	Frosted flatwoods salamander	*Ambystoma cingulatum*	T, CH	N
Birds	American wood stork	*Mycteria americana*	T	N
	Eastern black rail	*Laterallus jamaicensis jamaicensis*	T	N
	Piping plover	*Charadrius melodus*	T, CH	Y
	Red-cockaded woodpecker	*Picoides borealis*	E	N
	Red knot	*Calidris canutus rufa*	T, PCH	Y
Fish	Atlantic sturgeon*	*Acipenser oxyrinchus**	E, CH	Y
	Shortnose sturgeon*	*Acipenser brevirostrum**	E	Y
Mammals	Northern long-eared bat	*Myotis septentrionalis*	T	N
	Finback whale*	*Balaenoptera physalus**	E	N
	North Atlantic right whale*	*Balaena glacialis**	E, CH	Y
	Sei whale*	*Balaenoptera borealis**	E	N
	Sperm whale*	*Physeter macrocephalus**	E	N
	West Indian manatee	*Trichechus manatus*	T	Y
Plants	American chaffseed	*Schwalbea americana*	E	N
	Canby's dropwort	*Oxypolis canbyi*	E	N

CATEGORY	COMMON NAME	SCIENTIFIC NAME	Status	Project Area Occupancy
	Pondberry	*Lindera melissifolia*	E	N
	Seabeach amaranth	*Amaranthus pumilus*	T	Y
Reptiles	Green sea turtle**	*Chelonia mydas***	T	Y
	Kemp's ridley sea turtle**	*Lepidochelys kempii***	E	Y
	Leatherback sea turtle**	*Dermochelys coriacea***	E	Y
	Loggerhead sea turtle**	*Caretta caretta***	T, CH	Y

NOTES:

* Species under the jurisdiction of NOAA Fisheries, all others are under USFWS only.

** The U.S. Fish and Wildlife Service (FWS) and NMFS PRD share jurisdiction of this species, with NMFS PRD having jurisdiction when in the marine environment and USFWS having jurisdiction when in the terrestrial environment.

E - Federally Endangered, T - Federally Threatened, CH - Critical Habitat, PCH - Proposed Critical Habitat

Species that may be present within the project area are discussed in detail below.

Piping Plover

Piping plovers (*Charadrius melodus*) are a small, endangered shorebird species that overwinters along coastal beaches, sandflats, and mudflats from the Carolinas to Yucatan. Most of their time at overwintering grounds is spent foraging (Johnson and Baldassarre 1988, Drake 1999), primarily for polychaete marine worms, crustaceans, insects, and bivalve mollusks (Zonick and Ryan 1996). The CRNWR envelopes the project area and is utilized by both wintering and migrating plovers throughout the year, with an estimated annual abundance of about five to six dozen plovers (Dodd and Spinks 2001, Wallover et al. 2015). Lighthouse Island is designated critical habitat for piping plover.

Conservation measures for this species and their critical habitat include ensuring adequate quantity and quality and reducing risk factors. USFWS (United States, Department of Interior 2009) has identified several habitat elements necessary for the conservation of the species in the wintering habitats and includes: (1) intertidal sand beaches or mud flats with little to emergent vegetation, (2) flats with little to no vegetation above high tide to be used for roosting, (3) algae for feeding, (4) spits running into water, (5) salterns, and (6) unvegetated washovers among others. Risk factors include: (1) disturbance, (2) altering site topography, (3) detrimentally altering sediment and nutrient exchanges, (4) introducing significant amounts of vegetation, (5) detrimentally altering hydrology of tidal flats, (6) detrimentally altering water quality, and (7) directly or indirectly altering washover passes.

Rufa Red Knot

The rufa red knot (*Calidris canutus rufa*) is a threatened subspecies of red knot that breeds in the low latitudes of Arctic Canada and winters from the Gulf of Mexico to Eastern South America (Baker 2020). The species tends to migrate in large single-species flocks, making areas of foraging and resting habitat important (United States, Department of Interior 2021). According to

the USFWS, preferred habitats include large areas of exposed intertidal segments, often in a mix of ocean or bayfront areas and tidal flats in sheltered bays and lagoons. Dynamic habitat features that may also be important for the subspecies are sand spits, islets, shoals, and sandbars often associated with inlets. Red knots are often distributed within suitable habitat based on consistent abundance of food resources. Red knots, in general, eat mollusks and softer, invertebrates like shrimp and crablike organisms, marine worms, and horseshoe crab eggs. For the rufa red knot, horseshoe crab eggs are a valuable food resource at stopover sites during migration.

Lighthouse Island (within CRNWR) has been proposed as critical habitat for the rufa red knot. Risk factors affecting conservation of the species include: (1) disturbance, (2) depredation, (3) modification or loss of habitat, and (4) natural and human-caused disasters (United States, Department of Interior 2021). Surveys conducted from 2007-2010 in CRNWR estimated red knot abundance as averaging over 2,000 birds, with over 1,000 birds during migrations in the spring and fall and generally fewer than 200 overwintering there (Wallover et al. 2015).

Sturgeon

Atlantic (*Acipenser oxyrhynchus*) and shortnose sturgeon (*Acipenser brevirostrum*) inhabit coastal, estuarine, and riverine environments on the Atlantic coast. Both species spawn in freshwater. According to SCDNR, sturgeon are impeded from spawning in the nearby Santee and Cooper rivers but may reproduce below the dams. Shortnose sturgeon rarely inhabit coastal waters and tend to stay closer to the freshwater/saltwater divide; therefore, it is unlikely that the shortnose sturgeon occurs in the project area. Atlantic sturgeon migrate to the Atlantic ocean as sub-adults and return to the rivers to spawn. Both species are listed as species occurring within the CRNWR in their CCP (USFWS 2010); however, the likelihood of sturgeon occurring in the project area is low.

North Atlantic Right Whale (NARW)

North Atlantic right whales (*Balaena glacialis*) are highly migratory, summering in feeding and nursery grounds in New England waters and northward to the Bay of Fundy and the Scotian Shelf (Waring et al, 2014). They migrate southward in winter to the northeastern coast of Florida. Calving grounds for NARW primarily occur off the coast of southern Georgia south to northern Florida; however, calving occasionally occurs as far north as Cape Fear, North Carolina. Calving grounds, extending from Cape Fear south to northern Florida, were designated as critical habitat under the ESA in 2016. During the winter months, right whales are routinely seen close to shore in the critical habitat area.

West Indian Manatee

Manatees (*Trichechus manatus*) inhabit both saltwater and freshwater habitats and can be found in shallow (usually <20 feet), slow-moving rivers, estuaries, saltwater bays, canals, and coastal areas (USFWS 2001) throughout their range. In South Carolina, manatees occupy fresh, brackish, and marine habitats and move freely between salinity extremes. Manatees will move up rivers until the water is too shallow for passage or is blocked by a dam. Manatees are thermally stressed at water temperatures below 18ºC (64.4ºF) (Garrott et al. 1995). For this reason, manatees are only seen in South Carolina in summer months and no critical habitat has been designated. Counties in South Carolina in which the manatee is known or believed to occur include: Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper. In the CRNWR CCP (USFWS 2010), USFWS acknowledged that West Indian manatees are not known to occur in the refuge, though rare sightings occur.

Seabeach Amaranth

Seabeach amaranth is an annual plant found on the dunes of Atlantic Ocean beaches. Upon germination, the species forms a small unbranched sprig, but soon begins to branch profusely into a clump, which often reaches 30 cm in diameter and consists of five to 20 branches. Occasionally, a clump may get as large as a meter or more across, with 100 or more branches. The species is an effective sand binder, building dunes where it grows (http://www.fws.gov/nces/plant/seabamaranth.html). Seabeach amaranth occurs on barrier island beaches, where its primary habitat consists of overwash flats at accreting ends of islands, and lower foredunes and upper strands of non-eroding beaches. The species appears to need extensive areas of barrier island beaches and inlets, functioning in a relatively natural and dynamic manner.

Seabeach amaranth has historically been present on beaches within CRNWR, including Lighthouse Beach and Raccoon Key. In 2017, the North Carolina Botanical Garden (NCBG) and USFWS staff propagated 2,000 seeds of the species on the front beach areas of the park.

Sea Turtles

There are four species of sea turtles on the Atlantic Coast, i.e., the Kemp's Ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Demorchelys coriacea*), loggerhead sea turtle (*Caretta caretta*), and green sea turtle (*Chelonia mydas*).

