



**US Army Corps
of Engineers®**

Maintenance Dredging of the Atlantic Intracoastal Waterway in South Carolina

Final Environmental Assessment

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Charleston District

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Table of Contents

1	INTRODUCTION	1
1.1	Description of Document	1
1.2	Project Authorization	1
1.3	Project Description and Location	1
1.4	Purpose and Need.....	6
1.5	Prior Studies and Reports	7
1.6	O&M Changes Since 1976.....	7
1.7	Scope of the Environmental Assessment.....	11
2	ALTERNATIVES	13
2.1	Alternatives Analysis	13
2.2	Alternative A (No Action Alternative).....	15
2.3	Alternative B (Existing O&M Activities).....	16
2.4	Alternative C (Beneficial Use Placement)	16
2.5	Alternatives Considered but Eliminated	21
3	EXISTING CONDITIONS	22
3.1	Water Quality.....	22
3.2	Noise	26
3.3	Aesthetics (Visual Resources)	26
3.4	Recreation	27
3.5	Fish and Wildlife Resources	27
3.6	Benthic Organisms	28
3.7	Air Quality.....	28
3.8	Threatened and Endangered Species.....	29
3.9	Navigation	32
3.10	Climate and Climate Change	32
3.11	Essential Fish Habitat.....	33
3.12	Hazardous, Toxic, and Radioactive Waste	34
3.13	Cultural Resources.....	34
3.14	Wetlands	36
3.15	Socioeconomics and Environmental Justice	37
3.16	Coastal Barrier Resources System	38
3.17	Coastal Zone Resources.....	40
4	ENVIRONMENTAL CONSEQUENCES	41
4.1	Water Quality.....	41
4.2	Noise	42
4.3	Aesthetics (Visual Resources)	42
4.4	Recreation	43
4.5	Benthic Organisms	43
4.6	Fish and Wildlife Resources.....	44
4.7	Air Quality.....	44
4.8	Threatened and Endangered Species	45
4.9	Navigation	46
4.10	Climate/Climate Change	46
4.11	Essential Fish Habitat.....	47
4.12	Hazardous, Toxic, and Radioactive Waste	49
4.13	Cultural Resources.....	49
4.14	Wetlands	50

4.15	Socioeconomics and Environmental Justice	51
4.16	Coastal Barrier Resource System	51
4.17	Coastal Zone Resources	52
5	CUMULATIVE IMPACTS	53
5.1	Past, Present, and Reasonably Foreseeable Future Actions	53
5.2	Resource Areas Evaluated for Cumulative Effects	53
6	PUBLIC INVOLVEMENT AND COORDINATION	56
7	ENVIRONMENTAL COMPLIANCE	57
7.1	Clean Air Act of 1972	57
7.2	Clean Water Act of 1972 – Section 401 and Section 404	57
7.3	Coastal Barrier Resources Act of 1982.....	57
7.4	Coastal Management Zone Act of 1972	57
7.5	Endangered Species Act of 1973	58
7.6	Environmental Justice (EO 12898).....	58
7.7	Fish and Wildlife Coordination Act of 1934	59
7.8	Floodplain Management (EO 11988)	59
7.9	Protection of Wetlands (EO 11990).....	59
7.10	Migratory Bird Treaty Act and EO 13186.....	59
7.11	National Environmental Policy Act of 1969	59
7.12	Marine Mammal Protection Act of 1972	59
7.13	Magnuson-Stevens Fishery Conservation and Management Act	60
7.14	Executive Order 13112, Invasive Species.....	60
7.15	National Historic Preservation Act of 1966.....	60
8	COMMITMENTS	61
9	REFERENCES	70

List of Figures

Figure 1. AIWW Location Map.....	3
Figure 2. Reach 1A: Little River to Bucksport.....	4
Figure 3. Reach 1B: Bucksport to Winyah Bay.....	4
Figure 4. AIWW Reach 2: Winyah Bay to Charleston Harbor.....	5
Figure 5. AIWW Reach 3: Charleston Harbor to Port Royal.....	6
Figure 6. Profile of a typical South Carolina estuarine shoreline.....	10
Figure 7. Beneficial Use Placement Proposed Locations.....	17
Figure 8. Sediment Sample Locations and Physical Characteristics.....	25
Figure 9. Average Annual Precipitation for South Carolina.....	33
Figure 10. AIWW and DMMA locations within CBRS Unit M01.....	39
Figure 11. AIWW and dredge placement locations within CBRS Unit M05.....	39
Figure 12. AIWW dredging location within CBRS Unit M10.....	40

List of Tables

Table 1. Congressional Authorizations by Reach.....	2
Table 2. AIWW Dredging Frequency and Quantities 1976 to 2023.....	7
Table 3. Channel Realignment Locations and Dredge Quantities.....	9
Table 4. AIWW Reach 1 Shoaling and Dredge Placement Information.....	18
Table 5. AIWW Reach 2 Shoaling and Dredge Placement Information.....	19
Table 6. AIWW Reach 3 Shoaling and Dredge Placement Information.....	20
Table 7. Water Quality Classification by Location for AIWW.....	23
Table 8. 2022 303(d) List of AIWW Impaired Waters.....	24
Table 9. Threatened and Endangered Species by County.....	30
Table 10. AIWW Commercial Cargo Summary 2009 to 2019.....	32
Table 11. Federally Managed Species Occurring in South Carolina Tidally Influenced Waters.....	34
Table 12. Disadvantaged Census Tracts and Associated Burden/Socioeconomic Category.....	38

LIST OF APPENDICES

Appendix A. Prior Studies, Reports and Existing Water Projects

Appendix B. Agency and Public Correspondence

Appendix C. Biological Assessment

Appendix D. Coastal Zone Consistency

Appendix E. Section 106

Appendix F. Essential Fish Habitat

Appendix G. 404(b)(1) Analysis

Appendix H. Sediment Analysis

Appendix I. 401 Certification

List of Acronyms

AIWW	Atlantic Intracoastal Waterway
APE	Area of Potential Effect
ArchSite	South Carolina's Archaeological Site File
BMP	Best Management Practice
CAA	Clean Air Act
CBIA	Coastal Barrier Improvement Act
CBRA	Coastal Barrier Resource Act
CBRS	Coastal Barrier Resource System
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CMP	Coastal Migratory Pelagics
CZMA	Coastal Zone Management Act
CWA	Clean Water Act
dBA	Decibels
DPS	Distinct Population Segment
DMMA	Dredged Material Management Area
EA	Environmental Assessment
EFH	Essential Fish Habitat
EO	Executive Order
EPA	US Environmental Protection Agency
ER	Engineer Regulation
ESA	Endangered Species Act
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
HMS	Highly Migratory Species
HTRW	Hazardous, Toxic, and Radioactive Waste
IPaC	Information for Planning and Consultation
IPCC	Intergovernmental Panel on Climate Change
MAFMC	Mid-Atlantic Fishery Management Council
MALAA	May Affect, Likely to Adversely Affect
MANLAA	May Affect, Not Likely to Adversely Affect
MBTA	Migratory Bird Treaty Act
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Services
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NHPA	National Historic Preservation Act
NWI	National Wetlands Inventory
O&M	Operation and Maintenance
PA	Programmatic Agreement

PCBs	Polychlorinated biphenyls
PDC	Project Design Criteria
RCRA	Resource Conservation and Recovery Act
SAFMC	South Atlantic Fishery Management Council
SARBO	South Atlantic Regional Biological Opinion
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SCIAA	South Carolina Institute of Archaeology and Anthropology
SHPO	South Carolina State Historic Preservation Office
SIP	State Implementation Plan
TMDL	Total Maximum Daily Load
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Service

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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 (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, in coordination with Federal and State resource agencies, to update the original analysis of environmental impact and compliance, and to evaluate additional dredged material management alternatives to those in the April 1976 Final Environmental [Impact] Statement and Statement of Findings (FEIS/SOF), *Maintenance Dredging of Atlantic Intracoastal Waterway*. The existing NEPA document provides an evaluation of impacts from operations and maintenance (O&M) of the Atlantic Intracoastal Waterway (AIWW) Navigation Project. This EA addresses, among other things, a reduction of the overall adverse impact of AIWW maintenance dredging, as well as beneficial use additions to the disposal (or placement) alternatives originally considered. USACE believes that the changes and associated impacts evaluated in this EA are in the net beneficial and reduce overall adverse environmental impact below the level of significance, and that the proposed action does not represent either a substantial change relevant to environmental concerns or present significant new circumstances or information relevant to environmental concerns; accordingly, the intent is to issue a Finding of No Significant Impact (FONSI).

1.2 Project Authorization

The River and Harbor Act of 1937 (River and Harbors Committee Document No. 6, 75th Congress, 1st Session) authorized enlargement of the Atlantic Intracoastal Waterway (AIWW) to its present dimensions. Prior to 1937, the AIWW within South Carolina was treated as three separate projects with independent authorizations (Table 1). The three segments of the AIWW are still referred to by their original names: Little River to Winyah Bay, Winyah Bay to Charleston Harbor, and Charleston to Port Royal.

Current channel dimensions for the South Carolina portion of the AIWW provide for a waterway 12 feet deep at mean low water and not less than 90 feet wide, extending from the North Carolina/South Carolina line at Little River to and including Port Royal Sound, with a branch channel of the same dimensions to McClellanville, a total distance of 212 miles; for the construction of three bridges crossing the waterway in Horry County; and an anchorage basin 125 feet wide, 335 feet long, and 12 feet deep near Myrtle Beach. The three bridges were completed in 1936 and the waterway was completed in 1940. The anchorage basin was never completed and was deauthorized by the Water Resources Development Act (WRDA) of 1986. The AIWW project also includes a series of dredged material management areas (DMMAs) along and adjacent to the waterway.

1.3 Project Description and Location

Within the State of South Carolina, the AIWW extends 237 miles (Figure 1). The Charleston District maintains 212 miles of the AIWW beginning at the North Carolina/South Carolina state line above Little River Inlet and extending to Port Royal Sound near Hilton Head. The Savannah District maintains the remaining 25 miles from Port Royal Sound to the South Carolina/Georgia state line. Throughout South Carolina, the AIWW consists of a system of naturally deep estuaries, rivers, and sounds that have been connected by a series of man-made land cuts to provide a continuous inland navigation route.

Table 1. Congressional Authorizations by Reach

Reach 1. Little River to Winyah Bay		
Rivers & Harbor Act	Work Authorized	Documents
Jul 3 1930	A waterway 8 feet deep and 75 feet wide from Cape Fear River to Winyah Bay	HD 41, 71 st Cong., 1 st sess
Aug 30 1935	Construction of bridges across the waterway in Horry County, SC	Rivers and Harbors Committee Doc 14, 72 nd Cong, 1 st sess
Aug 26 1937	All of AIWW in South Carolina authorized to 12 feet deep and at least 90 feet wide	Rivers and Harbors Committee Doc 6, 75 th Cong, 1 st sess
Mar 2 1945	To provide an anchorage basin near Myrtle Beach, SC 12 feet deep, 125 feet wide, and 335 feet long, with connecting channel	HD 327, 76 th Cong,
Reach 2. Winyah Bay to Charleston Harbor		
Sep 19 1890	Channel from Minim Creek to Winyah Bay	Annual Report, 1889 p. 1184
Jun 13 1902	Channel from Charleston to a point opposite McClellanville	HD 84, 56 th Cong, 1 st sess and Annual Rpt, 1900, p.1908
Mar 2 1907	Branch channel to McClellanville	Annual Report, 1903 p. 1133
Mar 2 1919	Extending the channel to Minim Creek, thence through the Estherville-Minim Creek Canal to Winyah Bay	HD 178, 63 rd Cong, 1 st sess
Mar 3 1925	Cut across the Santee Delta at Four Mile Creek	HD 237, 68 th Cong, 1 st sess
Aug 30 1935	Enlarging the channel from Winyah Bay to Charleston, including the branch channel to McClellanville, to a depth of 10 feet and bottom width of 90 feet	Rivers and Harbors Committee Doc 11, 72 nd Cong, 1 st sess
Aug 26 1937	All of AIWW in South Carolina authorized to 12 feet deep and at least 90 feet wide	Rivers and Harbors Committee Doc 6, 75 th Cong, 1 st sess
Reach 3. Charleston to Port Royal		
Mar 3 1881	Wappoo Cut: 7 x 200 feet across Ashley River Bar and 6 x 60 feet from there to Stono River. Revision of 1888 includes revetting Elliott's Cut.	H Ex Doc 19, 46 th Cong, 3 rd sess and Annual Report, 1881 p.1069. Revision: Annual Report, 1889 p. 1196
Sep 19 1890	Brickyard Creek, or Beaufort River, 7 feet x sufficient width channel in Brickyard Creek	Annual Report, 1890 p. 1235
Jul 13 1892	Revised widening and straightening of Brickyard Creek	
Jun 13 1902	Fenwick Cut: 7 x 90 feet cut connecting S. Edisto and Ashepoo Rivers	H Ex Doc 117, 50 th Cong, 1 st sess and Annual Report, 1888 p.999
Mar 3 1925	Entire waterway from Charleston to Beaufort authorized as 7 x 75 feet project, with cutoffs in Wappoo Creek and between Dawho and S. Edisto Rivers	SD 178, 68 th Cong, 2 nd sess
Jul 3 1930	Abbapoola and Russell Creeks, tributary channels, improved 3 x 40 feet, for 5 and 4.2 mi from mouths, respectively	Section 3 permitted improvement of tributaries to already authorized waterways
Aug 30 1935	7 x 75 feet cutoff between Ashepoo and Coosaw Rivers	HD 129, 72 nd Cong, 1 st sess

For O&M purposes, Charleston District has divided the AIWW into three reaches; however, since a portion of reach 1 follows the Waccamaw River and does not require dredging, reach 1 is separated into two sub-reaches:

Little River to Winyah Bay. The first section of this reach (1A) begins at the Little River Inlet at the North Carolina/South Carolina state line and passes through the 26-mile Pine Island Cut before entering the Waccamaw River near Bucksport (Figure 2).

The second section (1B) extends from Bucksport to Winyah Bay near Georgetown (Figure 3). Dredging does not occur in this reach.

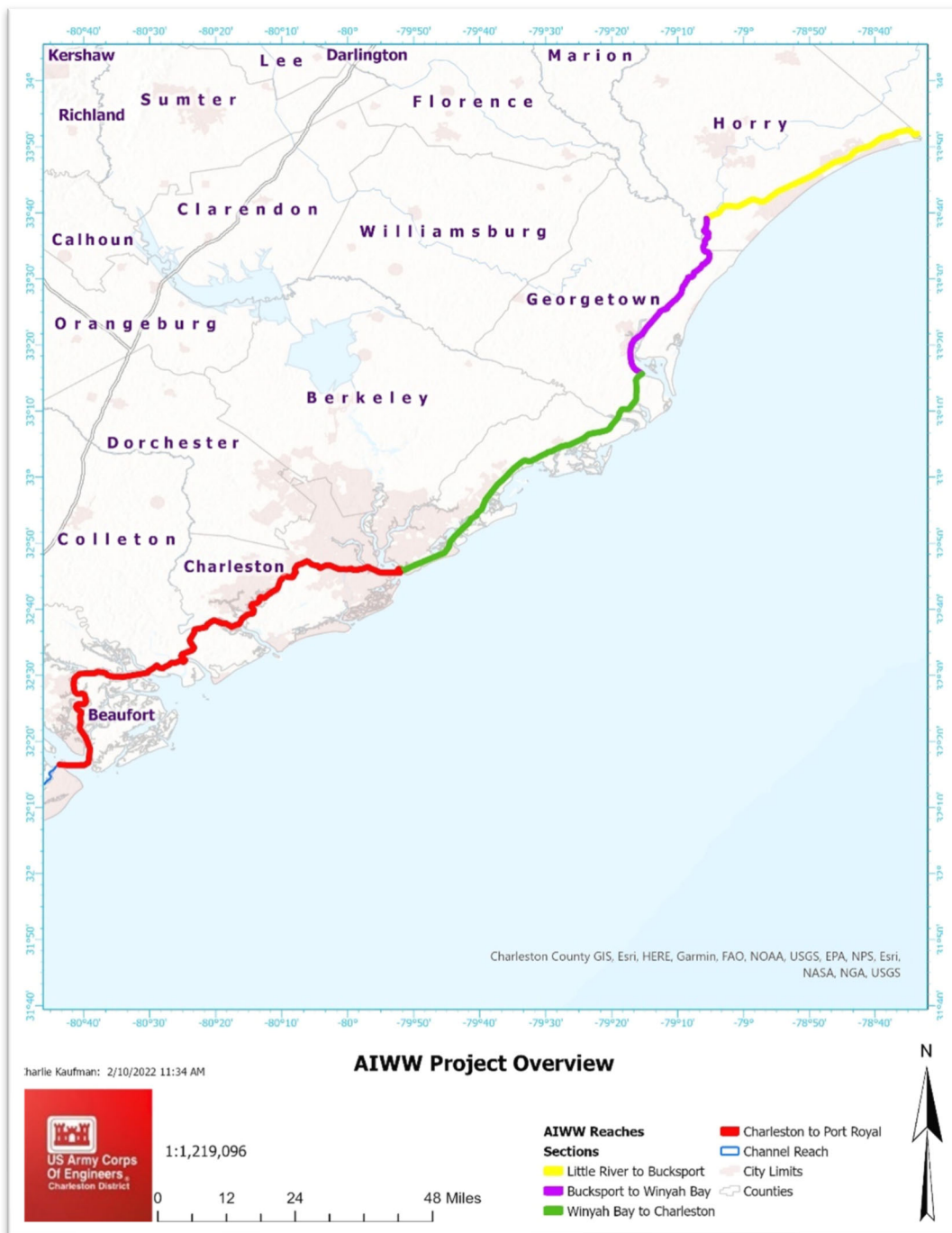


Figure 1. AIWW Location Map



Figure 2. Reach 1A: Little River to Bucksport

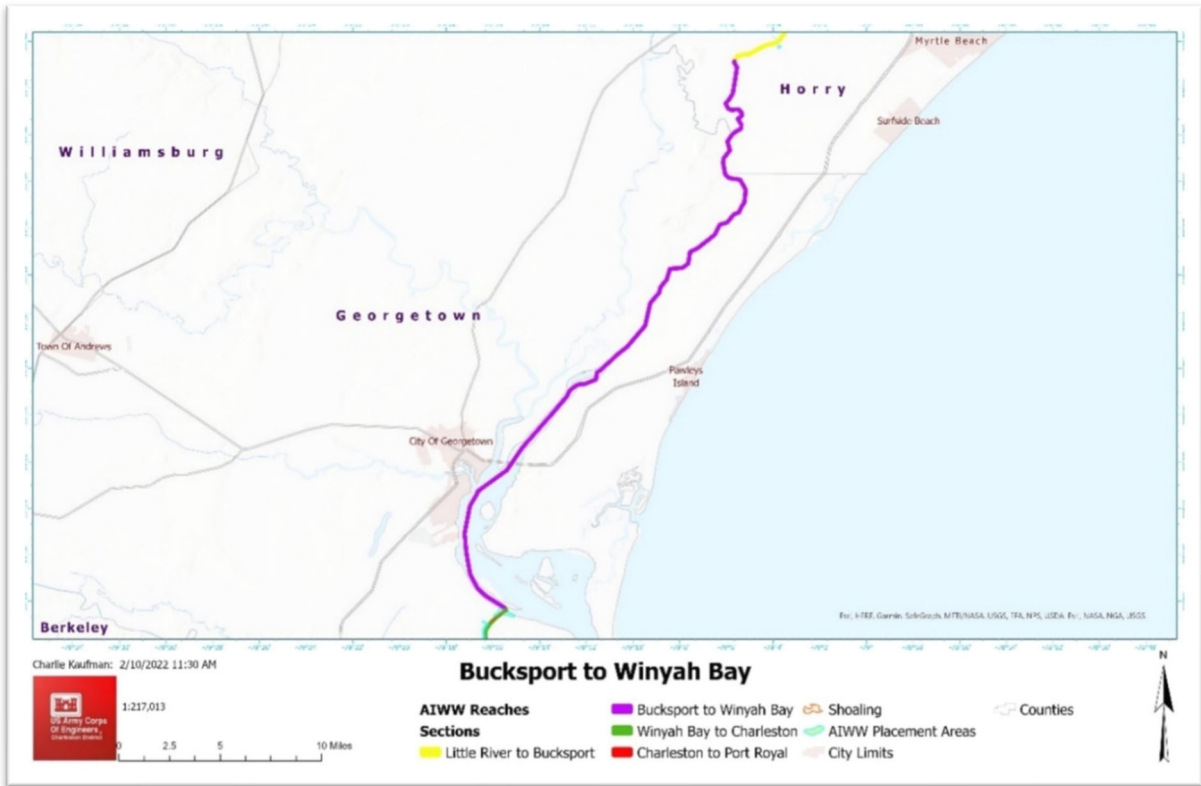


Figure 3. Reach 1B: Bucksport to Winyah Bay

Winyah Bay to Charleston Harbor. Reach 2 begins at Winyah Bay and extends to the Charleston Harbor. From Winyah Bay, it flows through Minim Creek canal, Four-mile Creek, and Alligator Creek through a land cut to McClellanville. From McClellanville, it passes through Matthews Cut, Harbor River, Graham Creek, and a landcut to Price Creek. From Price Creek, it passes north of Capers Island and through Bullyard Sound before moving north of Dewees Island and Sullivans Island and into Charleston Harbor (Figure 4).

Charleston to Port Royal. Reach 3 begins at Charleston and extends 70 miles to Port Royal Sound. From Charleston Harbor, the AIWW flows through Wappoo Creek and Elliott Cut and into the Stono River. From the Stono River, the waterway continues to Wadmalaw River, then passes through the Dawho River and North Creek and into the South Edisto River by way of Watts Cut. From the South Edisto River, it passes through Fenwick Cut, the Ashepoo River and the Ashepoo-Coosaw Cutoff into the Coosaw River. From the Coosaw River, it flows into Brickyard Creek and the Beaufort River to Port Royal Sound (Figure 5).

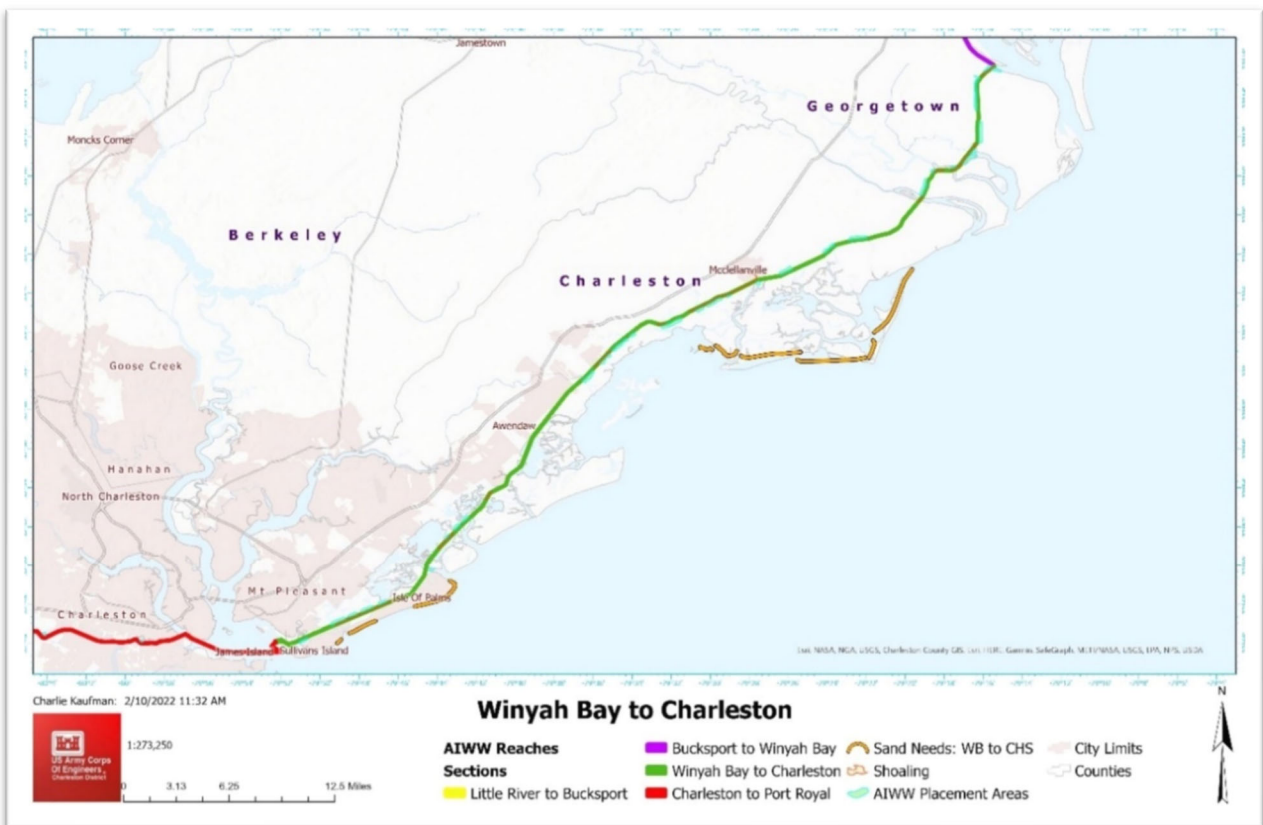


Figure 4. AIWW Reach 2: Winyah Bay to Charleston Harbor

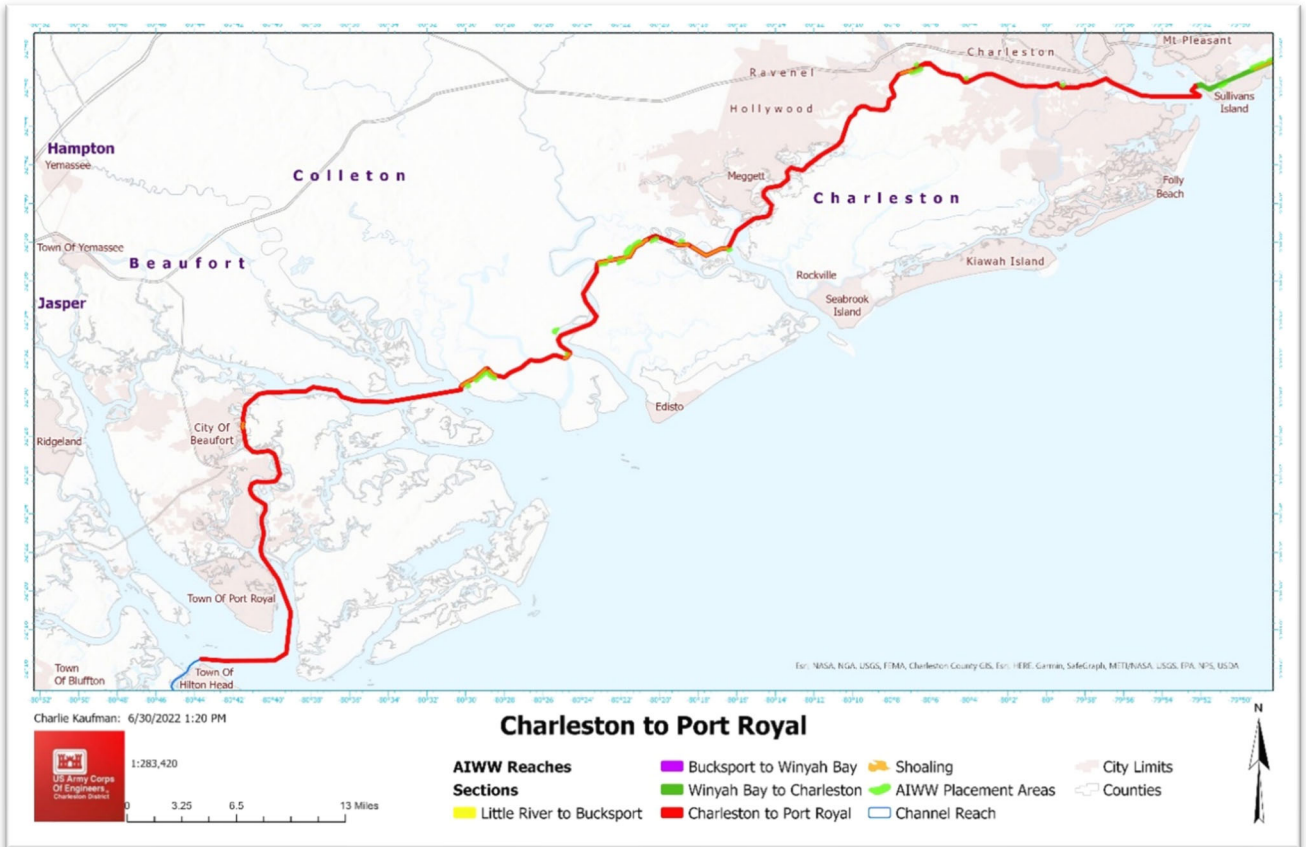


Figure 5. AIWW Reach 3: Charleston Harbor to Port Royal

1.4 Purpose and Need

The purpose of the AIWW Navigation Project is to ensure safe and unobstructed navigation of the AIWW beginning at the North Carolina/South Carolina state line and extending to Port Royal, South Carolina (Figure 1). The need for maintenance dredging is driven by the accumulation of sediments, commonly referred to as shoaling, which restricts safe and efficient navigation for commercial and recreational vessels. Maintenance dredging is also subject to the availability of funds.