Green Sea Turtle

Green sea turtles are found in all temperate and tropical waters around the world and stay mainly near the coastline and around islands. They are often found in shallow flats and seagrass meadows during the day and return to scattered rock ledges, oyster beds, and coral reefs in evenings (FFWCC 2010). In the U.S. Atlantic waters, green turtles are found from Massachusetts to Texas, the U.S. Virgin Islands, and Puerto Rico. South Carolina is home to predominately green sea turtles of the North Atlantic distinct population segment (DPS) and are designated as federally threatened.

From April through November predominately, juvenile green sea turtles occupy feeding grounds in South Carolina in relatively shallow, sheltered waters where seagrasses and algae are present. They may be found in sheltered estuarine creeks, bays and marshes. The potential exists for nesting along sandy beaches, however, very few cases have been documented by state wildlife agencies. Nesting typically occurs further south between June and September. According to publicly accessible data summarized from the SCDNR Sea Turtle Conservation program, two green sea turtles have attempted to nest on Lighthouse Island from 2017-2022. None have been recorded attempting to nest on Raccoon Key in that timeframe.

In terms of population distribution, between 2000 and 2019, the SCDNR and the University of Georgia Marine Extension and Georgia Sea Grant conducted nearly 8,000 trawling events during May through mostly July between St. Augustine, FL and Winyah Bay, South Carolina, but only captured 21 individual sea turtles. Very little population distribution data exists for this project area. Thus, it is assumed that individuals of green sea turtle may be present in the project area but are expected to be in low or very low densities.

Loggerhead Sea Turtles

Loggerhead sea turtles are found in temperate and subtropical waters of the world. They feed in coastal bays, estuaries, and in shallow water along the continental shelves of the Atlantic, Pacific, and Indian Oceans. Loggerhead sea turtles occur throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian oceans and are widely distributed within their range. They can be found hundreds of miles offshore or inshore in bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers (Conant et al. 2009). Loggerhead sea turtles primarily feed on mollusks, crustaceans, fish, and other marine animals. Feeding areas often include coral reefs, rocky areas, and shipwrecks.

From early April to early November, juvenile loggerheads utilize estuarine, neritic and coastal shelf waters as foraging grounds. Adult female loggerhead sea turtles inhabit coastal South Carolina (Northwest Atlantic Ocean DPS) generally from mid-May to mid-August during nesting periods. According to SCDNR, statewide, loggerhead sea turtles have averaged 3,378 nests annually over the past 10 years. Lighthouse Island averages close to 200 nests annually but has had over 1,500 in 2022 and over 1,000 annually since 2019. Nearby Raccoon Key averages generally less than 50 nests each year. Nests are constructed between the high tide line and primary dune front.

Leatherback Sea Turtles

Leatherback sea turtles are the most widely distributed species of sea turtle, being found throughout the Atlantic, Pacific, and Indian oceans, including areas near Alaska and Labrador. Leatherback turtles are highly migratory and pelagic and can be found at depths more than 3,000 feet. Because of their ability to regulate their body temperature, they can be found in deeper water than other species of sea turtles and can be active in water below 40° F. Leatherback sea turtles primarily feed on jellyfish, but also consume sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. The distribution and food habits of post-hatchling and juvenile leatherbacks are unknown, although they may be pelagic and associate with Sargassum weed.

Sub-adult and adult leatherback sea turtles are common in South Carolina's coastal waters in the spring and in smaller numbers in the fall. Nearshore concentrations may occur in South Carolina from April - June during migration when cannonball jellyfish are abundant. From 1997-2007 SCDNR conducted aerial surveys for the species and recorded 1,000 in the state over that timeframe. Nesting occurs from March - July but is rare to infrequent in South Carolina and has not been recorded at Raccoon Key or Lighthouse Island in the previous 5 years.

Kemp’s Ridley Sea Turtles

Kemp’s ridley turtles inhabit shallow nearshore and inshore waters of the northern Gulf of Mexico, particularly in Texas and Louisiana. During winter, turtles in the northern Gulf may travel to deeper water (NMFS and USFWS 1992). Kemp’s ridleys are often found in waterbodies associated with salt marshes. Kemp’s ridley nesting is essentially limited to the beaches of the western Gulf of Mexico, primarily in Tamaulipas, Mexico. In the US, nesting occurs primarily in Texas (especially Padre Island National Seashore), and occasionally in Florida, Alabama, Georgia, South Carolina and North Carolina (NMFS and USFWS 2013). Neonatal Kemp’s ridleys feed on Sargassum and infauna or other epipelagic species. Post-pelagic diets include various items such as mollusks, sea horses, cownose rays, jellyfish, crabs, tunicates and fish. Live bottom (sessile invertebrates attached to hard substrate) has been

identified as a preferred habitat of neritic juveniles in the coastal waters of western Florida (NMFS and USFWS 2013). Hatchlings may become entrained in Gulf of Mexico eddies and dispersed by oceanic surface currents, then enter coastal shallow water habitats when they reach about 20 cm in length.

Similar to the green sea turtle, South Carolina's coastal waters are predominately used as developmental foraging grounds with juveniles generally occupying areas in the summer. The species is often found in nearshore and in-shore salt marsh habitats. Nesting occurs from April - July and very rarely occurs in South Carolina, with only 3 cases documented - none of which were at Lighthouse Island or Raccoon Key. Research conducted from north Florida through central South Carolina by the SCDNR, in partnership with the UGA, captured 260 Kemp's ridley sea turtles between 2000 and 2015. This data would suggest that a low-very low density of this species would be expected occupying the project area.

3.7 Coastal Zone Resources

The Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. §§ 1451 – 1466) was established as a national policy to preserve, protect, develop, and where possible, restore or enhance, the resources of the Nation’s coastal zone for current and future generations. The South Carolina Coastal Management Program was established per the CZMA and was authorized in 1977 under South Carolina’s Coastal Tidelands and Wetlands Act. The proposed action is within South Carolina’s designated Coastal Zone Management Area.

3.8 Coastal Barrier Resources System (CBRS)

The Coastal Barrier Resources Act (CBRA) of 1982 (19 U.S.C. § 3501 *et. seq.*), as amended by the Coastal Barrier Improvement Act (CBIA) of 1990 limits Federally subsidized development within CBRA Units to minimize the loss of human life by discouraging development in high-risk areas and to protect undeveloped coastal barriers along the Atlantic and Gulf Coasts, including islands, spits, tombolos, and bay barriers that are subject to wind, waves, and tides such as estuaries and nearshore waters. The entire project area is located within the Cape Romain CBRA Unit, SC-06P. There are two types of mapping units within the CBRS, System Units and Otherwise Protected Areas (OPAs). OPAs are denoted with a ‘P’, SC-06P is an OPA. The only federal spending prohibition in OPAs is on federal flood insurance.

3.9 Cultural Resources

The management of cultural resources is regulated under federal laws such as the National Historic Preservation Act (NHPA) of 1966 (54 U.S.C. § 300101 *et seq.*), the Archaeological and Historic Preservation Act of 1974 (54 U.S.C. §§ 312501 – 312508), the American Indian Religious Freedom Act of 1978 (42 U.S.C. §§ 1996 and 1996a), the Archeological Resource Protection Act of 1979 (16 U.S.C. §§470aa – 470mm), NEPA (42 U.S.C. § 4321 *et seq.*), the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. § 3001 *et seq.*), the Abandoned Shipwreck Act of 1987 (43 U.S.C. §§2101 – 2106), and the Sunken Military Craft Act of 2004 (10 U.S.C. § 113 *et seq.*).

Cultural resources considered in this study are those defined by the NHPA as properties listed, or eligible for listing, on the National Register of Historic Places (NRHP) and are referred to as

historic properties. Historic properties include buildings, structures, sites, districts, objects, cultural items, Indian sacred sites, archaeological artifact collections, and archaeological resources (36 C.F.R. § 800.16(l)(1)). Cultural resources also include resources with unknown NRHP eligibility status.

Archaeological and Historical Setting

This undertaking is located in an area that is a natural channel through a sandy beachline featuring tidal flows between the Atlantic Ocean and lagoons. A review of historical charts in the area indicated the shoreward portion, called Sandy Point, of the new channel framework was once front beach and back marsh and was lost to the ocean between 2005 and 2011. Due to the proximity of Charleston and the historic reliance on water-based transportation, this area was used extensively throughout the historic period as well. There are no structures, places, or items of historical significance listed on the NRHP in the immediate project area; however, the Cape Romain Lighthouse is a nearby resource that is NRHP-listed. Wrecks or abandoned vessels have occurred in the project area, but there is likely little to nothing remaining of these due to the shifting nature of the channels involved and the ongoing channel work conducted by the Corps. In addition, the migration of the natural channel has scoured, redeposited, and reshaped the area many times to a depth greater than that which is provided by the current navigation project.