Dredged material management is a key part of maintenance dredging. In addition to the placement of dredged material within 90 existing DMMAs and two existing in-water placement sites, material will be placed for beneficial use (BU) along the beaches and nearshore of Sullivan’s Island and Isle of Palms. Section 125 of the Water Resources Development Act (WRDA) of 2020 requires the Assistant Secretary of the Army for Civil Works to maximize the BU placement of dredged material obtained from construction and O&M of USACE water resource development projects. BU practices can reduce the financial cost of dredged material placement while providing the following opportunities: increase shoreline resilience; improve and maintain habitat for sea turtles, shorebirds, and invertebrates; and protect coastal marsh resources from the effects of sea level rise. Therefore, there is a need to use dredged material to benefit nearby coastal resources.

1.5 Prior Studies and Reports

Since authorization in 1937, numerous studies and reports have been conducted in connection with the AIWW, including the 1976 FEIS/SOF, along with a 2006 EA/FONSI (specific to dike repair of Placement Site 1006/1027S W-C). Other prior studies, reports, and existing water projects related to the AIWW are briefly described in Appendix A.

1.6 O&M Changes Since 1976

Dredging History 1976 to Present. There has been a substantial reduction in the frequency of maintenance dredging and volume of dredged material placement from that anticipated in 1976. Table 2 below lists the dredging amounts by reach and year for the period 1976 to 2023. At the time of the 1976 NEPA analysis, USACE expected to dredge the waterway on an annual basis. It was and is not feasible or necessary to conduct maintenance dredging on an annual basis; therefore, dredging events are now prioritized based on need and availability of funding. Currently, reach 1A from Little River to Bucksport is dredged only as needed, and reach 1B from Bucksport to Winyah Bay is never dredged since the current channel depth in that area exceeds the authorized depth. Reach 2 and reach 3 are dredged approximately every 3 years on average. Specific shoaling areas may require a 2-year cycle where others may require a 4-year cycle.

Upland Dredged Material Management Areas. There has also been a substantial reduction in the DMMA footprint and acreage. When the waterway was constructed in the mid-1930s, the State of South Carolina obtained placement area easements along the waterway. The easements ran parallel to the waterway on one side or another, extending back about 1,000 feet from the edge of the water and dredged materials were pumped along this area. In the beginning, small dikes were occasionally constructed to prevent material from returning to the waterway; however, after a few years it was determined this was not sufficient so the DMMA's are now surrounded by dikes.

Table 2. AIWW Dredging Frequency and Quantities 1976 to 2023.

Year	Little River to Bucksport (yd ³)	Winyah Bay to Charleston (yd ³)	Charleston to Port Royal (yd ³)	Little River to Port Royal (yd ³)
1976	474636	1063343	646522	0
1977	179309	452367	0	0
1978	147209	1540187	478976	0
1979	0	0	0	890,107
1980	0	0	0	1,449,452
1981	0	0	0	276,068
1982	0	1,542,076	550,374	0
1983	1,421,130	0	0	0
1984	239,234	0	844,320	0
1985	0	878,513	0	0
1986	0	1,045,520	0	0
1987	0	0	0	0
1988	0	0	0	0
1989	0	1,098,845	503,204	0
1990	0	0	0	0
1991	0	0	0	0
1992	0	1,217,116	0	0
1993	0	80,263	0	0

1994	0	0	722,940	0
1995	0	90,000	0	0
1996	0	2,054,241	0	0
1997	0	0	721,134	0
1998	0	0	1,002,241	0
1999	0	678,980	0	0
2000	0	581,465	0	0
2001	41,006	0	0	0
2002	266,486	0	0	0
2003	0	0	0	0
2004	0	0	399,989	0
2005	0	607,900	345500	0
2006	0	0	0	0
2007	0	0	0	0
2008	0	121,700	243,000	0
2009	0	0	0	0
2010	0	649,000	303,400	0
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
2014	0	0	0	0
2015	0	0	0	0
2016	0	368,997	0	0
2017	0	0	0	0
2018	0	0	892,874	0
2019	0	1,327,649	0	0
2020	0	0	0	0
2021	0	0	0	0
2022	0	0	0	0
2023	0	0	630,000	0

In 1980, USACE conducted a study to review past dredging requirements and evaluate the need for placement areas in Horry County. The study determined that nearly 66 percent of the land held in easements in Horry County could be considered excess to project needs and USACE proposed a relinquishment program. In August 1981, the South Carolina Coastal Council (now South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management), the state agency which acts on behalf of the State of South Carolina on matters related to the AIWW, signed an agreement with Horry County which would allow Horry County to act as co-sponsor for that portion of the AIWW lying within Horry County. The county was unsuccessful in implementing the necessary 50-year placement plan due to the amount of real estate required. In December 1983, a tri-party agreement was signed between USACE, Horry County, and the South Carolina Coastal Council that further reduced the placement area acreage. This plan provided for small permanent placement areas which would be maintained by Horry County. As a result, only about 600 acres of the original 5,754 acres of placement area easements in Horry County were retained.

Channel Realignments. Channel realignments have further reduced maintenance dredging requirements. In 2022, six sections of Reach 3, totaling 272 linear feet, were realigned to reduce maintenance dredging needs. Realignments follow the natural thalweg, or deepest location of the channel which reduces the need for dredging in these areas (Table 3).

Since realignment, the Younges Creek, Ashepoo River, and Beaufort areas are not expected to require future dredging. Shoaling is still expected at the Dawho, Rock Creek and Brickyard Creek locations; however, the realignments will reduce overall dredge quantities in these three areas (per dredging event) by approximately 60 percent. For each future dredging cycle, the realignments are anticipated to reduce total dredging quantities by 500,000 cubic yards (yd³) for a cost savings of approximately \$3,500,000.00. A cultural resources survey of the alignment areas was performed in 2021 and coordinated with the State Historic Preservation Office (SHPO) and federally recognized tribes (Appendix E).

Table 3. Channel Realignment Locations and Dredge Quantities

Realignment Area	Station Numbers	Previous Dredging Quantity (each dredging cycle - yd³)	Expected Future Dredging Quantity (each dredging cycle - yd³)
Dawho	8278 – 8396	321,623	60,158
Ashepoo River	9131 – 9173	64,649	0
Rock Creek	9234 - 9322	124,637	55,000
Brickyard Creek	9970 - 10000	54,434	19,024
Younges Creek	7878-7912	32,740	0
Beaufort	10401-10461	44,798	0

DMMA Maintenance Strategies. Maintenance strategies typically involve stabilization measures intended to maintain the integrity of dikes, minimize erosion, and improve slope stability along shorelines. Selection of a particular method for necessary maintenance is dependent on the location of the erosion, repair schedule, and funding. Since 1976, DMMA maintenance strategies have evolved to include increased potential for natural and nature-based approaches.

Living Shorelines. South Carolina Code of Regulations R.30-12.Q refers to living shorelines as a shoreline stabilization approach used in intertidal wetland environments that maintains, restores, and/or enhances natural estuarine process through the strategic placement of native vegetation and/or use of green infrastructure. As such, living shorelines in coastal South Carolina are usually constructed as sills parallel to the shoreline at the marsh-water interface, or more specifically between the low and high tide lines, to stabilize estuarine shorelines (see Figure 6). Along the AIWW, living shoreline sills align upland placement areas to absorb wave energy and trap sediments behind the sill. This stabilizes the shoreline of the AIWW and reduces undercutting of upland placement areas, which can lead to breaches in dikes and losses of dredged material back into the waterway.

Living shoreline techniques commonly practiced in South Carolina today typically incorporate natural materials such as native marsh vegetation, coir logs, and oyster shells or other materials that promote the formation of oyster reefs, including oyster castles or manufactured wire reefs (e.g., concrete-coated crab traps) (SCDNR 2019). In the past, USACE has constructed “hybrid” living shorelines (see revetments and rock sills below); however, these structures typically require hard structure materials which can increase project cost. The preferred method of stabilization for AIWW maintenance uses oyster shells that would attract native oysters (*Crassostrea virginica*) to

build shellfish reefs. Oyster recruitment to suitable substrate is high in South Carolina waters from April to September. Because oysters thrive in the intertidal zone in South Carolina they are extremely suitable for providing vertical relief and trapping sediments to stabilize shorelines at the marsh-water interface (SCDNR 2019).

The typical height of oyster reef-based living shoreline sills is 1-2 feet, depending on the materials used and vertical growth of the living reef over time (SCDNR 2019). The specific technique and materials for the living shoreline sills at a particular location in the AIWW would be based on site attributes for suitability, including the energy level from waves and currents, salinity, width and slope of the bank, sediment firmness, and sediment composition.

Living shorelines constructed for the AIWW would meet the definition and project standards for living shorelines found in sections R.30-1D (31) and R.30-12.Q of state regulations S.C. Code Sections 48-39-10 et seq. Construction of typical reef-based living shorelines in South Carolina is considered low-impact. Heavy equipment is not generally used. Construction would likely occur from the waterside with small, shallow boats to reach the intertidal zone to avoid damage to the marsh during construction. While unlikely, any lost marsh vegetation due to construction would be replaced. Construction is limited to times of low tide for proper placement. As with other AIWW maintenance measures, living shoreline sills are routinely inspected and repaired as needed.

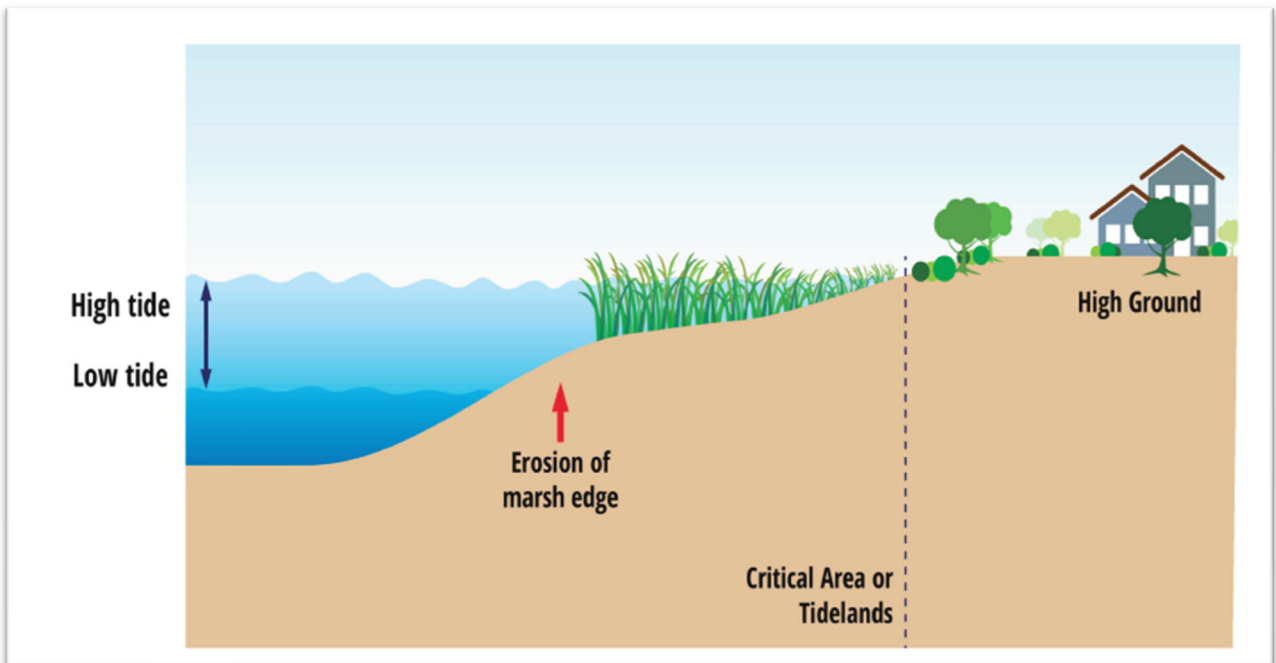


Figure 6. Profile of a typical South Carolina estuarine shoreline

The red arrow depicted in Figure 6 indicates the area of erosion concern where living shoreline sills would typically be placed in coastal South Carolina to reduce loss of the marsh edge. Along the AIWW, the area shown as “High Ground” in the figure is where upland areas would be found (SCDNR 2019).

Revetments. A structural measure involving the placement of stone over the slope of a shoreline to protect from erosion. Materials that may be used include concrete, stone or rubble, and gabion baskets. This method generally requires little maintenance and has an indefinite lifespan; however, revetments may contribute to the loss of intertidal habitat (UMA 2017).

Rock Sills. Rock sills, also called marsh sills, are a type of hybrid living shoreline technique used to address eroding marsh along shorelines of a waterway (UMA 2017). The structures are typically placed parallel to the shoreline and consist of quarry-run granite rock. In 2006 two rock sill were installed at placement area 1006/1027S W-C, located along the AIWW by the Isle of Palms connector in Charleston County, to address significant erosion along the shoreline and marsh that could lead to failure of the dike at the disposal area (USACE 2006). While the rock sills proved successful in restoring and protecting approximately 1500 linear feet of shoreline, the total footprint of the two rock sill segments was approximately 1.2 acres, and the project was generally determined too costly for use as a future maintenance strategy.

1.7 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 environmental impacts to the following resources:

- Water Quality
- Noise
- Visual Resources (Aesthetics)
- Recreation
- Benthic Organisms
- Fish and Wildlife Resources
- Air Quality
- Threatened and Endangered Species
- Navigation
- Climate and Climate Change
- Essential Fish Habitat
- Hazardous, Toxic, and Radioactive Waste
- Cultural Resources
- Wetlands
- Socioeconomics and Environmental Justice
- Coastal Barrier Resources System
- Coastal Zone Resources

Resources that were not considered relevant to the evaluation of placement (or disposal) alternatives or otherwise requiring updates were identified through a preliminary screening process. The following describes resources not carried forward for a detailed analysis, along with the rationale for their elimination.

Land Use. Land use typically refers to human alteration of the natural environment for the purpose of development, agriculture, or recreational enjoyment, and is typically regulated by local ordinances, management plans and government regulations. Under the modifications to placement alternatives considered, dredging activities would occur in the AIWW channel, no new upland or in-water placement areas are proposed, and BU placement activities would occur along beaches and nearshore of Sullivans Island and Isle of Palms. No land use changes would occur.

Safety and Occupational Health. Safety and Occupational Health concerns the health, safety, and protection of people in the workplace. The alternatives would not involve human exposure to asbestos, radiation, or chemicals. Work would be conducted on dredging vessels where all applicable safety regulations and policies would be implemented to avoid endangerment or unusual risk to personnel. No adverse effects on safety or occupational health are expected.

Geologic Resources. The affected environment is located within the Lower Coastal Plain of South Carolina and the Sea Island Coastal Region. River bottoms, swamps, marshes, and tidal flat features in this region were formed during the Holocene Period and contributed to the physiographic structure of the modern coastline. The alternatives considered would involve removal of substrates within the navigation channel; however, routine maintenance dredging of the AIWW in South Carolina has been ongoing since the 1940s and no changes to authorized depth are being proposed. Therefore, under the considered modifications to placement alternatives, no impacts to Geologic Resources are anticipated.

2 ALTERNATIVES

2.1 Alternatives Analysis

The action alternatives (Alternatives 2 and 3) in this alternatives analysis do not revisit the dredging of the AIWW for maintenance purposes (see 1.6. O&M Changes Since 1976 for a discussion of the substantial reduction in maintenance dredging), but instead focus on dredged material management (DMM) of the material removed through maintenance dredging. These alternatives include modifications to alternatives considered in the original 1976 EIS (Alternatives 2 and 3), as well as additional beneficial use alternatives (Alternative 3). The No Action alternative would be to forego dredging of the AIWW for maintenance purposes. Under either action alternative, the vast majority of maintenance material removed through dredging will continue to be placed in existing upland DMMAs. Environmental analysis and compliance for maintenance dredging using existing DMMAs will be updated in the context of Alternative 2. Some discussion of dredging equipment and dredged material transport is included as it relates to dredged material management.

Alternatives considered for DMM of the AIWW were evaluated based on compliance with environmental laws and regulations, compliance with executive orders, impacts to the environment, cost effectiveness, engineering feasibility, and the ability of the alternative to meet the purpose and need of the project. Alternatives were also evaluated for consistency with *the Federal standard* (see 33 C.F.R. Parts 335-338). The Federal standard is the dredged material placement alternative or alternatives identified by USACE which represent the least costly alternatives consistent with sound engineering practices and environmental standards established by the 404(b)(1) evaluation process or ocean dumping criteria. In reviewing alternatives, 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. Alternatives that were evaluated and eliminated are discussed below and in Section 2.4. Only the Proposed Action Alternative was found to meet the criteria outlined above. The No Action Alternative, while it would not meet the purpose and need for action, was included in the evaluation to provide a baseline for environmental impacts, as required by NEPA.

2.1.1 Dredging Methods and Equipment. This section provides information on the various types of dredging methods considered during development of alternatives.

Hydraulic Cutterhead Dredge. Hydraulic dredging utilizes suction to remove sediments from the channel bed. The hydraulic cutterhead dredge utilizes a rotating tool mounted in front of the suction head that separates and excavates sediments. The material is then transported hydraulically via a pipeline to a placement site. In the past, Charleston District has utilized hydraulic cutterhead for maintenance dredging of the AIWW due to the waterway's proximity to placement areas.

Hopper Dredge. A hopper dredge is a ship equipped with trailing suction pipes, dredge pumps, and a hopper. The trailing suction pipes are equipped with a drag head that moves over the ocean floor or channel bed to suction sediments and create a slurry. Dredge pumps are used to hydraulically transport the slurry to the hopper for storage and excess water is then allowed to drain from the hopper. Once the hopper is full, the material can be discharged from the bow of the ship using a nozzle, pumped via surface or underwater pipes to a placement area, or deposited through doors located in the bottom of the vessel.

Mechanical Dredge. Mechanical dredging utilizes heavy equipment such as excavators to remove sediment from the channel bed. The heavy equipment is placed on a barge or on the

banks of the waterway and the dredge material is transported offsite for placement. Mechanical dredges allow greater mobility which makes this type of dredging well suited for projects that require precision. Mechanical dredges are typically used when the placement area is too far away to effectively pump materials.

2.1.2. Advance, Allowable, and Overcut Beyond Allowable Depth. There are several optional improvements that can be made to channel dimensions to compensate for variability in shoaling and equipment inaccuracies. Advance dredging refers to dredging depths beyond the authorized depth to account for excess shoaling that occurs between dredging cycles. Allowable dredging depth is generally ± 2 feet beyond the maximum or advance depth to account for the inherent variability and inaccuracy of dredging equipment. Overcut may refer to dredging along the sides of the channel to address potential movement of material down the sides of the channel or an overcut may occur throughout the channel bottom because of furrowing or pitting by the dredging equipment.

2.1.3. Transport of Dredged Material. For the AIWW, dredged material is typically transported via hydraulic pipeline to the placement areas. Due to the proximity between the shoaling locations and placement areas, hydraulic pumping via pipelines would be the preferred, cost-effective approach. Depending on the distance between the dredge site and the placement area, booster pumps may be necessary to facilitate transport of material. Other methods of transport considered include hopper dredge (Section 2.1.1) or barge. A barge is a flat bottom boat used for carrying materials and that travels either under its own power or is towed by another vessel.

2.1.4. Dredged Material Placement Activities.

This section describes potential alternatives for placement of dredged material.

Confined Placement of Dredged Material. Confined placement involves placement of dredged material within confined facilities generally known as DMMAs. Dikes are used to contain the dredged material. Currently, dredged material is pumped from the AIWW to the diked containment area via hydraulic dredge. Treatment of dredge material prior to placement in upland DMMAs is not required since dewatering occurs within the facility. Once the diked containment area nears its original design capacity, dikes are raised to allow additional capacity. Currently there are approximately 90 active confined placement facilities where materials dredged from the AIWW could be placed.

Unconfined Placement of Dredged Material. Unconfined placement typically involves depositing dredged material where there are no confining structures. In-water placement refers to depositing dredged material into surface waters such as lakes, rivers, and estuaries. Currently there are two existing in-water sites in use for the AIWW in South Carolina. These approved in-water placement sites have been in use since the 1970s.

In-water site 1 is located at Dewees Inlet between Winyah Bay and Charleston. The placement area is approximately 15.1 acres in size. The depth is unknown.

In-water site 2 is located at the North Edisto River between Charleston and Port Royal. The placement site is approximately 20.4 acres in size and 26 feet deep. Typically, no material is discharged at depths above 20 feet mean low low water (MLLW).

Ocean Placement of Dredged Material. This placement method requires use of a United States Environmental Protection Agency (USEPA) designated ocean dredged material disposal site (ODMDS). Material dredged from a waterway is typically transported to the ODMDS via seagoing barge.

Beneficial Use Placement. This method provides for placement of uncontaminated dredge material as a resource to achieve environmental and/or economic benefits and may include beach placement, nearshore placement, fish and wildlife habitat creation, or upland placement. The Federal Government has placed considerable emphasis on using dredged material in a beneficial manner. As early as 1968, USACE established a policy to beneficially use dredged material for various purposes including beach nourishment and/or erosion control. Congress further enhanced the use of dredged material for beach fill projects under Section 145, WRDA 1976, as amended by Section 933, WRDA 1986 (Vallianos 1990). Other statutes such as WRDA 1992, 1996, 2000, 2007 and most recently Section 125 (c) of WRDA 2020, demonstrate that BU placement has been a Congressional priority for many years. USACE has also emphasized the use of dredged material for beneficial use through such regulations as 33 CFR Part 335, Engineer Regulation (ER) 1105-2-100, ER 1130-2-520 and by Policy Guidance Letter No. 56. ER 1105-2-100 provides that “*all dredged material management studies should include an assessment of potential beneficial uses for environmental purposes including fish and wildlife habitat creation, ecosystem restoration and enhancement and/or hurricane and storm damage reduction.*”

Fish and Wildlife Habitat Creation involves the use of dredged sediments to create or maintain marine wildlife habitats. Examples could include upland habitats or nesting islands for birds, aquatic habitats for fish and benthic organisms, and mudflat nourishment and marsh recharging through thin layer placement. Thin layer placement uses a nozzle to spray a thin layer of dredge sediments onto existing marsh or mudflats to restore elevation lost through subsidence or to provide a buffer to sea level rise. An added benefit of mudflat nourishment and marsh recharge projects is their potential to contribute to flood protection. USACE is investigating the feasibility of marsh recharge at a site near Graham Creek. USACE would coordinate with Federal and state agencies and conduct NEPA analysis prior to proceeding with design and implementation.

Upland Placement involves placing dredged sediments in upland areas to support the construction industry, agriculture or forestry industry, or recreation.

Nearshore Placement involves the placement of dredged material along eroding shorelines to restore or enhance nearshore profiles and/or beaches. Material is typically placed in a shore-parallel form in shallower water to facilitate migration of sediments onshore.

Beachfront Placement. This placement option would occur only in circumstances where funding, equipment/contractor availability, and appropriate beach conditions permit. Backshore placement (from the limit of high-water foam lines to dunes) is costly, logistically intensive, and mostly beneficial where erosional hotspots persist along beach profiles. Foreshore placement (between the normal high and low tide lines) is slightly less dependent on these circumstances.

Re-handling. Rehandling involves using previously dredged sandy sediments located in upland DMMA's. Rehandling would occur when adequate volumes are available and erosional hotspots exist in the project area. This method typically requires the addition of water to turn the material back into a slurry for removal.

2.2 Alternative A (No Action Alternative)

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, maintenance dredging of the AIWW by USACE would cease. This alternative would also exclude the placement of dredged material from the AIWW into existing DMMA's and in-water placement areas, and maintenance strategies would no longer be conducted. Sediment could continue to accumulate in shoaling

locations in the waterway, restricting commercial and recreational vessel traffic. Eventually the waterway could become impassable for larger vessels. Bank erosion along the shoreline adjacent to existing DMMA's would continue and could eventually result in dike failures with large quantities of dredge spoil spilling into the waterway.

2.3 Alternative B (Existing O&M Activities)

Alternative B would continue O&M activities for the AIWW including maintenance dredging of the waterway with dredged material placement into existing confined (DMMA's) and unconfined (in-water) placement sites (see Sections 1.6 and 2.1.4 above). Maintenance dredging would occur by means of a hydraulic cutterhead dredge that would transport dredged materials through a pipeline to be discharged as a slurry. Tables 4-6 below provide detailed information on shoaling locations, dredging frequency, dredged material amounts, and dredged material placement locations.

2.4 Alternative C (Beneficial Use Placement)

Alternative C is similar to Alternative B but also includes beneficial use (BU) placement of dredged sediments along the beaches and nearshore areas at Sullivan's Island and Isle of Palms (Figure 7). Under Alternative C, sand provided for beach or nearshore placement would either come from (1) the approximately 500,000 yd³ of shoaling identified for dredging in the Breach Inlet reach of the AIWW; or (2) 200,000-400,000 yd³ of material derived from dredged sediments previously placed at Breach Inlet DMMA's. The expected frequency of dredging cycles for Breach Inlet is every 2 years and material would be placed similarly in future cycles depending on dredged sediment composition, placement area (beach or nearshore), DMMA capacity, equipment and contractor availability, and availability of funding. Sediment dredged from Breach Inlet that is beach-quality sand (i.e., sediment containing ≥80% sand for the purposes of this project) would be used for beach placement. Sediment not considered beach-quality sand but composed of 60-79% of sand may be used for nearshore placement. Any dredged sediment consisting of <60% sand would not be suitable for beach or nearshore placement.

Sediments dredged from the waterway would be transported via pipeline to the beach and nearshore areas. If it is deemed necessary to utilize pipelines placed on the sea floor for transport, they must either be of sufficient weight to remain in place or be anchored or weighted. Floating pipelines are typically anchored to the sea floor and may require booster pumps if the length of the pipeline is too long for the dredge to push the material to the placement location. Pipelines are typically placed in the same pipeline corridor for each recurring event to minimize potential damage to resources in the area.

In 2021, twenty composite sediment samples were collected at various shoaling locations along the waterway (Appendix H). Sediment composition analyses performed on samples obtained from Breach Inlet shoaling areas show higher proportions of sand in subsamples from the western half of the shoaling area, and progressively more fines in eastern portions. As the cutterhead dredge moves eastward along the shoal, visual observation, in addition to sediment sampling information, will determine when sediment placement will shift from beach to nearshore.

Sand derived from dredged sediments previously placed at existing Breach Inlet DMMA's would be extracted from one of five existing sites (re-handling): 1006S W-C, 1028S W-C, 1056S W-C, 1088S W-C, and 1110S W-C. Rehandling may be accomplished by methods bidders deem appropriate. Potential options include but are not limited to: (1) excavation of material in the DMMA using traditional land-based equipment, loading material onto barges, and hydraulic pumping to the nearshore; and (2) excavation of material via small hydraulic cutterhead dredge inside of placement areas with pipeline transportation to the nearshore. Water would be pumped from the

AIWW into the barge for option 1 to turn the material back into a slurry to be discharged into the nearshore. Likewise, for option 2, water would be pumped from the AIWW into the placement area for the sand to be hydraulically pumped by the dredge.

In 2023, 13 composite sediment samples each were collected from the 5 Breach Inlet DMMAs. The physical analysis of these samples indicates that 4 of the 5 DMMAs contain predominately fine sand that is suitable for beach or nearshore placement.

The BU options being pursued at this time involve nearshore and beach placement options. In the future, should the opportunity to implement other BU options become available, USACE would coordinate these activities with federal and state agencies, and NEPA would be updated, as appropriate.



Figure 7. Beneficial Use Placement Proposed Locations

Table 4. AIWW Reach 1 Shoaling and Dredge Placement Information

Little River to Bucksport						
Stations: 0+00 to 1930+00						
Mileage: 36.55 miles						
Shoal Identifier	Start Station	End Station	Dredge Frequency (months)	Estimated Quantity (cy)	Upland DMMAs	In-water DMMAs
Day Marker 22A	1085+00	1100+00	48	10000	1152 L-B	None
Unidentified	N/A	N/A	As Needed, primarily based on extreme events	As Needed	55, 64, 92, 110, 179, 200, 214, 320, 389, 444, 487, 536, 563, 688, 745, 810, 892, 1002, 1046, 1092, 1152, 1255, 1302, 1390, 1430, 1480, 1610, 1750, 1860 L-B	None
Bucksport to Winyah Bay						
Stations: 1930+00 to 3691+00						
Mileage: 33.35 miles						
Shoal Identifier	Start Station	End Station	Dredge Frequency (months)	Estimated Quantity (cy)	Upland DMMAs	In-water DMMAs
Not Applicable	N/A	N/A	N/A	N/A	None	None

Table 5. AIWW Reach 2 Shoaling and Dredge Placement Information

Winyah Bay to Charleston						
Stations: 3691+00 to 6510+00						
Mileage: 53.39 miles						
Shoal Identifier	Start Station	End Station	Dredge Frequency (months)	Estimated Quantity (cy)	Upland DMMAs	In-water DMMAs
Unidentified	N/A	N/A	As Needed, primarily based on extreme events	As Needed	775N, 716N, 697N W-C	None
South Island Ferry	3698+00	3744+00	36	100,000	1511N, 1505N, 1500N, 1496N, 1450N, 1421N, 1370N W-C	None
Minim Creek	3956+00	3997+35	36	100,000	1270N, 1229N, 1190N W-C	None
Little Crow Island	3997+35	4050+00	36	140,000	1270N, 1229N, 1190N W-C	None
North Santee River	4053+00	4066+00	36	25,000	1229N, 1190N, 1156N W-C	None
Four Mile Creek	4084+00	4109+00	48	50,000	1156N, 1103N, 1058N, 1027N W-C	None
South Santee River	4195+00	4216+00	48	22,000	1058N, 1027N W-C	None
Jeremy Creek	00+45	42+77.95	24	200,000	562N, 488N W-C	None
Mathews Cut	4723+18	4926+00	36	730,000	488N, 402N, 364N, 341N, 310N, 225N, 204N W-C	None
Awendaw Creek	5000+000	5020+00	36	45,000	225N, 204N W-C	None
Graham Creek	5179+00	5244+00	36	180,000	106N, 78N, 55N, 39N, 19N, 13N, 41S W-C	None
Capers Island	5730+00	5758+00	48	75,000	612S, 645S W-C	None
Deweese Island	5896+00	5957+00	48	245,000	612S, 645S, 690S W-C	810S W-C (Deweese Inlet)
Breach Inlet	6163+00	6341+00	24	500,000	970S, 1006S, 1028S, 1056S, 1088S, 1110S, 1207S W-C	810S W-C (Deweese Inlet)