Inventory of Resources in the Study Area

Cultural resource surveys (historic research, remote sensing, and dive investigations) have been conducted in South Carolina's inland and offshore waters, but only a few have been conducted in the general vicinity of the current project area. One of the first known investigations within the Area of Potential Effects (APE) included aspects of prospecting for and identifying submerged prehistoric sites within the current survey areas in 2016. The Corps performed a remote cultural resources survey in the Area of Potential Effects (APE) in 2016. It was entitled the Clark Creek Survey and comprised of single beam sonar, sidescan sonar, magnetometer, and sub-bottom profiler over a portion of the project area (approximately 24 acres). The survey concluded that the magnetic anomalies and sonar targets identified did not have signatures of historically significant cultural resources. One cultural resource was identified as having previously been located near the survey area. Site 38CH26, a Late Woodland site that was on Racoon Key near Cape Romain, was lost due to coastal impacts of several storm events.

The current APE covers a much larger area than the 2016 survey and is defined as the area proposed for dredging, as well as the area proposed for placement near shore of Lighthouse Island. The Corps conducted submerged cultural resources surveys of the placement area in February 2023 and the advanced maintenance area in February and March 2023. Results were presented in a report entitled, *Town Creek Federal Navigation Project, Submerged Cultural Resources Survey, Charleston County, South Carolina* (Cozzi and Watts 2023).

The area where the Corps proposes nearshore placement along Lighthouse Island had not been previously surveyed, and there was a potential for undisturbed cultural deposits and underwater resources that could be impacted by the sediment placement. The NRHP indicated that there were known historic sites near the APE, including the Cape Romain Lighthouse. Results of the 2023 survey indicated that no significant submerged cultural resources were present in this area. The survey identified 26 small anomalies, five of which were located outside the survey area border and the remaining 21 magnetic anomalies had signature

characteristics associated with small ferrous objects (e.g., crab traps, small boat anchors, fishing buoy clumps, and other debris).

The area where the Corps proposes advance maintenance within the Town Creek Inlet was partially surveyed in the past. Results of the 2023 survey indicated that no significant submerged cultural resources were present in this area. The survey identified 102 anomalies, five of which were geographically associated with NOAA charted channel buoys and four of which were associated with buoy mooring residue. The remaining 93 magnetic anomalies had signature characteristics associated with small ferrous objects (e.g., crab traps, small boat anchors, fishing buoy clumps, and other debris).
A search of the NOAA Wrecks and Obstructions Database originally revealed the presence of several wrecks and obstructions near the APE (Figure 6). Little information is available for these wrecks and obstructions, as there is no history on when these wrecks sank and their vessel name. Several items are listed as being submerged and dangerous. The surveys revealed that none of these wrecks/obstructions exist within in the survey area.

Figure 5. NOAA's Wrecks and Obstructions Database results for Town Creek with several wrecks and obstructions noted near the project area.

The survey results were coordinated with the South Carolina State Historic Preservation Office (SHPO), the South Carolina Institute for Archeology and Anthropology (SCIAA), and 13 Tribes. SHPO provided responses in March and July 2023 to concur with the survey methodologies utilized and the determination that there was no impact to submerged cultural resources by the proposed actions (SHPO Project No. 22-RL0136). The Catawba Indian Nation responded in March 2023 that they had no concerns about the undertaking and requested consultation only for inadvertent discoveries (2022-46-4). The Eastern Shawnee of Oklahoma responded in April 2023, stating that the project proposes no adverse effect and that they should be contacted in the event of inadvertent discoveries (EST Reference Number 4602).

3.10 Visual Resources (Aesthetics)

Visual resources include the visible character of a place and both natural and humanmade attributes. Visual resources influence how an observer experiences a particular location and distinguishes it from other locations.

The project is centrally located within the CRNWR, comprising 64,229 undeveloped acres of tidal creeks, bays, barrier islands, and marshlands. The project area contains many pleasing attributes including the open water, tidal creeks, islands, and undeveloped marsh.

3.11 Air and Noise

The Clean Air Act (CAA), as amended, requires the EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The CAA established two types of national ambient air quality standards -- primary and secondary. Primary standards are levels established by the EPA to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards are levels established to protect the public welfare, including protection from decreased visibility and damage to animals, crops, vegetation, and buildings.

The EPA Office of Air Quality Planning and Standards has set NAAQS for six principal pollutants which are called “criteria” pollutants. Those pollutants are carbon monoxide, lead, nitrogen oxides, particulate matter (PM_{10} and $PM_{2.5}$), ozone and sulfur dioxide. All air pollutants are listed as in attainment for Charleston County (EPA 2015).

Environmental noise is a conglomeration of distant and nearby noise sources. Types of nearby noise sources observed within the project area include naturally occurring noises (e.g., wind on the beach, wave action in the surf zone, buzzing of insects, bird calls) and those from man-made sources (e.g., marine vessel engines, etc.).

3.12 Hazardous, Toxic, and Radioactive Waste (HTRW)

Hazardous waste is defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as any substance which may present a significant danger to public health and/or environment if released.

There are currently no known HTRW producers adjacent to the project site or any entity that discharges toxic effluent nearby. Since the area has been dredged multiple times, there is minimal risk of encountering HTRW.

3.13 Socioeconomics and Environmental Justice

Environmental justice is the fair treatment and meaningful involvement of all people regardless of income, race, color, national origin, Tribal affiliation, or disability in agency decision-making and other Federal activities that affect human health and the environment. Section 112(b)(1) of WRDA 2020 requires that “In the formulation of water development resources projects, the Secretary shall comply with any existing Executive Order regarding environmental justice in effect as of the date of enactment of this Act to address any disproportionate and adverse human health or environmental effects on minority communities, low-income communities, and Indian Tribes.” The Executive Order (EO) in place at the time of the enactment of WRDA 2020 was EO 12898 (1994), Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which directs each federal agency to assess whether disproportionately high and adverse effects would be imposed on minority or low-income areas by federal actions. Subsequent EOs include: EO 14008 (January 2021), Tackling the Climate Crisis at Home and Abroad, which in Section 219 directs federal agencies to “[develop]

programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities"; and, EO 14096 (April 21, 2023), Executive Order on Revitalizing Our Nation's Commitment to Environmental Justice for All, which directs federal agencies to pursue the protection of environmental justice communities (including underserved and disadvantaged communities) "from disproportionate and adverse human health and environmental effects (including risks) and hazards," and to "provide opportunities for the meaningful engagement of persons and communities with environmental justice concerns who are potentially affected by Federal activities."
The project falls within Census Tract 45019005002, with a population of 3,684. According to the American Community Survey 5-Year Estimate, 64% of the population reported as black and the remaining 36% as white from 2016-2020 (US Census Bureau 2022). The same survey reported that the ratio of male to female was approximately 47% male to 53% female, among 1,483 households with a median household income of $49,118. Of the occupied housing units, 83% were owner occupied. Approximately 26.4% of the people in the area are below the poverty level.

According to the Climate and Economic Justice Screening Tool that was developed by CEQ, the census tract that encompasses the project area is not identified as disadvantaged (CEQ 2022).

3.14 Climate Change

The climate in this region of South Carolina consists of long hot summers and cool winters. Summers are warm and humid (average July high and low temperatures are 92°F and 71°F, respectively), and winters are relatively mild (average January high and low temperatures are 58°F and 35°F, respectively). In general, the state has warmed by 0.5-1° (F) over the last century and the sea is rising about 1-1.5" every decade (USEPA 2016). Precipitation occurs chiefly as rainfall and averages about 49.5"/year with approximately one-third of that total occurring during the months of June, July, and August. It is expected that in the coming decades changing climate in South Carolina will lead to an increase in the number of unpleasantly hot days, an increase in heat related illness, an increase in inland flooding, a decrease in crop yields, and harm to livestock (USEPA 2016). Sea level rise is the biggest climate change concern in the project area, specifically, CRNWR. Per a study commissioned by the U.S. Geological Survey, the projected sea level rise for the Cape Romain region is at least one foot by 2015 (Eaton, et al. 2021). Due to sea level rise, there is an increased risk of coastal storm surge and potential damages to resources located within the refuge. CRNWR was identified as a Priority Environmental Area in the South Atlantic Coastal Study (USACE 2022b). The refuge is at medium to high risk from storm surge and sea level rise and potential loss of natural habitats for numerous species, including sea turtles.

3.15 Natural Areas, Parks, and Recreation

The project is centrally located in CRNWR which comprises 66,287 acres of tidal creeks, bays, barrier islands, and marshlands. The refuge extends 22 miles along the South Carolina coast and is established as a migratory bird refuge (USFWS 2010). The objectives of the refuge have expanded to include the protection and management of endangered species. In1975, approximately 29,000 acres of the refuge were designated as Class I National Wilderness Area.

The estuaries and waters around the project area are considered some of the best inshore saltwater fishing and boasts the highest catch rates for many species (SCDNR 2013). As such,

Cape Romain is an intensively used and visited area as it offers opportunities for recreational shellfish harvesting, recreational fishing, recreational boating, and wildlife viewing. There are two public landings in close proximity of the project, McClellanville and Buck Hall Landing in the Francis Marion National Forest.

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

4.1 Water Quality

Alternative A (Side-Cast Only)

There will be a minor, temporary increase in turbidity levels in the project area during dredging. Due to the sandy nature of the sediments proposed for dredging, turbidity plumes will be minimal and restricted primarily to the dredging area. No permanent degradation of water quality will occur due to low, <10%, of fines in the dredge materials. All work will be performed in compliance with water quality standards.

Alternative B (Proposed Action)

Impacts to water quality from the proposed action are similar to Alternative A; however, the proposed action also includes the potential use of a special purpose hopper dredge that would transport the material for nearshore placement. Implementation of nearshore placement would have minor short-term negative impacts to water quality due to placement in the littoral zone. Material placed in the littoral zone may generate temporary turbidity plumes that will be limited to areas only a few hundred to a few thousand feet. This turbidity is usually generated by the fines ratio of the pumped sediment suspended within the return effluent. The higher the level of fines in the dredge materials the longer the fines will stay suspended in the water column. Since the percentage of fines is 10% or less, dredging is not expected to create a large turbidity plume, or for the plume to last very long if one is created. All work performed during construction will be done in a manner so as not to violate applicable water quality standards.

A Section 401 Water Quality Certification (WQC) was issued by SCDHEC in 1978 for the original project. Dredging and disposal methods have since changed; therefore, USACE submitted an application to SCDHEC to obtain a new Section 401 WQC for the proposed action. A Section 401 WQC was issued on August 8, 2023 and all conditions will be implemented (see Appendix E). Additionally, although USACE does not process and issue permits for its own activities, USACE completed a 404(b)(1) evaluation for this project (Appendix F).

Alternative C (No Action)

Under the No Action Alternative, the proposed maintenance dredging would not occur; therefore, no direct or indirect project related impacts to water quality would result.

4.2 Wetlands

Alternative A (Side-Cast Only)

Wetlands are not found within the proposed area to be dredged. There may be minor, temporary increase in turbidity levels in the project area during dredging and, therefore, there may be minor, temporary impacts to fringe wetlands located near the proposed dredging.

Alternative B (Proposed Action)

Effects to wetlands will be similar to that of Alternative A. Wetlands are not found within the proposed placement area. The proposed project would not result in the placement of fill within wetlands.

Alternative C (No Action)

Under the No Action Alternative, the proposed dredging would not occur; therefore, no direct or indirect project related impacts to wetlands would result.

4.3 Terrestrial Biological Resources

Alternative A (Side-Cast Only)

Under Alternative A, only side-cast dredging could occur within the Town Creek entrance channel. This involves only actions taken in the aquatic environment but may have direct and/or indirect impacts to terrestrial biological resources. Dissolution of dredged sediment side-cast into the water column will cause increased turbidity which may have some impact to the movement and orientation of amphibious species.

The potential impacts directly associated with side-cast dredging in the navigation channel are actions considered under the 2020 SARBO and would not be expected to have effects beyond those previously analyzed.

Alternative B (Proposed Action)

The Proposed Action Alternative has the same potential impacts to terrestrial biological resources as Alternative A, however, this alternative may also have additional impacts during transport and placement of dredge materials. Nearshore placement of dredged material may alter nearshore hydrology and intertidal ecology by altering seafloor topography and by nourishing nearby shoreline. Changes in hydrology may include the breaking of waves further offshore, increased magnitude of longitudinal wave action, and reduction in area of tidal inundation onshore. Increasing nearby beach area may also increase the area of available sand flats, mud flats, overwashes and similar intertidal habitat types. Nevertheless, the magnitude and duration of effects from placement of dredged material is expected to be insignificant in impact to affected terrestrial biological resources.

The action of placing dredged material nearshore may also have both direct and indirect effects to faunal communities affected by intertidal and subtidal changes. Direct interference between the dredging vessel or the dredge material being deposited and any fauna moving toward or from shoreline may occur when the vessel is actively depositing dredged material. Additionally, there is potential for collisions between the dredge vessel and neritic fauna when the vessel is navigating to and from the placement area or while placing dredged material. Furthermore, placement of dredged material may bury or smother organisms either directly below or moving through areas of placement. Direct and indirect effects to terrestrial biological resources may include direct loss of amphibious species (e.g., sea turtles) and/or temporary reductions in shoreline deposition of food resources of aquatic origin (e.g. horseshoe crab eggs, marine invertebrates, etc.). Nevertheless, impacts to terrestrial biological resources for the aforementioned reasons are expected to be insignificant.

Alternative C (No Action)

Under the No Action Alternative, the proposed maintenance dredging would not occur; therefore, no direct or indirect project related impacts to terrestrial resources would result.

4.4 Aquatic Biological Resources

Alternative A (Side-Cast Only)

Dredging activities would involve disturbance of the bottom substrate and the subsequent removal of benthic communities; however, a study has shown a relatively short recovery time for infaunal communities following dredging (Wilber and Clark 2007). Once dredging activities cease, pelagic larval recruits can initially inhabit impacted areas and adjacent unimpacted areas would provide for gradual recruitment of less opportunistic species. It is expected that benthic communities would be re-established within approximately one to two years after dredging activities cease (Vivan et. al. 2009).

Some plankton entrained by the dredging operations will suffer injury or mortality. Turbidity resulting from the dredging activity may reduce primary productivity by phytoplankton as light penetration into the water column is reduced. Potential effects on plankton are expected to be minor and temporary due to the short duration of dredging activities and low percentage of fine-grained material in dredged sediments.

Dredging will take approximately two months to complete for each dredging cycle. Disturbances would be minor within a very localized area around the dredging area, of which nekton can avoid given their mobility. Therefore, dredging is not anticipated to adversely impact fish species in the area.

The oyster grounds within and adjacent to the channel may be damaged by sedimentation caused from dredging. The SCDHEC has the authority to prohibit shellfish harvesting when necessary to ensure that shellfish harvested in South Carolina waters are safe for human consumption. While contamination is not anticipated, SCDHEC will close the area as appropriate if contamination does occur.

Alternative B (Proposed Action)

Impacts associated with the dredging of the channel will be similar to those from Alternative A. The Proposed Action also involves nearshore placement of dredged material. The subtidal and intertidal zones are highly dynamic, harsh, and are characterized by variations in various abiotic factors. Fauna of the intertidal zone generally are highly mobile and respond to stress by displaying large diurnal, tidal, and seasonal fluctuations in population density (Reilly et al. 1983). Given the small quantities of sand material placed from each hopper dredge load (250-300 cy), it is unlikely that intertidal benthic fauna that are resilient in high energy environments will be smothered by the sand placements within the shallow water area. Most macroinvertebrates in the turbulent nearshore zone can migrate through the surface sand layers and are resilient to this type of disturbance (Parr *et al.,* 1978). Smothering and mortality may occur in lesser mobile species (*e.g.* amphipods and polychaetes) within the small area of placement. Given the shallow water depths of the placement area, the large grain size of the sediment, and the small size of the hopper load, the material will settle quickly within the interval periods of dredging and transiting time between each deposit.

Based on the above, the proposed action will have short-term, minimal impacts on aquatic resources.

Alternative C (No Action)

Under the No Action Alternative, the proposed dredging would not occur; therefore, no direct or indirect project related impacts on aquatic resources would result.

4.5 Essential Fish Habitat

Alternative A (Side-Cast Only)

As discussed above, dredging would result in elevated turbidity levels and suspended solids in the project area when compared to the existing conditions; however, significant increases in turbidity are not expected to occur outside the immediate construction areas and turbidity levels and suspended sediments would be expected to return to background levels once construction ceases. Dredging of the federal channel could have negative effects on non-vegetated benthic communities through removal, direct burial, increased turbidity, or changes in the sand grain size or beach profiles.

Alternative B (Proposed Action)

Dredging of the federal channel could have negative effects on non-vegetated benthic communities through removal, direct burial, increased turbidity, or changes in the sand grain size or beach profiles. Dredging and placement activities would result in elevated turbidity levels and suspended solids in the project area when compared to the existing conditions; however, significant increases in turbidity are not expected to occur outside the immediate construction areas and turbidity levels and suspended sediments would be expected to return to background levels once construction ceases.