Table 6. AIWW Reach 3 Shoaling and Dredge Placement Information

Charleston to Port Royal						
Stations: 6510+00 to 11282+08						
Mileage: 90.38 miles						
Shoal Identifier	Start Station	End Station	Dredge Frequency (months)	Estimated Quantity (cy)	Upland DMMAs	In-water DMMAs
Unidentified	N/A	N/A	As Needed, primarily based on extreme events	As Needed	104, 395, 540, 580 C-P	None
Rantowles	7390+00	7424+00	48	50,000	532 C-P	None
Upper Dawho River	8274+00	8381+00	Recently realigned	Recently realigned	1590 C-P	1440 C-P (North Edisto River)
Lower Dawho River	8391+00	8431+00	24	45,000	1590 C-P	1440 C-P (North Edisto River)
Watts Cut	8511+00	8670+00	24	490,000	1668, 1717, 1743, 1764, 1789, 1820, 1835 C-P	None
Fenwick Cut	9042+00	9064+00	36	21,000	2160, 2237 C-P	None
Rock Creek	9270+00	9294+00	48	Recently realigned	2461 C-P	None
Ashepoo Coosaw Cutoff	9306+00	9392+00	24	360,000	2461, 2508, 2536, 2564 C-P	None
Brickyard Creek	10065+00	10083	48	Recently realigned	None	None

2.5 Alternatives Considered but Eliminated

Alternatives considered but eliminated include use of a hopper dredge or mechanical dredge, transport via hopper dredge or barge, and ocean disposal of dredged material. Hopper dredges are self-propelled, typically ocean-going vessels and are not suitable for dredging shallow depths. Cutterhead dredges can operate uninterrupted, offer precise control, can handle a wide range of materials, and are more suitable for waterways. The controlling depths of the AIWW could limit accessibility by a seagoing barge so placement of dredged material offshore would require use of a hopper barge to move dredge material from the AIWW to the seagoing barge for transport to the authorized ODMDS. This would be costly and time consuming. The existing upland and in-water placement sites are adjacent to the waterway, making pipeline transport the most cost-efficient method. Placement of all dredged material in the ODMDS would preclude all BU placement options, including the nearshore and beach placement options being pursued at this time.

3 EXISTING CONDITIONS

3.1 Water Quality

South Carolina Department of Health and Environmental Control (SCDHEC) water quality standards were established to protect and improve water quality for the citizens of South Carolina in accordance with Section 303 of the Clean Water Act (CWA). SCDHEC Water Classifications and Standards (R61-68) provides the rules and standards applicable to all surface waters, including class descriptions and designations. The five class designations for the AIWW include Class SA (saltwater), Class SB (saltwater), Class SFH (shellfish harvesting waters), Class FW (freshwaters), and Class ORW (outstanding resource waters). An “spa” included with a class designation indicates site-specific standards for one or more parameters. For ORW waters, the previous class designation is provided in parenthesis. See Table 7 below.

Class SA and Class SB refer to tidal saltwater suitable for primary and secondary contact recreation, crabbing and fishing, and for the survival and propagation of a balanced indigenous aquatic community of marine flora and fauna. These waters are not suitable for the harvesting of clams, mussels, or oysters for market purposes or human consumption. The primary difference between SA and SB waters is the water quality standard for dissolved oxygen (DO). SA waters require a daily average of not less than 5.0 mg/l with a low of 4.0 mg/l. SB waters require that DO remain at 4.0 or greater with no daily average requirement.

Class SFH refers to tidal waters protected for the harvesting of shellfish, and suitable for the uses specified for SA and SB waters. Shellfish harvesting allows the taking of bivalve mollusks such as clams, mussels, and oysters, for sales or consumption.

The AIWW is classified as Class FW from SC Highway 9 to the Waccamaw River in Horry County. From the Waccamaw River to Thoroughfare Creek, the AIWW is considered freshwaters with a special condition limiting DO to not less than 4 mg/l, and limiting the pH range from 5.0 to 8.5. Freshwaters are considered suitable for primary and secondary contact recreation, as a source for drinking water supply after conventional treatment in accordance with SCDHEC requirements, suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora, and suitable for industrial and agricultural uses.

The AIWW is classified as ORW beginning at the confluence of Wadmalaw Sound and the Stono River in Charleston County and extending to the S. Edisto River at Fenwick Cut in Colleton County. ORW include freshwaters suitable as a source for drinking water supply after conventional treatment in accordance with SCDHEC requirements, and freshwaters or saltwaters that represent an exceptional resource for recreation or conservation.

Water quality standards for all designations place limits on the allowable levels of DO, turbidity, bacteria, and toxic pollutants based on the designated use. A water body that fails to meet state water quality standards is considered “impaired” and added to the state’s CWA Section 303(d) list of impaired waters. To meet the water quality standard, waters on the list require development of a Total Maximum Daily Load (TMDL) to limit the amount of a pollutant that can be discharged to the water body on a daily basis. Once a TMDL has been approved, the water body can be delisted, regardless of whether it is meeting the required standards or remains impaired. Currently there are 19 areas along the AIWW included in the 2022 303(d) list of impaired waters (Table 8). Existing approved TMDLs along the AIWW include Charleston Harbor (DO), Waccamaw River/AIWW (DO), and the South Santee Coastal waters (Fecal Coliform).

Table 7. Water Quality Classification by Location for AIWW

Waterbody	County	Class	Description and Site-Specific Standards
AIWW	Horry	SA	Beginning at NC state line and extending to SC Highway 9.
AIWW	Horry	FW	From SC Highway 9 to its confluence with the Waccamaw River
AIWW	Georgetown, Horry	FW sp	From Waccamaw River to Thoroughfare Creek (D.O. not less than 4 mg/l, pH 5.0-8.5)
AIWW	Georgetown	SA sp	Thoroughfare Creek to Winyah Bay (D.O. not less than 4 mg/l)
AIWW	Georgetown	SA	Winyah Bay to South Santee River
AIWW	Charleston	SFH	South Santee River to Ben Sawyer Bridge
AIWW	Charleston	SB	Ben Sawyer Bridge through Charleston Harbor to confluence of Elliott Cut and Stono River
AIWW	Charleston	SFH	Confluence of Elliott Cut and Stono River to S.C.L. Railroad Bridge over Stono River
AIWW	Charleston	SFH	S.C.L Railroad Bridge over Stono River to confluence of Wadmalaw Sound and Stono River
AIWW	Charleston	ORW (SFH)	Confluence of Wadmalaw Sound and Stono River to Gibson Creek
AIWW	Charleston	ORW (SFH)	Gibson Creek along Wadmalaw and Dawho Rivers to North Creek
AIWW	Charleston	ORW (SFH)	North Creek through Watts Cut to S. Edisto River
AIWW	Charleston, Colleton	ORW (SFH)	S. Edisto River at Watts Cut to S. Edisto River at Fenwick Cut
AIWW	Colleton	SFH	S. Edisto River at Fenwick Cut along Ashepoo River to confluence with Helena Sound
AIWW	Beaufort, Colleton	SFH	Helena Sound to confluence with Coosaw River
AIWW	Beaufort	SFH	Coosaw River along Brickyard Creek to confluence with Albergotti Creek
AIWW	Beaufort	SA	Confluence of Abergotti Creek to the Beaufort River to a boundary drawn along the Beaufort River between upper banks of Battery Creek and Cat Island Creek
AIWW	Beaufort	SFH	Battery and Cat Island Creek through Port Royal Sound to confluence with Skull Creek

Table 8. 2022 303(d) List of AIWW Impaired Waters

Priority Rank	Basin	HUC 12	County	Description	Station	Use	Causes
3	Santee	30501120403	Georgetown	AIWW at Minum Creek	06A-11	Shellfish	Fecal C.
3	Santee	30502020202	Charleston	AIWW at Marker 22A	11-11	Shellfish	Fecal C.
3	Santee	30502020202	Charleston	Stono River (AIWW) at Marker 27	11-12	Shellfish	Fecal C.
3	Santee	30502020202	Charleston	Stono River (AIWW) at Marker 51	11-16	Shellfish	Fecal C.
3	Santee	30502020202	Charleston	AIWW @ Confluence UT, 1.5 m SW Graham Creek	07-19	Shellfish	Fecal C
3	Santee	30502090202	Charleston	AIWW, Midway between Tibwin Cr and Matthews Cr	07-21	Shellfish	Fecal C.
3	Santee	30502090202	Charleston	AIWW, Midway between Awendaw and Graham Cr	MD-793	Recreation	Enterococci
3	Santee	30502090202	Charleston	AIWW Dock across from Graham Cr	MD-794	Recreation	Enterococci
3	Santee	30502090203	Charleston	AIWW Trib North of Sewee Camp and South of Houses	MD-796	Recreation	Enterococci
3	Santee	30502090203	Charleston	AIWW .35 m SW Shellfish Site07-03	RO-20451	Recreation	Enterococci
3	Santee	30502090202	Charleston	AIWW Adj to Wild Dunes Golf Course Storm Drainage Outfall	09A-18	Shellfish	Fecal C.
3	Santee	30502090202	Charleston	AIWW @25 th St 10B	09A-19	Shellfish	Fecal C
3	PeeDee	30402060906	Horry	AIWW at Socastee	CSTL-558	Fish	Mercury
3	PeeDee	30402060906	Horry	AIWW at SC 544	MD-127	AL	PH
3	PeeDee	30402060906	Horry	UT to AIWW at SC 707	RS-03332	Recreation	E. Coli
3	PeeDee	30402060906	Horry	AIWW at Dock Behind MB Clarion Hotel Near US 501	RS-16307	AL	PH
3	PeeDee	30402080301	Horry	AIWW at 3 mi N of 501 Bridge	MD-085	AL	PH
3	PeeDee	30402080301	Horry	AIWW-Little River at SC9-US17	MD-125	Recreation	Enterococci
3	PeeDee	30402080301	Horry	AIWW at N Myrtle	MD-163	Fish	Mercury

3.1.1. Sediment Testing

Sediments provide important habitat for aquatic organisms and can create environmental problems if harmful contaminants are present and released when disturbed. In 2021, 20 sediment composite samples were collected by Anamar Environmental Consulting, Inc. on behalf of USACE at various locations along the AIWW (see Figure 8). Two to six sediment subsamples were combined into each composite sample for physical, sediment chemistry, and elutriate chemistry analysis. The Sediment Sampling and Analysis Report for the AIWW in South Carolina is provided in Appendix H.

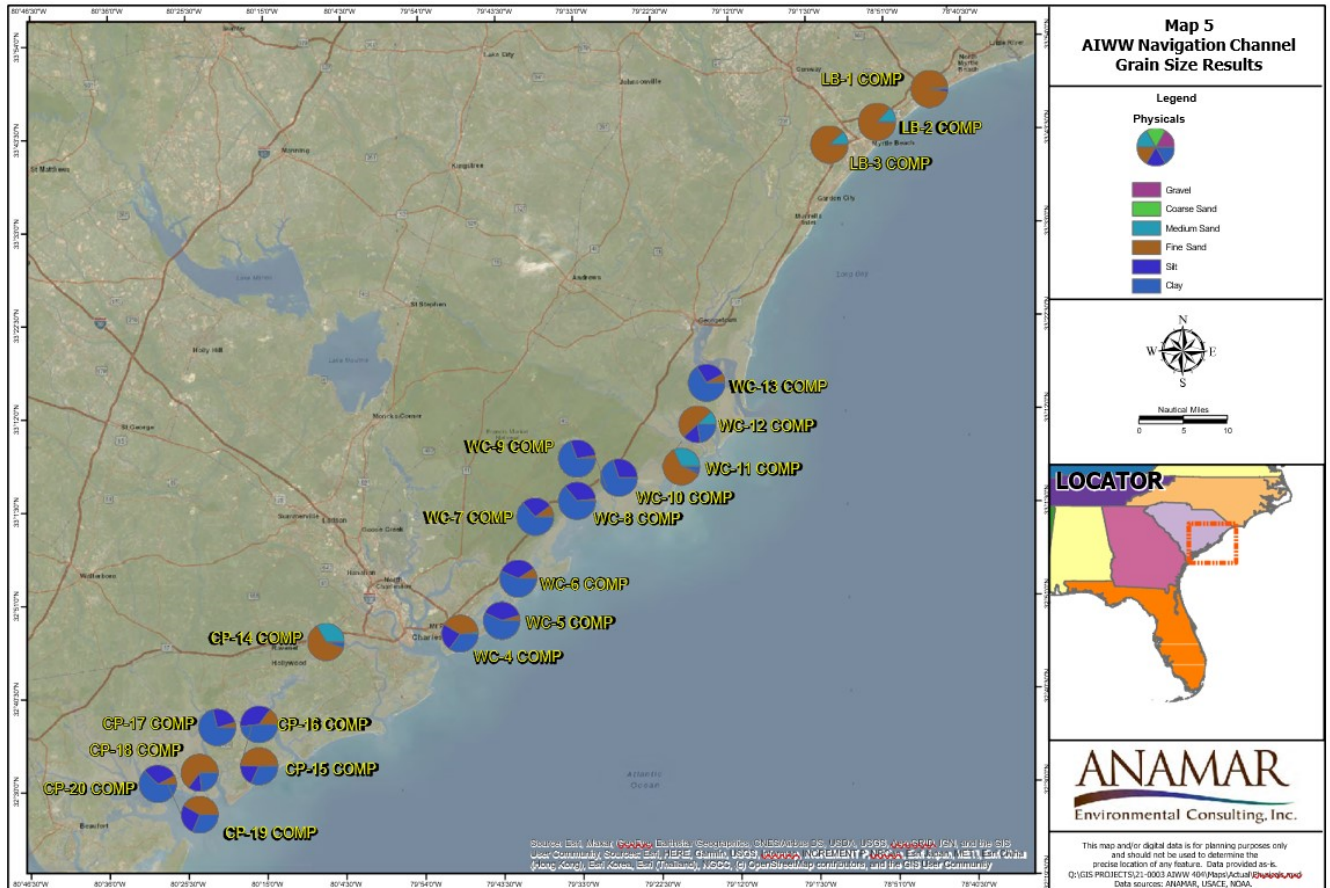


Figure 8. Sediment Sample Locations and Physical Characteristics

Sediment Chemistry. Full sediment chemistry analyses were performed on project composite samples LB-1 through LB-3 and CP-16. Limited sediment chemistry analyses (metals and PAHs only) were performed on the rest of the composite samples.