Dredging activities would involve disturbance of the bottom substrate and the subsequent removal of benthic communities; however, studies have shown a relatively short recovery time for infaunal communities following dredging (Wilber and Clark 2007). Once dredging activities cease, pelagic larval recruits would initially inhabit the impact areas and the adjacent unimpacted areas would provide a gradual recruitment of less opportunistic species. It is expected that benthic communities would be re-established within approximately one to two years after dredging activities cease (Vivan et. al. 2009).

The proposed nearshore placement at Lighthouse Point could result in localized nonpoint source pollution, interference with spawning and/or migration, loss of foraging habitat, and burial or smothering of marine organisms. Nearshore placement would provide beneficial effects including dissipation of wave energy and indirect beach nourishment (Smith et al 2017).

USACE intends to comply with the conservation recommendations and best management practices included in the *Programmatic Essential Fish Habitat Consultation for USACE Activities and Projects Regularly Undertaken in South Carolina* (Appendix D). Therefore, impacts to EFH and HAPCs associated with the Town Creek maintenance dredging and beneficial use placement are expected to be temporary and will not result in significant effects on managed species.

Alternative C (No Action)

Under the No Action Alternative, the proposed dredging would not occur; therefore, no direct or indirect project related impacts on EFH would result.

4.6 Threatened and Endangered Species

Suitable habitat is present within the project area for the following federally listed species: piping plover, rufa red knot, seabeach amaranth, Atlantic sturgeon, shortnose sturgeon, North Atlantic right whale, West Indian manatee, green sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, and loggerhead sea turtle. Designated critical habitat is within the project area for the North Atlantic right whale, loggerhead sea turtle, and piping plover. The project area also includes proposed critical habitat for rufa red knot.

Per Section 7 of the ESA, USACE consulted with USFWS concerning ESA effects determinations and potential impacts to listed species. On December 15, 2022, USFWS concurred with USACE's determinations (Appendix B). Specifically, by email dated December 15, 2022, USFWS stated as follows:

> The Service concurs with the Corps' determination for the species and critical habitat determinations of MANLAA in Table 1 on page 4 of your November 16, 2022, letter requesting concurrence. This project involves in-water work only. As you know, the Service and NMFS share jurisdiction of federally-listed sea turtles. The Service has jurisdiction of sea turtles when they are out of the water on their nesting beaches and NMFS has jurisdiction of sea turtles when they are in the water. Although the in-water work is outside of our jurisdiction and we concur with your agency's determinations on sea turtles when they are on their nesting beaches adjacent to the project area, we do have concerns about dredging occurring within waters of the Cape Romain National Wildlife Refuge (NWR) between April 1 and October 31. Cape Romain NWR has the highest density of loggerhead sea turtle nesting north of Florida. These individuals are part of the Northern Recovery Unit of the Northwest Atlantic Distinct Population Segment (DPS). We recommend that the dredging contract specify that work must be completed between November 1 and March 31.

As acknowledged by the December 15, 2022, USFWS email response, because the project involves in-water work only, it is subject to NMFS' ESA jurisdiction. More specifically, the maintenance dredging of the navigation channel is covered by 2020 SARBO, and USACE will adhere to all applicable Project design criteria. Notably, Section 2.5.2.2 of the 2020 SARBO describes modified hopper dredges and states that they "have historically not resulted in entrainment of ESA-listed species and hence have had fewer restrictions than larger, traditional hopper dredges". Section 2.5.2.2 of the 2020 SARBO also describes that modified hopper dredges have smaller dragheads and lower suction velocity than traditional hopper dredges. In addition, and regarding USFWS' recommendation for work to be completed between November 1 and March 31, modified hopper dredging does not necessitate the need for a protected species observer (PSO) to monitor dredged material for the potential presence of take. Therefore, the risk of entrainment from modified hopper dredging is expected to be discountable and no future minimization measures are needed to limit entrainment. In this regard, and consistent with the 2020 SARBO, impacts to sea turtles as a result of the dredging operation (e.g., side cast and/or modified hopper) are expected to be minimal (regardless of the time of year when the work is conducted).

Alternative A (Side-Cast Only)

Under Alternative A, environmental impacts to listed species would be expected to be the same as those under Alternative B with the exception of dredging not occurring in the advanced maintenance area and without the use of a modified hopper dredge or beneficial use placement.

Alternative B (Proposed Action)

The proposed action may impact the below listed species. The USFWS and NMFS PRD share jurisdiction of sea turtles, with NMFS having jurisdiction when in the marine environment and USFWS having jurisdiction when in the terrestrial environment.

With regard to listed species under the jurisdiction of NMFS, the action is a covered activity under the 2020 SARBO, and USACE will adhere to all applicable project design criteria. Routes of effects from the dredging are evaluated in the 2020 SARBO; for purposes of NEPA, these effects are summarized below. In recognition that the USACE is relying on the 2020 SARBO for federally listed species under NMFS' jurisdiction, USACE incorporates herein by reference the analysis and findings in the 2020 SARBO, and further summarizes and/or cites to that document below. The following analysis also documents and discloses the potential impacts, if any, to federally listed species under USFWS jurisdiction.

Piping Plover and Red Knot:

The extent of potential impact from placement of dredge material falls within federally designated or federally proposed critical habitat for these species. Cyclic placement of the estimated nearshore dredge material may potentially result in some increase in the total area of shoreline and/or tidal flats in the area through time as wave action and tidal flow displace sand mounds. This net increase in sandy sediment to shoreline habitat should improve habitat quality/quantity and have a beneficial impact to these species and critical habitat.

Indirect effects to shorebird species from beneficial use placement of dredged material may include temporary reductions in shoreline deposition of food resources of aquatic origin (e.g., horseshoe crab eggs, marine invertebrates, etc.). However, the frequency and magnitude of dredge material depositions is expected to have insignificant effects to this process and thus to affected shorebird species.

Seabeach Amaranth:

Cyclic placement of dredge material may potentially result in some increase in the total area of shoreline and/or tidal flats in the area through time as wave action and tidal flow displace sand mounds. This net increase in sandy sediment to shoreline habitat should improve habitat quality/quantity and have a beneficial impact to this species.

Northern Atlantic Right Whale (NARW):

As acknowledged in Section 3.1.4.1.4 of the 2020 SARBO, vessel strikes, while extremely unlikely, may occur during dredging or during the transportation of materials between dredging and material placement locations. NARW typically inhabit coastal waters along coastal Georgia and northern Florida each winter, often close to shore. According to the NMFS species directory website, each fall, some right whales travel more than 1,000 miles from North Atlantic feeding grounds to their only known calving grounds in the southeast; the majority of calving occurs in the shallow, coastal waters off Georgia and northeastern Florida. These whales remain near the surface with their new calves and are hard to spot in the water making them susceptible to

vessel strikes, which is one of the leading causes of death for this species. The 2020 SARBO includes a North Atlantic Right Whale Conservation Plan to address this issue. The project will adhere to all applicable PDCs and requirements of the conservation plan.

West Indian Manatee:

Operation of either the side-cast or special-use hopper dredge in the waters throughout the project area may adversely affect manatees that occur in the area through collision or entanglement. However, USACE will implement *Standard Manatee Construction Conditions*, as recommended by FWS, thereby reducing any potential impacts to discountable and insignificant levels. The project area does not fall within any critical habitat for West Indian Manatee. If the project occurs during the warmer months, standard manatee conditions for in-water construction work will be followed to ensure that any manatees in the vicinity are not harmed or harassed.

Green/Kemp's Ridley/Leatherback/Loggerhead Sea Turtles:

Operation of the proposed dredge equipment have not historically resulted in entrainment (NMFS 2020). As previously mentioned, the equipment used by both the side-cast dredge and the modified hopper dredge has smaller draghead sizes and openings, as well as lower suction horsepower than conventional hopper dredges. In 1998, North Carolina Wildlife Resources Commission and USACE conducted a test to determine whether or not these vessels could take sea turtles. The findings concluded that these dredges do not pose a significant threat to sea turtles (USACE 1998). As of 2018, there are no records of take associated with the use of these vessels (SARBO 2020). As noted above, modified hopper dredging does not necessitate the need for a PSO to monitor dredged material for the potential presence of take and, therefore, the risk of entrainment from modified hopper dredging is expected to be discountable and no future minimization measures are needed to limit entrainment. Accordingly, as noted above and consistent with the 2020 SARBO, impacts to sea turtles as a result of the dredging operation are expected to be minimal (regardless of the time of year when the work is conducted).

The extent of potential impact from placement of dredge material falls within federally designated critical habitat for the loggerhead sea turtle. The nearshore placement of the material will create a temporary "feeder berm." The berm itself will have a maximum height of 2 feet and, therefore, will allow movement of turtles to and from the beach. Cyclic placement of the dredge material may potentially result in some increase in the total area of shoreline and/or tidal flats in the area through time as wave action and tidal flow displace sand mounds. This net increase in sandy sediment to shoreline habitat should improve habitat quality/quantity and have a beneficial impact to these species and critical habitat.