Results of laboratory analyses of sediment samples were compared to published sediment screening values as appropriate. These levels are the threshold effects level (TEL) and the effects range low (ERL). The ERL and effects range medium (ERM) are concentrations associated with biological effects from a large collection of biological experiments and field assessments. The ERL and ERM values are defined as the concentrations at which 10% and 50% of the studies showed a biological effect at specific concentrations, respectively. Values below the ERL would rarely be expected to be associated with measurable biological effects. Values between the ERL and ERM represent a range in which there are possible biological effects for a wide range of organisms. Values above the ERM represent a range above which there are probable biological effects for a wide range of organisms.

Metals and Tributyltin. Metals were analyzed in all twenty composite samples. Copper and nickel were detected in concentrations above the TEL in samples WC-10 and WC-13. Arsenic was detected in concentrations above the ERL in 14 out of 20 samples.

PAHs. PAHs were analyzed in all 20 composite samples. Naphthalene was detected in concentrations above the TEL in samples LB-1 and LB-2.

Pesticides. Pesticides were analyzed in four composite samples (LB-1, LB-2, LB-3, and CP-16). Total pesticides ranged from 1.9 µg/kg to 6.1 µg/kg. There are no published sediment screening criteria (i.e., TEL, ERL) for total pesticides.

PCBs. PCBs and Aroclors were analyzed in four composite samples (LB-1, LB-2, LB-3, and CP-16). None of the 26 congeners or seven Aroclors were detected above the method detection level (MDL) in any of the samples tested (U-qualified).

Dioxins and Furans. Dioxins and furans were analyzed in four composite samples (LB-1, LB-2, LB-3, and CP-16). Total toxic equivalents (TEQ) ranged from 0.189 ng/kg to 0.517 ng/kg in samples LB-1, LB-2, and LB-3. The TEQ for sample CP-16 was 6.43 ng/kg, which exceeded the TEL.

3.2 Noise

Noise pollution involves disturbing or unwanted sound that interferes with or causes harm to human health or wildlife. Noise pollution has been shown to result in adverse effects to human health including stress related illnesses, noise-induced hearing loss, sleep disturbances, and high blood pressure. While state and local governments are typically responsible for addressing noise pollution matters, USEPA retains authority to evaluate the effectiveness of existing regulations for protecting the public health and welfare, pursuant to the Noise Control Act of 1972 and the Quiet Communities Act of 1978. To protect the public from all adverse effects on health and welfare in residential areas, USEPA recommends an average 24-hour exposure limit of 55 A-weighted decibels (dBA). To protect individuals against hearing damage or loss, EPA recommends an average 24-hour exposure limit of 70 dBA.

Noise in the study area results from a variety of natural and man-made sources. Natural areas adjacent to the AIWW include the Waccamaw National Wildlife Refuge (reach 1), Santee Coastal Reserve (reach 2), and Ace Basin National Wildlife Refuge (reach 3). Sound sources in these areas may include insects, animals, birds, wind, water, and precipitation. Natural sound sources found in the beach environments along the coast generally include wind, surf, and precipitation. Myrtle Beach International Airport (reach 1) and the Marine Corps Air Station (reach 3) are the primary sources of man-made sound related to air traffic. U.S. Highway 17 is a major thoroughfare and source of transportation noise that parallels the AIWW, primarily in reaches 1 and 2. Residential housing is located along the waterway from Little River to Bucksport (reach 1), Charleston area (reach 2), and Beaufort (reach 3). Residential noise sources include traffic, construction, human, and animal sounds. Man-made sound sources located on the waterway include dredging vessels, commercial watercraft, and recreational boating.

3.3 Aesthetics (Visual Resources)

Aesthetic resources are natural and man-made features of the environment that can be perceived by all the senses, not just sight. Visual resources include visible physical features of both man-made and natural environments that together comprise the visual landscape and may include land, water, vegetation, structures, animals, or other features. The AIWW flows through many natural areas including the Waccamaw National Wildlife Refuge, Ernest F. Hollings Ace Basin National Wildlife Refuge, Cape Romain National Wildlife Refuge, Tom Yawkey Wildlife Center, Santee

Coastal Reserve, and the Francis Marion National Forest. The waterway also intersects several major rivers including the Waccamaw River, Pee Dee River, North Santee River, South Santee River, Stono River, Wadmalaw River, Dawho River, N. Edisto River, South Edisto River, Ashepoo River, and Beaufort River. These natural areas and waterways possess visually pleasing attributes including tidal marsh, tidal flats, tidal creeks, pine flatwoods, pine oak forests, Carolina Bays, and open waters. Other visually pleasing attributes in the study area include the beaches of Sullivan's Island and Isle of Palms along the Atlantic Ocean and their adjacent dunes, maritime shrub thickets, and maritime forests; agricultural lands; green space/parks; and some residential and commercial buildings (primarily reach 1).

3.4 Recreation

Recreation involves any activity conducted for enjoyment. Outdoor recreation can involve land and water activities such as hiking, camping, hunting, fishing, boating, biking, surfing, swimming, or cycling. The AIWW is popular for fishing and recreational boating. Natural areas along the AIWW provide opportunities for hiking and birdwatching; and campsites are available at Myrtle Beach State Park and Huntington Beach State Park (reach 1), and Santee Coastal Reserve (reach 2). Sullivan's Island and Isle of Palms are year-round tourist destinations where residents and visitors enjoy swimming, surfing, fishing, boating, sunbathing, jogging, and walking.

3.5 Fish and Wildlife Resources

Marine Mammals. All marine mammals are protected under the Marine Mammal Protection Act of 1972 (MMPA), as amended. The Act prohibits the unauthorized hunting, harassment, capture or killing of marine mammals as well as the import or export of the species, including their parts and products. Federal entities responsible for implementing the MMPA include National Oceanic Atmospheric Administration (NOAA) Fisheries, U.S. Fish and Wildlife Service (FWS), and the Marine Mammal Commission. Marine mammals most likely to be found in the inlets, rivers, and open waters of the AIWW include bottlenose dolphin and West Indian manatee. The West Indian Manatee is discussed in Section 3.8. Additional information regarding the bottlenose dolphin is provided below.

The bottlenose dolphin inhabits marine and estuarine habitats including tidal creeks, inlets, marshes, rivers, and waters along the beachfronts in South Carolina. Some factors influencing habitat use include availability of food resources, water temperature, and water depth. Diet typically consists of prey such as fish, crab, shrimp, and squid. Bottlenose dolphins are susceptible to threats and stressors including entanglement in fishing gear, habitat destruction, exposure to biotoxins such as algae blooms, illegal harassment, and watercraft strikes (NOAA Fisheries 2022).

Terrestrial Mammals. Terrestrial mammals that may be found within the project area include rodents, marsupials, insectivores, carnivores, and hooved animals. Mammalian species that are adapted to survive in dune and maritime shrub thicket communities include mice, raccoons, opossums, and deer. Inland of the dunes and maritime shrub thickets are the maritime forests which support shrews, moles, bats, raccoons, opossums, and bobcats. The salt marsh communities are home to rats, mice, and shrew and provide foraging habitat for deer, raccoons, and otters. Other species that may be found in freshwater habitats and uplands include rabbits, mice, rats, foxes, squirrels, coyotes, and bats; and the Cape Romain National Wildlife Refuge supports a captive breeding program for red wolves.

Fish. The inlets, bays, rivers, and canals of the AIWW support a large variety of freshwater and saltwater fish species. Some of the freshwater species include striped bass, largemouth bass, American shad, herring, white crappie, catfish, and redfish. Saltwater species include black drum, red drum, cobia, Southern flounder, mackerel, sea bass, and dolphin fish.

The inlets, rivers, and open waters of the AIWW as well as the nearshore beach areas provide habitat for numerous shark species. These include the Sand tiger shark, Spinner shark, Lemon shark, Sandbar shark, Tiger shark, Blacktip shark, Bonnethead shark, Finetooth shark, Atlantic sharpnose shark, and Smoothhound shark. Additional information on shark species and their habitat is provided in the EFH assessment in Appendix F.

Birds. The project area is utilized by many species of shorebirds, seabirds, and migratory birds for nesting and foraging. Shorebird species commonly observed are the American oystercatcher, plovers, willet, sandpipers, lesser/greater yellowlegs, and gulls/terns. Shorebirds typically feed by foraging for invertebrates in mud flats and sandy beaches. During high tides, shorebirds typically roost in flocks on the high beach, marsh, and sometimes on docks.

Seabirds spend most of their time in coastal waters or over the oceans. They feed on fish found in nearshore and estuarine waters. Seabirds tend to nest on small coastal islands in mixed colonies, typically isolated coastal islands that are high enough to prevent overwashing, yet small enough to not support mammalian predators. During the nesting season, foraging occurs within 10 to 15 miles of their nesting sites. Seabirds that frequent the South Carolina coast are the sandwich tern, least tern, royal tern, common tern, Eastern brown pelican, Forster's tern, gull-billed tern, and black skimmer.

The Migratory Bird Treaty Act of 1918 (MBTA) prohibits the killing, capturing, trading, selling, or transport of protected migratory bird species without prior authorization of the FWS. MBTA implements four conservation treaties that the United States entered into with Canada, Mexico, Japan, and Russia to ensure the sustainability of all populations of protected migratory bird species. The Act applies only to migratory bird species that are native to the United States or U.S. territories. According to the Information for Planning and Consultation tool (IPAC), at least 45 species of migratory birds could be found in the project area.

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3.6 Benthic Organisms

The benthic zone is the region located at the lowest level of a water body and includes surface and subsurface sediment layers. Benthic organisms are classified as epifauna (living on the bottom surface or attached to objects) or infauna (living beneath the surface). Most benthic organisms inhabiting the beach region are infauna, living beneath the sand surface where salinities and temperature are more constant. Many are filter or deposit feeders and the intertidal zone, with its rich concentration of organic matter brought in with the tides, provides habitat for a diverse assemblage. Typical beach inhabitants include beach fleas, ghost crabs, coquinas, mole crabs, and burrowing worms in the intertidal zone, and blue crabs, horseshoe crabs, sand dollars, clams, and gastropods in sub-tidal areas (USACE 1976).

In the open waters, dominant benthic species typically vary based on bottom sediment composition. Dominant organisms found in silty clay sediments include polychaetes, amphipods, and arthropods. Dominant organisms found in coarse to finer sands/muds (primarily sands) include polychaetes, oligochaetes, decapods, and bivalves (Van Dolah et al 1984).

3.7 Air Quality

Air quality in a specific location is described by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors including the type and level of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The significance of the pollutant concentration is determined by comparison to Federal and state ambient air quality standards. The Clean Air Act (CAA) and its subsequent amendments, established the National Ambient Air Quality Standards (NAAQS) for six

principal air pollutants, also known as “criteria air pollutants.” The pollutants include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), particulate matter (PM_{2.5} and PM₁₀), ozone (O₃) and sulfur dioxide (SO₂).

A locality’s air quality status and the stringency of air pollution standards and regulations depend on whether monitored pollutant concentrations attain the levels defined in the NAAQS. To ensure NAAQS are achieved and maintained, the CAA requires each state to develop a State Implementation Plan (SIP). SCDHEC, Bureau of Air Quality oversees the state’s air agendas, including the SIP. The state and national ambient air quality standards represent the maximum allowable atmospheric concentrations that may occur while ensuring protection of public health and welfare, with a reasonable margin of safety. Short-term standards (1, 8, and 24-hour periods) are established for pollutants contributing to acute health effects, while long-term standards (quarterly and annual averages) are established for pollutants contributing to chronic health effects.

If the concentration of one or more criteria pollutants in a geographic area is found to exceed the regulated threshold level for one or more of the NAAQS, the area may be classified as a non-attainment area. Areas with concentrations of criteria pollutants that are below the levels established by the NAAQS are considered either in attainment or unclassifiable areas. All pollutants are currently classified as in-attainment for Horry, Georgetown, Charleston, Colleton, and Beaufort counties in South Carolina (USEPA, 2021).

3.8 Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 (16 USC 1531-1543) regulates activities affecting plants and animals that are Federally classified as threatened or endangered, as well as the designated critical habitat of such species. There are several Federally listed threatened and endangered species that may be found in the project area. Table 9 identifies Federally listed species under the jurisdiction of the U. S. Fish and Wildlife Service and/or NOAA National Marine Fisheries Service (NFMS) that are known to occur in Horry, Georgetown, Charleston, Colleton, and Beaufort counties.

Federally listed species that could be present in the project area include Atlantic sturgeon, shortnose sturgeon, West Indian manatee, piping plover, rufa red knot, green sea turtle, Kemp’s ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, and seabeach amaranth. In general, piping plover, rufa red knot, and loggerhead sea turtle are projected to be most affected by project construction, given their relative abundance and use of the project area. A brief description of each species is provided below. Detailed information on threatened and endangered species is provided in Appendix C.

West Indian Manatee. The West Indian manatee can be found along coasts and inland waters of the southeastern United States. Manatees inhabit both salt and fresh water of sufficient depth (5 feet to usually less than 20 feet) throughout their range (USACE 2006). Manatees may be encountered in shallow, slow-moving water bodies such as canals, rivers, estuarine habitats, and saltwater bays, although on occasion they have been observed as much as 3.7 miles (6 km) off the Florida Gulf coast. Manatees require warm water, migrating to warmer waters whenever the temperature falls below 20° C. They are herbivorous, subsisting on seagrasses, large algae, and freshwater plants. Manatees reproduce slowly, reaching sexual maturity at 5 to 9 years of age and bearing a single calf (rarely twins) every 2 to 5 years. Threats to the manatee include natural mortality due to cold and red tide poisoning and human-induced mortality from loss of habitat, watercraft collisions, pollution, litter, and water control structures. Given their migratory habits, manatees can be assumed to be present in the inlets, estuaries, and open waters of the AIWW.