The potential impacts from dredging operations and nearshore placement of dredged materials to sea turtle species have been previously considered within the 2020 SARBO and are discussed in more detail in Sections 3.1.1.5 and 3.1.6 of that document. Further, as conditions of both SCDHEC-OCRM's Coastal Zone Consistency Determination Concurrence and SCDHEC's Section 401 WQC, nearshore placement of material would be limited to October 1st through June 15th to minimize potential impacts to sea turtle hatchlings leaving the beach.

<u>Alternative C (No Action)</u>

Under the No Action Alternative, the proposed dredging would not occur; therefore, no direct or indirect project related impacts to listed species would result.

4.7 Coastal Zone Resources

Alternative A (Side-Cast Only)

The actions under Alternative A have been evaluated by the Corps and determined to be consistent with the South Carolina Coastal Management program; however, South Carolina Department of Environmental Control-Office of Ocean and Coastal Resource Management (SCDHEC-OCRM) issued a Coastal Zone Consistency Determination Consistency Concurrence on August 4, 2023 (Appendix D).

Alternative C (Proposed Action)

The actions under the action alternative have been evaluated by the Corps and determined to be consistent with the South Carolina Coastal Management program. South Carolina Department of Environmental Control-Office of Ocean and Coastal Resource Management (SCDHEC-OCRM) issued a Coastal Zone Consistency Determination Concurrence on August 4, 2023 (Appendix D).

Alternative C (No Action)

Under the No Action Alternative, the proposed dredging would not occur; therefore, no direct or indirect project related impacts on coastal zone resources would result.

4.8 Coastal Barrier Resources System

There entire project area is located within the Cape Romain CBRA Unit, SC-06P. Consequently, excavated material will be re-distributed entirely within the CBRA unit. Therefore, no impacts to the coastal barrier unit will occur because of implementing any of the alternatives. There are two types of mapping units within the CBRS, System Units and Otherwise Protected Areas (OPAs). OPAs are denoted with a 'P', SC-06P is an OPA. The only federal spending prohibition in OPAs is on federal flood insurance, and consultation with the USFWS is not required for proposed actions carried out within an OPA. It should also be noted that even if this was not an OPA but instead a System Unit, there is a CBRA exception in Section 6(a)(2) for Federal Navigation Channel Maintenance which covers the maintenance or construction of improvements of existing Federal navigation channels, including the disposal of dredge materials related to such maintenance or construction. Therefore, the proposed project is in compliance with CBRA.

4.9 Cultural Resources

Federal agencies are required by Section 106 of the NHPA and by NEPA to consider the possible effects of their undertakings on historic properties. For cultural resources, the threshold for significant impacts includes any disturbance that cannot be mitigated and affects the integrity of a historic property (i.e., a cultural resource that is eligible for the NRHP). The threshold also applies to any cultural resource that has not yet been evaluated for its eligibility to the NRHP or disturbs a resource that has importance to a traditional group under American Indian Religious Freedom Act, EO 13007, and Native American Graves Protection and Repatriation Act (NAGPRA).

Analysis of potential impacts to cultural resources considers both direct and indirect impacts. Direct impacts may be the result of physically altering, damaging, or destroying all or part of a

resource, altering characteristics of the surrounding environment by introducing visual or audible elements that are out of character for the period the resource represents, or neglecting the resource to the extent that it deteriorates or is destroyed. Indirect impacts are those that may occur as a result of the completed project, such as increased vessel traffic in the vicinity of the resource and the associated hydrologic changes associated with this increase.

The APE has been defined as the Town Creek Federal navigation channel, as well as the surrounding shoreline and placement area. Actions anticipated within the APE would consist of dredging in the channel and placement of dredged material for beneficial use along shorelines.

Alternative A (Side-Cast Only)

The impact areas associated with implementation of Alternative A have been previously surveyed and do not include any known historical sites. Therefore, no impacts to cultural resources will occur as a result of implementing Alternative A.

Alternative B (Proposed Action)

The proposed action includes all areas within Alternative A, as well as a 4.5-acre advanced maintenance area (parallel to the inner shoal) and a proposed nearshore placement area along Lighthouse Island. It is unlikely that much remains in the area proposed for advanced maintenance due to the shifting nature of the channel and decades of dredging. In order to achieve full compliance with NHPA's Section 106 and the Abandoned Shipwreck Act of 1987, USACE conducted a submerged cultural resources remote sensing survey of the area that will be subject to maintenance dredging in February and March 2024. In addition, the Corps conducted a survey of the placement area in February 2023. The results were coordinated with the SC SHPO, SCIAA, and Tribes, and all parties concurred that no shipwrecks and archaeological sites eligible or potentially eligible for listing on the National Register of Historic Places will be affected by the proposed project.

Alternative C (No Action)

Under the No Action Alternative, the proposed dredging and subsequent sediment placement would not occur; therefore, no direct or indirect project related impacts on cultural resources would occur.

4.10 Visual Resources (Aesthetics)

Alternative A (Side-Cast Only)

The presence of dredging equipment will create a minor, temporary impact to the natural beauty of the project area. This temporary change could impact local aesthetics for anyone navigating the project area by commercial or recreational vessels during project operations. However, these impacts are temporary and will not affect the preservation of the coastal setting. Existing conditions will return to the area following completion of the project.

Alternative B (Proposed Action)

Effects to visual resources will be similar to that of Alternative A.

Alternative C (No Action)

Under the No Action Alternative, the proposed dredging would not occur; therefore, no direct or indirect project related impacts on visual resources would result.

4.11 Air and Noise

Alternative A (Side-Cast Only)

There will be a minor change in air quality as a result of fuel exhaust from dredge operations and any associated equipment, vessels, and vehicles. The change will be minor and temporary in nature. Air quality will return to normal following completion of the project.
Ambient noise levels will increase as a result of the operations of the dredge and any associated equipment, vessels, and vehicles during project construction. The increase will be minor and temporary in nature. Noise levels will return to normal following completion of the project.

Alternative B (Proposed Action)

Impacts to both air and noise will be similar to those of Alternative A.

Alternative C (No Action)

Under the No Action Alternative, the proposed dredging would not occur; therefore, no direct or indirect project related impacts on air quality or noise would occur.

4.12 Hazardous, Toxic and Radioactive Waste

Alternative A (Side-Cast Only)

The last cycle of maintenance dredging of the entrance channel occurred in 2016. Because of the type of material (sand) dredged, it is not expected that any hazardous, toxic or radiological waste will be encountered. Material that is predominately sand generally does not require any contaminant testing since contaminants adhere to organic particles, which are present in very low concentrations in this material. Additionally, pursuant to ER 1165-2-132, dredge materials and sediments beneath navigable waters proposed for dredging qualify as hazardous or toxic wastes only if they are within the boundaries of a site designated by the EPA or a state for a response action (either a removal action or remedial action) under CERCLA.

Alternative B (Proposed Action)

Impacts associated with Alternative B, are similar to those described above. No direct or indirect project related impacts on HTRW would result.

No Action Alternative

Under the No Action Alternative, the proposed dredging would not occur; therefore, no direct or indirect project related impacts on HTRW would result.

4.13 Socioeconomics and Environmental Justice

Alternatives A and B (Action Alternatives)

Maintenance of the navigation channel would have a favorable economic impact on the area. Recreational and commercial vessels serving the area will help and possibly even expand the industrial and commercial base that currently exists in McClellanville. This will directly and indirectly have a beneficial effect on the local, state, and national economy. Indirect benefits

may accrue in the area through increases in business activity, employment, property values, and tax revenues. Other benefits for the commercial fishing and tourism industry would also be expected to occur. Accordingly, it is not anticipated that there will be any disproportionately high human health or environmental impact on low income or minority populations.

Alternative C (No Action)

Under the No Action Alternative, the proposed dredging would not occur; therefore, the channel would continue to shoal in, and boat traffic would continue to find it difficult to traverse the inlet. This may result in negative impacts to the industrial and commercial base of the area and impact the local economy.

4.14 Climate Change

Alternatives A (Side-Cast Only)

Under this Alternative, the proposed project dredging would have no effect to climate change or sea level rise. The proposed project may result in a negligible release of greenhouse gases into the atmosphere when compared to global greenhouse gas emissions. Greenhouse gas emissions have been shown to contribute to climate change. Greenhouse gas emissions associated with the Corps federal action may occur from the combustion of fossil fuels associated with the operation of dredging equipment. Greenhouse gas emissions from the Corps action have been weighed against national goals of energy independence, national security, and economic development and determined not contrary to the public interest.

Alternative B (Proposed Action)

Maintenance dredging of Town Creek would have no impacts on sea level rise. Impacts associated with greenhouse gases are similar to those described for Alternative A.

Alternative C (No Action)

Under the No Action Alternative, the proposed project would not occur and there would be no effect to climate change or sea level rise.

4.15 Natural Areas, Parks, and Recreation

Alternative A (Side-Cast Only)

While the proposed maintenance dredging may be an inconvenience to recreators and commercial fishers during construction, it is not expected to have any long-term adverse effect on fishing activities in the area. The dredging will have a long-term positive effect by continuing to provide access which in turn, promotes recreational opportunities.

Maintaining the navigation channel will also provide fishing vessels better access to and from McClellanville, which may improve commercial fishing. Recreational boaters will also benefit from maintaining the channel, despite that the presence of the dredge and associated equipment could create a temporary obstruction for boats (recreational and commercial) navigating the vicinity.

No effects to CRNWR nor the Wilderness Area are anticipated as a result of the dredging operations.

Alternative B (Proposed Action)

Results from dredging activities associated with the Proposed Action are similar to those stated above for Alternative A.

The nearshore placement of material will have long-term, positive impacts to CRNWR and will meet some of the objectives outlined in their Comprehensive Plan by protecting Lighthouse Island and its resources.

Alternative C (No Action)

Under the No Action Alternative, the proposed project would not occur and there would be no effect to natural areas, parks, and recreation.

CHAPTER 5 CUMULATIVE IMPACTS

Cumulative impacts are defined in the regulations implementing NEPA as follows:

> Cumulative effects, which are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

40 C.F.R. § 1508.1(g)(3). The following paragraphs summarize the cumulative impacts expected from the proposed project.

5.1 Past, Present, and Reasonably Foreseeable Future Actions

Dredging of the Town Creek navigation channel has occurred periodically since the project was completed in 1975, and routine O&MM dredging of the entrance channel will occur as necessary when funding is available.

In 2016, USACE conducted maintenance dredging of the Jeremy Creek reach of the Atlantic Intracoastal Waterway near the navigation channel and placed the material in an upland location. Maintenance dredging of this particular reach occurs as needed, approximately every 7-10 years. Dredging is currently not scheduled to occur for a few more years.

5.2 Resource Areas Evaluated for Cumulative Effects

Implementation of the proposed action would have no effects or negligible effects on Water Quality, Aquatic Resources, Terrestrial Resources, Cultural Resources, Visual Resources, Air Quality, Noise, Hazardous Waste, Socioeconomics, Environmental Justice, Climate Change, and Natural Areas, Parks, and Recreation. As such, these resources were not carried forward into the cumulative effects analysis. Implementation of the proposed action will have minor impacts to the resources further discussed below.

Essential Fish Habitat

The proposed action, when considered with past, present, and reasonably foreseeable future projects, would not result in significant impacts to EFH. USACE has completed a programmatic consultation that applies to the Town Creek project. USACE intends to follow the conservation measures set forth in the *Programmatic Essential Fish Habitat Consultation for USACE Activities and Projects Regularly Undertaken in South Carolina* in order to avoid significant individual or cumulative adverse effects on EFH or living marine resources under the jurisdiction of NMFS. See appendix C for additional information.

Threatened and Endangered Species

The proposed action, when considered with past, present, and reasonably foreseeable future projects, would not result in significant impacts to listed species. While the proposed project may affect some listed species, the work will be performed in compliance with all applicable laws and will follow all applicable minimization measures and conditions that are identified in the

2020 SARBO. Informal consultation with USFWS concluded with their concurrence on December 15, 2022. Additionally, the project may help provide and protect habitat for some listed species. Individuals may be temporarily affected by the dredging and placement activities; however, cumulative adverse impacts will be minor.

Given the scale of the project, the minor and temporary nature of adverse effects, and the beneficial use of the dredged material, there should be little adverse cumulative impact resulting from the proposed project.

CHAPTER 6 PUBLIC INVOLVEMENT AND COORDINATION

The Draft EA and Finding of No Significant Impact (FONSI) was released to the public for a 30-day review and comment period on January 11, 2023. The draft EA was placed on the Charleston District's external website. Additionally, notification letters were sent to the following:

- **Tribes**
  - Absentee-Shawnee Tribe of Indians of Oklahoma
  - Alabama-Quassarte Tribal Town
  - Catawba Indian Nation
  - Cherokee Nation
  - Chickasaw Nation
  - Delaware Tribe of Indians
  - Eastern Band of the Cherokee Indians
  - Eastern Shawnee Tribe of Oklahoma
  - Kialegee Tribal Town
  - The Muscogee (Creek) Nation
  - Poarch Band of Creek Indians
  - Shawnee Tribe
  - Thlopthlocco Tribal Town
  - Tuscarora Nation
  - United Keetoowah Band of Cherokee Indians in Oklahoma
- **Federal Agencies**
  - Environmental Protection Agency
  - National Marine Fisheries Services
  - U.S. Fish and Wildlife Service
- **State Agencies**
  - SCDHEC Bureau of Air Quality
  - SCDHEC Bureau of Water
  - SCDHEC Ocean and Coastal Resources Management
  - South Carolina Department of Natural Resources (SCDNR)
  - South Carolina Department of Archives and History
  - South Carolina Department of Parks, Recreation, and Tourism

CHAPTER 7 COMPLIANCE WITH OTHER ENVIRONMENTAL LAWS

Clean Air Act of 1972

The CAA sets goals and standards for the qualify and purity of air. It requires the EPA to set NAAQS for pollutants considered harmful to public health and the environment. Charleston County is designated as in attainment for all principal pollutants. The short-term effects from construction equipment associated with the project would not result in permanent adverse effects to air quality in the study area. Air quality permits would not be required for this project.

Clean Water Act of 1972 – Section 401 and Section 404

A Section 401 WQC was issued by SCDHEC for the original project in 1978. The dredging and disposal methods have changed, therefore USACE obtained a new Section 401 WQC for the proposed action, which SCDHEC issued on August 8, 2023. All WQC conditions as well as standard best management practices will be implemented to minimize migration of sediments on and off the placement areas during and after construction.

A 404(b)(1) Analysis of the project has been completed and is included in Appendix F.

Coastal Barrier Resources Act of 1982

The CBRA provides for a Coastal Barrier Resources System of undeveloped coastal barriers along the Atlantic and Gulf Coasts, including islands, spits, tombolos, and bay barriers that are subject to wind, waves, and tides such as estuaries and nearshore waters. Resources in the system are to be protected by restricting federal expenditures that have the effect of encouraging development of coastal barriers. The entire project area is located within the Cape Romain CBRA Unit, SC-06P. There are two types of mapping units within the CBRS, System Units and Otherwise Protected Areas (OPAs). OPAs are denoted with a ‘P’, SC-06P is an OPA. The only federal spending prohibition in OPAs is on federal flood insurance, and consultation with the USFWS is not required for proposed actions carried out within an OPA. It should also be noted that even if this was not an OPA but instead a System Unit, there is a CBRA exception in Section 6(a)(2) for Federal Navigation Channel Maintenance which covers the maintenance or construction of improvements of existing Federal navigation channels, including the disposal of dredge materials related to such maintenance or construction. Therefore, the proposed project is in compliance with CBRA.

Coastal Management Zone Act of 1972

The CZMA requires that “each federal agency conducting or supporting activities directly affecting the coastal zone shall conduct or support those activities in a manner which is, to the maximum extent practicable, consistent with approved state management programs.” Per the Coastal Tidelands and Wetlands Act (S.C. Code Ann.) SCDHEC-OCRM issued a Coastal Zone Consistency Determination Concurrence on August 4, 2023 (Appendix D).

Endangered Species Act of 1973

The ESA is designed to protect and recover threatened and endangered species of fish, wildlife, and plants. Suitable habitat is present within the project area for the following federally listed species: piping plover, rufa red knot, Atlantic sturgeon, shortnose sturgeon, seabeach amaranth, West Indian manatee, North Atlantic right whale, green sea turtle, leatherback sea turtle, Kemp's ridley sea turtle, and loggerhead sea turtle. As noted above, the USFWS and NMFS share jurisdiction of sea turtles, with NMFS having jurisdiction when in the marine environment and USFWS having jurisdiction when in the terrestrial environment.

The project would be implemented in compliance with the 2020 SARBO issued by NMFS, and as noted above in Section 4.6, USACE incorporates herein by reference the findings and analysis of that document.