Table 9. Threatened and Endangered Species by County

Category	Common Name	Scientific Name	Status	Counties
Amphibians	Frosted flatwoods salamander	<i>Ambystoma cingulatum</i>	Threatened	Beaufort, Charleston, Colleton
Birds	American wood stork	<i>Mycteria americana</i>	Threatened	Beaufort, Charleston, Colleton, Horry, Georgetown
	Bachman's warbler	<i>Vermivora</i>	Endangered	Charleston
	Bald eagle	<i>Haliaeetus leucocephalus</i>	Bald and Golden Eagle Protection	Charleston, Colleton, Horry, Georgetown
	Eastern black rail	<i>Laterallus jamaicensis</i>	Threatened	Beaufort, Charleston, Colleton, Georgetown
	Piping plover	<i>Charadrius melodus</i>	Threatened	Beaufort, Charleston, Colleton, Horry, Georgetown
	Red-cockaded woodpecker	<i>Picoides borealis</i>	Threatened	Beaufort, Charleston, Colleton, Horry, Georgetown
	Red knot	<i>Calidris canutus rufa</i>	Threatened	Beaufort, Charleston, Colleton, Horry, Georgetown
Fishes	Atlantic sturgeon*	<i>Acipenser oxyrinchus*</i>	Endangered	Beaufort, Charleston, Colleton, Horry, Georgetown
	Shortnose sturgeon*	<i>Acipenser brevirostrum*</i>	Endangered	Beaufort, Charleston, Colleton, Horry, Georgetown
Insects	None Found			
Mammals	Finback whale*	<i>Balaenoptera physalus*</i>	Endangered	Beaufort, Charleston, Colleton, Horry, Georgetown
	Humpback whale *	<i>Megaptera novaengliae</i>	Endangered	Beaufort, Charleston, Colleton, Horry, Georgetown
	Northern long-eared bat	<i>Myotis septentrionalis</i>	Threatened	Beaufort, Charleston, Colleton, Horry, Georgetown
	Right whale*	<i>Balaena glacialis</i>	Endangered	Beaufort, Charleston, Colleton, Horry, Georgetown
	Sei whale*	<i>Balaenoptera borealis</i>	Endangered	Beaufort, Charleston, Colleton, Horry, Georgetown
	Sperm whale*	<i>Physeter macrocephalus</i>	Endangered	Beaufort, Charleston, Colleton, Horry, Georgetown
	West Indian manatee	<i>Trichechus manatus</i>	Threatened	Beaufort, Charleston, Colleton, Horry, Georgetown
Mollusks	None Found			
Plants	American chaffseed	<i>Schwalbea</i>	Threatened	Beaufort, Charleston, Horry
	Seabeach amaranth	<i>Amaranthus pumilus</i>	Threatened	Horry, Georgetown
	Pondberry	<i>Lindera melissifolia</i>	Endangered	Beaufort, Charleston, Georgetown
	Canby's dropwort	<i>Schwalbea americana</i>	Endangered	Colleton, Charleston
Reptiles	Green sea turtle **	<i>Chelonia mydas **</i>	Threatened	Charleston, Colleton, Horry, Georgetown
	Kemp's ridley sea turtle **	<i>Lepidochelys kempi**</i>	Endangered	Charleston, Colleton, Horry, Georgetown
	Leatherback sea turtle **	<i>Dermochelys coriacea **</i>	Endangered	Charleston, Colleton, Horry, Georgetown
	Loggerhead sea turtle **	<i>Caretta caretta **</i>	Threatened	Charleston, Colleton, Horry, Georgetown

*Under the jurisdiction of NMFS **Under the jurisdiction of NMFS and FWS

Atlantic Sturgeon. Atlantic sturgeon spend most of their lives in marine waters and migrate up rivers in February and March to spawn. The species is managed under a fishery management plan (FMP) implemented by the Atlantic States Marine Fisheries Commission (ASMFC). Threats from dredging, water quality, and commercial by-catch likely contribute to the population decline of this species. The AIWW crosses several rivers designated as Atlantic sturgeon critical habitat.

Shortnose Sturgeon. The shortnose sturgeon is the smallest of the three sturgeon species that occur in eastern North America. It is an anadromous fish that spawns in coastal rivers along the east coast of North America from the St. John River in Canada to the St. Johns River in Florida. The species prefers the nearshore marine, estuarine, and riverine habitats of large river systems. Shortnose sturgeon are benthic feeders. Juveniles are believed to feed on benthic insects and crustaceans, and adults primarily feed on mollusks and large crustaceans.

Piping Plover. There are three recognized populations of piping plovers in North America: Atlantic Coast, Northern Great Plains, and the Great Lakes population. The Atlantic Coast piping plover population breeds on coastal beaches from Newfoundland to North Carolina (and occasionally in South Carolina) and winters along the Atlantic Coast (from North Carolina south), the Gulf Coast, and in the Caribbean where they spend most of their time foraging. Piping plovers have been observed in the following counties in South Carolina: Beaufort, Charleston, Colleton, Georgetown, and Horry. Piping plovers typically nest in sand depressions on un-vegetated portions of the beach, above the high tide line on sand flats at the ends of sand spits and barrier islands, gently sloping foredunes, blowout areas behind primary dunes, sparsely vegetated dunes, and wash over areas cut into or between dunes. They head to their breeding grounds in late March or early April and nesting usually begins in late April; however, nests have been found as late as July. Feeding areas include intertidal portions of ocean beaches, wash over areas, mud flats, sand flats, wrack lines, and shorelines of coastal ponds, lagoons, or salt marshes (USFWS, 1996). Prey typically consist of worms, fly larvae, beetles, crustaceans, mollusks, and other invertebrates. According to IPAC, the action area does not include critical habitat for this species.

Sea Turtles. Modified for living in the open ocean, sea turtles have paddle-like front limbs for swimming, cannot retract their heads and have special respiratory mechanisms and organs to excrete excess salt taken in with seawater when they feed. Sea turtles generally have similar life histories and reproductive behavior. The loggerhead, Kemp's ridley, green and leatherback sea turtles can be found in South Carolina's near shore waters April through November or nesting on beaches from May through October; however, within the project area, nesting occurs almost exclusively by loggerhead sea turtles. Only one nesting attempt has been made by green sea turtles and leatherback sea turtles (including one false crawl) between 2000 and 2022 on Isle of Palms.

Anthropogenic factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching, include beach erosion, armoring and nourishment; artificial lighting; beach cleaning; increased human presence; recreational beach equipment; beach driving; coastal construction and fishing piers; exotic dune and beach vegetation; and poaching. An increased human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs, and an increased presence of native species (e.g., raccoons, armadillos, and opossums), which raid and feed on turtle eggs.

Rufa Red Knot. Red knots are migratory shorebirds. Their migration is one of the most impressive, with many individuals annually flying over 9,000 miles from the Arctic breeding grounds to the tip of South America. The red knot is about 9 inches tall, with a wingspan of 20 to 22 inches. Red knots winter in the coastal United States from Cape Cod to Mexico and South America and spend the summer on islands in the High Arctic. Red knots breed in the Arctic plain and islands above the

Arctic Circle. They will often fly over 1,500 miles before stopping over at winter feeding grounds. Wintering grounds are coastal beaches and mud flats along both the Pacific and Atlantic coasts from California and Massachusetts south to South America. In SC, they winter all along the coast, primarily on sandy beaches and mud flats. During wintering stopovers, knots feed on marine worms, small mollusks and horseshoe crab eggs. Habitat loss, pollution, toxins, disease, hunting and loss of prey base are the major threats to red knot populations. Critical habitat for the species has been proposed and would likely be located within the project area.

3.9 Navigation

The AIWW is recognized by the U.S. Department of Transportation as a marine highway traversing the eastern seaboard from Norfolk, Virginia to Key West, Florida. Maintaining the AIWW to the authorized depth is necessary to support vessel traffic. Vessels that depend on the authorized channel depth in South Carolina include commercial fishing vessels, recreational vessels, sport fishing vessels, research vessels, cargo vessels, and dredging vessels. According to the Waterborne Commercial Statistics Center, commercial vessel traffic in SC has generally increased over the past ten years, while cargo levels have decreased (Table 10). Navigational hazards along the AIWW may include currents, bridge clearances, or extensive shoaling. Currents on approach to bridges such as the Lady’s Island bridge can make navigation challenging and other bridges have vertical or horizontal clearances that limit vessel access.

Table 10. AIWW Commercial Cargo Summary 2009 to 2019

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
TONS												
	AIWW	2,471,422	2,932,940	2,874,679	2,688,468	2,942,568	2,415,652	2,619,798	2,341,565	2,329,318	2,354,306	2,052,236
	SAC	177,012	178,378	202,399	134,883	125,384	135,009	142,289	72,315	68,439	48,403	75,250
TRIPS-COMMERCIAL												
	AIWW	22,261	21,655	20,713	20,946	20,252	29,863	30,799	34,088	37,987	20,850	36,691
	SAC	3,304	1,861	1,264	1,352	1,022	3,369	2,798	4,449	7,840	2,858	3,597

3.10 Climate and Climate Change

According to the Köppen climate classification, South Carolina is classified as a humid, subtropical climate. Along the coast, the summers can be hot and muggy, and the winters can be cold, cloudy, and windy. The coldest month is typically in January with an average low of 42.4 °F and the warmest month is July with an average high above 83 °F. The average annual precipitation ranges from 46 to 56 inches per year with the highest rainfall totals occurring between Charleston and Little River (see Figure 9). During the months of July, August, and September, coastal counties receive between 5.1 and 7.6 inches of rain per month.

According to the Intergovernmental Panel on Climate Change (IPCC), global warming and climate change have been observed since the mid-20th century and are expected to continue into the future, which would contribute to a continued or possibly accelerated sea level rise (USEPA 2022). According to the South Atlantic Coastal Study, which analyzed the vulnerability of natural areas to coastal hazards such as storm surge inundation, erosion, wind, and saltwater intrusion from sea level rise, most of the project area is considered at medium to high risk for coastal storm surge and sea level rise. In addition, several adjacent natural areas such as Waccamaw National Wildlife Refuge, Tom Yawkey Wildlife Center, Santee Coastal Reserve, Cape Romain National Wildlife Refuge, Capers Island Heritage Preserve, and ACE Basin National Estuarine Research Reserve have been identified as areas that support priority biological resources and could be considered by stakeholders when looking for environmental resources to conserve and/or manage.

2023 CEQ guidance, *NEPA Interim Guidance on Consideration of Greenhouse Gas Emissions and Climate Change* requires that federal agencies consider the social cost of greenhouse gas emissions for alternatives comparison. Social effects of greenhouse gas emissions include extreme weather, the spread of disease, increased food insecurity, and coastal destruction. The social cost of carbon (SCC) is a method to calculate damages, in dollars, associated with greenhouse gas emissions. As of February 2023, the federal estimate of the SCC is \$51 per metric ton of CO₂ released into the air. CO₂ emissions in the US for 2022 totaled 4,970 million metric tons. The social cost of these carbon emissions is estimated at 254 billion dollars.

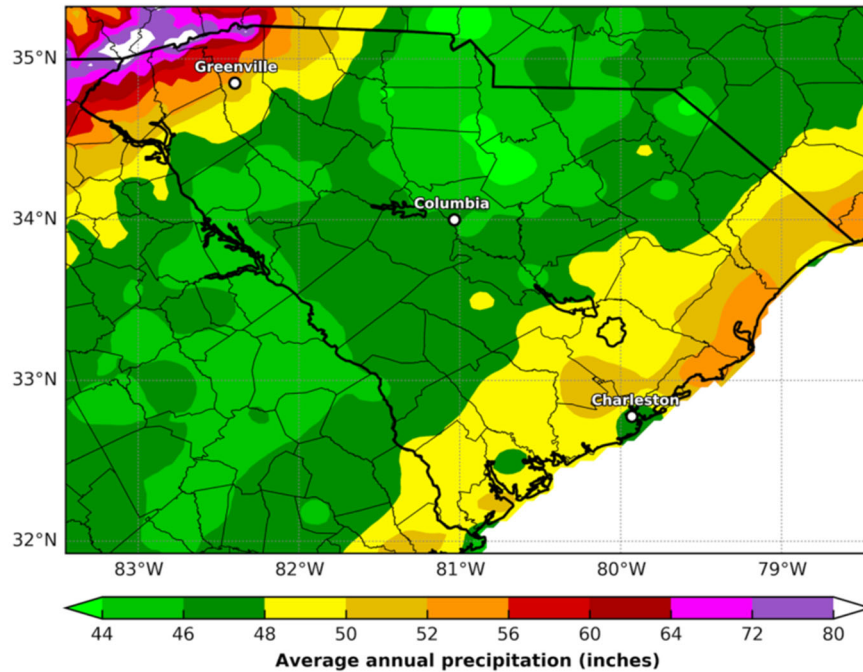


Figure 9. Average Annual Precipitation for South Carolina

3.11 Essential Fish Habitat

The 1996 Congressional amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (PL 94-265) set forth new requirements for the 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 Magnuson-Stevens Fishery Conservation and Management 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). EFH habitats that may be found in the project area include marine and estuarine water column, intertidal flats, estuarine emergent wetlands, oyster reefs/shell banks, palustrine emergent and forested wetlands, unconsolidated bottoms and aquatic beds. Managed species that may be found within the project area are listed in Table 11. Additional information is provided in Appendix F.

Table 11. Federally Managed Species Occurring in South Carolina Tidally Influenced Waters

Common Name	Scientific Name	Management Plan Agency	Fishery Management Plan (FMP)
White Shrimp	<i>Litopenaeus setiferus</i>	SAFMC	Shrimp
Brown Shrimp	<i>Farfantepenaeus aztecus</i>	SAFMC	Shrimp
Gag Grouper	<i>Mycteroperca microlepis</i>	SAFMC	Snapper Grouper
Gray Snapper	<i>Lutjanus griseus</i>	SAFMC	Snapper Grouper
Lane Snapper	<i>Lutjanus synagris</i>	SAFMC	Snapper Grouper
Black Sea Bass	<i>Centropristis striata</i>	SAFMC	Snapper Grouper
Spanish Mackerel	<i>Scomberomorus maculatus</i>	SAFMC	Coastal Migratory Pelagic
King Mackerel	<i>Scomberomorus cavalla</i>	SAFMC	Coastal Migratory Pelagic
Summer Flounder	<i>Paralichthys dentatus</i>	MAFMC	Summer Flounder
Bluefish	<i>Pomatomus saltatrix</i>	MAFMC	Bluefish
Scalloped Hammerhead Shark	<i>Sphyrna lewini</i>	NMFS	Highly Migratory Species
Bonnethead Shark	<i>Sphyrna tiburo</i>	NMFS	Highly Migratory Species
Bull Shark	<i>Carcharhinus leucas</i>	NMFS	Highly Migratory Species
Sandbar Shark	<i>Carcharhinus plumbeus</i>	NMFS	Highly Migratory Species
Finetooth Shark	<i>Carcharhinus isodon</i>	NMFS	Highly Migratory Species
Dusky Shark	<i>Carcharhinus obscurus</i>	NMFS	Highly Migratory Species
Blacktip Shark	<i>Carcharhinus limbatus</i>	NMFS	Highly Migratory Species
Atlantic Sharpnose	<i>Rhizoprionodon terraenovae</i>	NMFS	Highly Migratory Species
Lemon Shark	<i>Negaprion brevirostris</i>	NMFS	Highly Migratory Species

3.12 Hazardous, Toxic, and Radioactive Waste

In accordance with the Resource Conservation and Recovery Act (RCRA), facilities that generate, transport, treat, store, or dispose of hazardous waste must provide information about their activities to state environmental agencies. Most hazardous waste sites identified in reach 1A are located along Highway 17. For reach 2, the closest site is the Isle of Palms wastewater treatment plant, located approximately 0.15 miles from the AIWW. For reach 3, the closest facility is located approximately .08 mile from the waterway. Maintenance dredging has been ongoing since the 1940s, so the likelihood of undiscovered hazardous waste sites is very low.

The Toxic Substances Control Act of 1976 (TSCA) regulates chemical toxins and gives EPA the authority to require reporting, record-keeping, testing requirements, and restrictions for these substances. Specific chemicals that may be included under TSCA include polychlorinated biphenyls (PCBs), asbestos, radon, and lead-based paint. PCBs were analyzed in four composite sediment samples collected during AIWW sediment testing in 2021. None of the 26 congeners were detected above the MDL in any of the samples tested.