With regard to species under the jurisdiction of USFWS, USACE has determined that the project may affect but is not likely to adversely affect the piping plover, rufa red knot, West Indian manatee, green sea turtle (beach), leatherback sea turtle (beach), Kemp's ridley sea turtle (beach), and loggerhead sea turtle (beach). Furthermore, USACE has determined that the project may affect, but is not likely to adversely affect critical habitat or proposed critical habitat for piping plover, red knot and loggerhead sea turtle.

Per Section 7 of the ESA, USACE consulted with USFWS concerning determinations and the following potential impacts to listed species. On December 15, 2022, the USFWS concurred with USACE's determinations (Appendix B), as discussed above in Section 4.6.

Environmental Justice (EO 12898)

Section 112(b)(1) of WRDA 2020, Executive Order (EO) 12898 (1994), *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, EO 14008 (January 2021), *Tackling the Climate Crisis at Home and Abroad*, and EO 14096 (April 21, 2023), *Executive Order on Revitalizing Our Nation's Commitment to Environmental Justice for All*, all oblige federal agencies to consider whether their actions will have disproportionate and adverse human health and environmental effects on low income, minority, disadvantaged, or underserved communities.

Total minority populations (i.e., all non-white and Hispanic or Latino racial groups) combined comprise approximately 64 percent of the population in the project area. The project would have no adverse impacts on minority populations.

Fish and Wildlife Coordination Act of 1934

The Fish and Wildlife Coordination Act (FWCA) provides authority for the USFWS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features and requires that federal agencies consult with USFWS, NMFS, and state resource agencies on the proposed project. This coordination was conducted concurrently with the public review of the draft EA.

Floodplain Management (EO 11988)

To comply with Executive Order 11988, the policy of the USACE is to formulate projects that, to the extent possible, avoid or minimize adverse effects associated with the use of the floodplain

and avoid inducing development in the floodplain unless there is no practicable alternative. Projects that involve beneficial use of dredged material are inherently located in within the floodplain. USACE intends to prioritize beneficial use of dredged material wherever and whenever possible. For the proposed project, nearshore placement of dredged material helps alleviate problems associated with erosion, including the enhancement of habitat within the floodplain. For the reasons stated above, the project is in compliance with EO 11988, Floodplain Management.

Protection of Wetlands (EO 11990)

This Executive Order requires, among other things, that federal agencies avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. No wetlands would be affected by the proposed project. This project is in compliance with the goals of this Executive Order.

Migratory Bird Treaty Act and EO 13186

The Migratory Bird Treaty Act (MBTA) of 1918 is the domestic law that affirms, or implements, the United States' commitment to four international conventions with Canada, Japan, Mexico, and Russia for the protection of shared migratory bird resources. The MBTA governs the taking, killing, possessing, transporting, and importing of migratory birds, their eggs, parts, and nests. EO 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) directs federal agencies to take certain actions to further implement the MBTA, including evaluating the effects of actions on migratory birds. Migratory birds may benefit from the beneficial placement of material nearshore of Lighthouse Island, which may enhance and protect shore bird habitat. As such, the proposed action is not expected to negatively impact migratory birds.

National Wild and Scenic Rivers

The National Wild and Scenic Rivers System was created by Congress in 1968 (Public Law 90-542; 16 U.S.C. § 1271 et seq.) to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. According to the Wild and Scenic River inventory list, the proposed project would not affect a listed stream or portion of a stream.

National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act requires federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. The proposed project has been reviewed for historic properties (cultural resources listed on or eligible for listing on, the National Register of Historic Places) pursuant to regulations implementing Section 106 of the NHPA. In accordance with 36 C.F.R. §800.4(d)(1), USACE conducted surveys in February and March 2023, and the results were provided to the SHPO, SCIAA, and tribes to reach a determination that no historic properties would be impacted by the undertaking.

CHAPTER 8 ENVIRONMENTAL COMMITMENTS

The USACE shall comply with the applicable conditions of the USFWS BO, the SARBO, Programmatic EFH Consultation, and applicable state certifications. The USACE and its contractors commit to avoiding, minimizing or mitigating for adverse effects during activities associated with the period maintenance dredging of Town Creek by adhering to the below conditions:

Section 401 of the CWA Certification Conditions:

- The applicant must take all necessary measures to prevent petroleum products, oil, tar, trash, debris, and other pollutants from entering waters, wetlands, or adjacent areas.

- Once the project is initiated, it must be carried to completion in an expeditious manner in order to minimize the period of disturbance to the environment.

- As proposed, the applicant must limit nearshore placement of material to October 1st to June 15th to minimize potential impacts to loggerhead sea turtle hatchlings leaving the beach.

Coastal Zone Consistency Concurrence Conditions:

- Should the proposed project utilize a traditional hopper dredge to achieve the purpose of the federal action, the hopper dredge is limited to use between November 1st – March 31st to minimize potential negative impacts to sea turtles utilizing Cape Romain National Wildlife Refuge during mating and nesting season.

- Should the proposed project utilize a modified hopper dredge, as identified in the draft EA with smaller draghead sizes and openings in addition to lower suction horsepower than a traditional hopper dredge, nearshore placement of material must be limited to October 1st – June 15th to minimize potential impacts to sea turtle hatchlings leaving the beaches within Cape Romain National Wildlife Refuge.

USFWS Information Consultation Conditions:

- USACE will implement the *Standard Manatee Construction Conditions*.

Applicable Project Design Criteria per the NMFS 2020 SARBO:

- All personnel associated with the project (contractor) will be instructed about the potential presence of protected species and the appropriate protocols if they are encountered.

- All on-site personnel are responsible for observing water-related activities for the presence of ESA-listed species.

- All on-site project personnel will be informed of all ESA-listed species that may be present in the area and advised that there are civil and criminal penalties for harming, harassing, or killing ESA-listed species or marine mammals.

- All on-site project personnel will be briefed that the disposal of waste materials into the marine environment is prohibited. All crew will attempt to remove and properly dispose of all marine debris discovered during dredging operations, to the maximum extent possible.

- Sand placed on the beach or in the nearshore littoral areas will be placed in a manner that does not create mounds or berms that could prevent nesting sea turtles or hatchings from entering or exiting the beach from nearshore waters.

- All placement of material will not create an obstruction of species movement in the area (e.g., does not create a mound that would deter or prevent species from moving through the area).

- All vessels will preferentially follow deep-water routes (e.g. marked channels) to avoid potential groundings or damaging bottom resources whenever possible.

- If bares, scows, and other similar support equipment are used, they will be positioned away from areas with sensitive bottom resources such as hardbottom resources, to the maximum extent possible.

- If pipelines are used, they will be placed in areas away from bottom resources and of sufficient size or weight to prevent movement or anchored to prevent moved or the pipeline will be floated over sensitive areas.

- All work that may generate turbidity will be completed in a way that minimizes turbidity and sedimentation reaching non-mobile species to the maximum extent practicable. This may include selecting equipment types that minimize turbidity and positioning equipment away or downstream of non-mobile species.

- If turbidity curtains are used, barriers will be positioned in a way that does not block species' entry to or exit from designed critical habitat and does not entrap species within the construction area or block access for them to navigate around the construction area.

- Project personnel must take measures to monitor for entrapped species in areas contained by turbidity curtains and allow access for them to escape if spotted

- In-water lines (rope, chain, and cable) will be stiff, taut, non-looping. Examples of such lines are heavy metal chains or heavy cables that do not readily loop and tangle. Flexible in-water lines, such as nylon rope or any lines that could loop or tangle, will be enclosed in a plastic or rubber sleeve/tube to add rigidity and to prevent the line from looping or tangling. In all instances, no excess line is allowed in the water.

- All lines or cables will be immediately removed upon project completion.

- All in-water line and materials will be monitored regularly to ensure nothing has become entangled.

- Cables or lines with loops used to move pipelines or buoys will not be left in the water unattended.

- No geophysical surveys will occur at night or during periods of low visibility.

- The minimum number of geophysical sources possible will be used to obtain the necessary geophysical data and the acoustic source will be deactivated when not acquiring data or preparing to acquire data, except as necessary for testing.

- Only electromechanical sources will be used during geophysical surveys. Electromechanical sources will be limited to boomers, chirp sub-bottom profilers, side-scan sonars, and single beam, interferometric, or multibeam depth sounders.

- Survey equipment will be operated at the lowest power setting, narrowest beamwidth, and highest frequency possible to fulfill data needs and to effectively reduce exposure and received sound levels.

- Boomers and chirp sub-bottom profilers must be operated below 205 dB re 1 µPa (rms).

- Single beam depth sounders will be operated no lower than 24 kHz.

- Side-scan sonars, interferometric, and multibeam depth sounders will be operated above 160 kHz.

- No airguns or other deep-penetrating geophysical instruments are allowed under the 2020 SARBO.

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