3.13 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 CFR 800.16(I)(1)). Cultural resources also include resources with unknown NRHP eligibility status.

AIWW Overview. According to the South Carolina Department of Archives and History and the South Carolina Institute of Archaeology and Anthropology, who inventory data from the state's archaeological and built heritage, there are currently at least 49 known cultural resources within the study area. There are approximately 30 archaeological sites, 4 historic districts, 2 National Register of Historic Places (NRHP) listed properties, 1 NRHP listed landmark, 4 historic areas, and 8 historic structures. According to the NOAA Wrecks and Obstructions Database, there are at least 32 wrecks or obstructions within the Charleston District's AIWW reaches. Little to no history is known about many of these wrecks/obstructions, but some may be historic in nature.

Placement Areas. Three placement areas are within the boundary of a historic area associated with the Georgetown County Rice Cultural Nomination for the National Register of Historic Places. Four placement areas are located slightly outside of the proposed historic district/landscape. Site 38GE5, a prehistoric shell midden that is recommended as NRHP eligible, appears to be located within the Area of Potential Effect (APE) for one placement area. Nearby shell middens that are documented as being associated with this shell midden are noted as containing human remains, so it is possible that there could be a similar burial context at 38GE5. Placement areas on Minim Island and Little Crow Island do not have documented sites located directly on those islands, but there are two documented sites within close proximity. Site 38GE78 (burial site) is approximately 60 meters from the smaller Minim Island placement area, while site 38GE46 (named Minim Island Shell Midden, a prehistoric shell midden) is located on the larger Minim Island and approximately 180 meters from the Little Crow Island placement area.

Georgetown County Rice Cultural Site. Due to the known sites within this area, if the footprint of the existing placement areas is expanded, cultural surveys would be necessary to identify any cultural resources that may be present in any areas that have not previously been surveyed.

Little River to Bucksport. For the Little River to Bucksport APE, there are five previously identified archaeological sites (38HR156, 38HR271, 38HR273, 38HR491, and 38HR496), one NRHP historic district (Socastee Historic District), and seven historic structures (e.g., Rubin Sarvis House, South Island Grill, and several historic homes). Two historic areas are also documented including the Myrtle Beach Bridge (Intracoastal Waterway Railroad Bridge) and the Little River Intracoastal Waterway Bridge. All resources are in Horry County.

Three wrecks/obstructions are documented within this reach per the NOAA Wrecks and Obstructions Database. One is a visible wreck near the Grande Dunes Resort Club. There is no known history on any of these wrecks. Two other obstructions are documented near Oatbed Creek; although, these do not appear to be directly within the project area. These are listed as dangerous and always submerged, and there is no history for either wreck.

Bucksport to Winyah Bay. For the Bucksport to Winyah Bay APE, there are six previously identified archaeological sites (38GE106, 38GE113, 38GE251, 38GE252, 38GE420, and 38GE473), one National Historic landmark (Brookgreen Gardens), one NRHP listed resource (Hobcaw Barony), one NRHP historic district (Pee Dee River Rice Planters Historic District), and one historic area (Georgetown County Rice Culture). All resources are in Georgetown County.

Five wrecks/obstructions are documented within this reach per the NOAA Wrecks and Obstructions Database. One obstruction is documented near Belle Isle Gardens. Some history is provided, but it is unknown if the site still exists, as one survey was unable to locate the obstruction. It is listed as a possible sunken Power Squadron wreck, which had a smokestack visible at low tide. The wreck is believed to be a vessel named “Harvest Moon,” which was documented on the nautical charts starting in 1899. There is no visible wreck near Wachesaw Plantation Club. There is no known history for this wreck. Three obstructions are identified as dangerous and always submerged. There is no known history for these wrecks, and they are located near the Wachesaw Plantation Club, Mt. Rena, and Bullins Creek. These are listed as dangerous and always submerged, and there is no history for either wreck.

Winyah Bay to Charleston. For the Winyah Bay to Charleston APE, there are 16 previously identified archaeological sites (38CH9, 38CH121, 38CH140, 38CH145, 38CH146, 38CH149, 38CH431, 38CH442, 38CH454, 38CH644, 38CH2151, 38CH2352, 38GE5, 38GE46, 38GE78, and 38GE98), one NRHP historic district (McClellanville Historic District), and one historic area (Georgetown County Rice Culture). All resources are in Charlestown and Georgetown Counties.

According to the NOAA Wrecks and Obstructions Database, 10 wrecks/obstructions are documented within this reach per the NOAA Wrecks and Obstructions Database. Within the Charleston Harbor, a submerged, dangerous wreck is documented, along with a wreck dating to the 1950s. Nearby, within the Cove area, there are four submerged, dangerous obstructions, one of which is documented as a sunken boiler. Two obstructions/wrecks are documented near the Ben Sawyer Bridge. Two additional submerged, dangerous wrecks were documented near Harbor River and Jeremy Creek.

Charleston to Port Royal. For the Charleston to Port Royal APE, there are three previously identified archaeological sites (38BU480, 38CH848, and 38CN55), one NRHP historic district (Beaufort Historic District), one historic structure (John F. Limehouse Bridge), one NRHP listed property (Prospect Hill), and one historic area (See Woodland Shores). All resources are in Beaufort, Charleston, and Colleton Counties.

A total of 14 wrecks/obstructions are documented within this reach per the NOAA Wrecks and Obstructions Database. There are seven submerged and dangerous obstructions, with little to no history indicated. Three are documented within the Port Royal area, three near Beaufort, and one in Charleston Harbor. Seven wrecks/obstructions are documented, with little to no history. One is located near Beaufort, two near Brickyard Creek, one near Coosa River, two near Rock Creek, and one between Wappoo Creek and Charleston Harbor.

3.14 Wetlands

Wetlands are ecosystems that are inundated or flooded by water at a frequency and duration that results in anaerobic soil conditions and support hydrophytic vegetation. Wetlands provide many ecological functions such as flood storage, nutrient transformation, and clean water and are provided protection under federal and state regulations. According to Executive Order 11990, Protection of Wetlands, federal agencies must consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided.

According to the USFWS National Wetlands Inventory (NWI), the primary wetland type found along the waterway in reach 1 is classified as Estuarine Intertidal Emergent, Regularly Flooded (E2EM1N), more commonly known as salt marsh. Also, small expanses of freshwater marsh, forested, and scrub shrub wetlands occur along reach 1A, in between many of the developed areas. Freshwater Forested Semi-Permanently Flooded Tidal (PF01/2T) and Freshwater Emergent Seasonably Flooded Tidal (PEM1RD) wetlands are located adjacent to the Waccamaw River in reach 1B. Reach 2 from Winyah Bay to Charleston Harbor and reach 3 from Charleston Harbor to Port Royal Sound are dominated by salt marsh (E2EM1N) wetlands.

3.15 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.”*

According to 2020 census data, AIWW project boundaries fall within 62 census tracts. The combined population of these tracts is approximately 313,897. Overall, approximately 73% of the population is reported as white, 2% is reported as black, 5% is reported as Hispanic or Latino, and 1% is reported as Asian. Approximately 23% of the population is over 65 years of age (CEQ 2022).

Twenty-two of the 62 census tracts associated with the project area are identified as disadvantaged (Table 12 below), indicating the population located in these tracts are considered underserved and overburdened by pollution. According to the Council on Environmental Quality’s Climate and Economic Justice Screening Tool, to be identified as disadvantaged, a census tract must meet at least one burden threshold (Climate Change, Health, Transportation, Housing, Energy, Legacy Pollution, Water and Wastewater, or Workforce Development) and the associated socioeconomic threshold (low income or high school education).

Table 12. Disadvantaged Census Tracts and Associated Burden/Socioeconomic Category

CENSUS TRACT	LOW INCOME	CLIMATE CHANGE	HOUSING	HEALTH	LEGACY POLLUTION	TRANSPORTATION	ENERGY	WATER/WASTE WATER	HIGH SCHOOL DIPLOMA	WORKFORCE DEVELOPMENT
45051050900									X	X
45043920700	X	X								
45043920800	X	X		X		X		X		
45019005000	X	X			X	X		X		
45051051501	X	X								
45051060102	X	X								
45043920400	X			X	X	X				X
45043920502	X	X		X						
45043920503	X	X		X						
45019002200	X	X		X		X				
45019002400	X	X		X		X				
45019002300	X	X				X				
45029970800	X	X		X		X	X			
45013000200	X	X			X	X				
45013000400	X	X			X	X				
45013000600	X	X								
45019002502	X	X				X				
45013000903	X	X								
45013000800	X	X								
45013001000	X	X			X					
45013001102	X	X		X						
45051060208	X		X							

3.16 Coastal Barrier Resources System

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, restricts federal funding and financial assistance affecting CBRS units, to discourage development on coastal barriers that would result in the loss of natural resources, and pose threats to human life, health, and property. The waterway and/or dredged material placement areas fall within five CBRS units, however two of these units are designated as “otherwise protected areas” that are not subject to requirements under CBRA. The CBRA includes an exception at 16 USC 3505(a)(2) for the “maintenance or construction of improvements of existing Federal navigation channels (including the Intracoastal Waterway) and related structures (such as jetties), including the disposal of dredge materials related to such maintenance or construction.”

In the Bulls Bay location (Reach 2), the AIWW is entirely within CBRS Unit SC-06P; dredged material typically remains within the CBRS Unit during maintenance dredging activities. Since CBRS Unit SC-06P is designated as an "otherwise protected area," consultation under CBRA is not required.

In the Capers Island and Bulls Island locations, the AIWW is entirely within CBRS Unit SC-07P. Dredged material typically remains within the Unit during maintenance dredging activities. Since CBRS Unit SC-07P is designated as an "otherwise protected area," consultation under CBRA is not required.

Activities in CBRS Units M01, M05, and M10 would require consultation with USFWS. In the Little River, SC location (reach 1A), the AIWW is partially within CBRS Unit M01. DMMAs

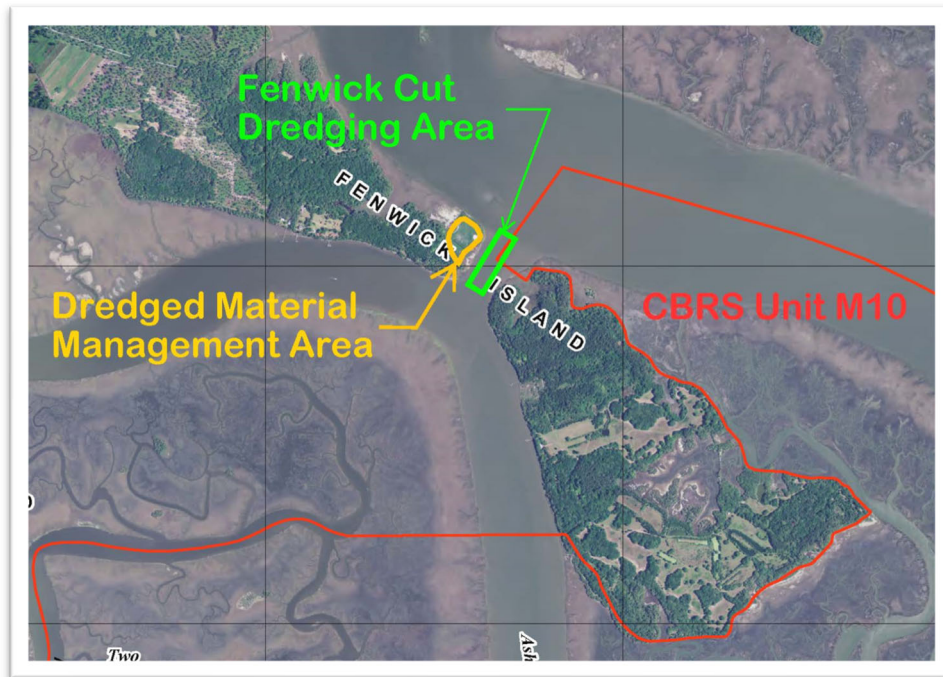


Figure 12. AIWW dredging location within CBRS Unit M10

3.17 Coastal Zone Resources

The South Carolina Coastal Management Program was authorized in the South Carolina Coastal Tidelands and Wetlands Act of 1977 (Statutory Code Ann. Section 48-39-10 et seq.). The SCDHEC Division of Ocean and Coastal Resource Management (OCRM) is responsible for the implementation of the state's program. The Coastal Zone Management Act of 1972 (CZMA) requires that each Federal agency activity performed within or outside the coastal zone that affects land or water use, or natural resources of the coastal zone, be carried out in a manner which is consistent to the maximum extent practicable (i.e., fully consistent) with the enforceable policies of approved state management programs.

The policy groups that were considered for determining if the proposed Federal action is consistent with the enforceable policies of the South Carolina Coastal Zone Management Program include: Dredging (Dredging and Spoil Disposal), Erosion Control, Areas of Special Resource Significance (Barrier Islands, Dune Areas, Navigation Channels, Public Open Spaces, and Wetlands), and Geographic Areas of Particular Concern (GAPC).

4 ENVIRONMENTAL CONSEQUENCES

4.1 Water Quality

Alternative A (No Action Alternative)

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

Alternative B (Existing O&M Activities)

Under Alternative B, maintenance dredging of the waterway by cutterhead suction dredge would result in increased turbidity levels leading to water discoloration, reduction of light penetration, and reduced dissolved oxygen levels. These localized effects are expected to be temporary since turbidity levels should return to normal once construction activities cease. Maintenance dredging of the AIWW has been ongoing since the 1940s and no new areas are proposed for maintenance dredging.

In-water placement of spoil material has the potential to temporarily alter circulation patterns and increase turbidity levels. Finer silt and clay sediments tend to remain suspended in the water column for longer periods of time than sand; however, tidal currents in the in-water placement locations should reduce suspension times and limit turbidity increases.

Effluent discharge from the placement of dredged materials into DMMA has the potential to transport dredged sediments back into the adjacent waterway. To reduce adverse effects to water quality, water discharge from the DMMA is controlled by a weir structure and designed to follow longer flow paths within the containment areas. This provides time for sediments to settle out before reaching the waterway. Regular maintenance is conducted on the DMMA to reduce any potential for dike failure that would result in adverse effects to water quality.

Results from the 2021 sediment sampling and analysis (Appendix H) identified arsenic levels above the TEL or ERL in 14 out of 20 samples; however, arsenic is naturally occurring in South Carolina because of high concentrations found in basement rock within the southeastern United States (Scott et al. 1994, Long et al. 1998, Sanger 1998). The sediment analysis also detected naphthalene (PAH) in concentrations above the TEL in 2 samples from Reach 1A, dioxins/furans were found in concentrations above the TEL in one sample from Reach 3, and copper and nickel were detected in concentrations above the TEL in 2 locations in Reach 2. Concentrations above the TEL would rarely result in adverse effects; therefore, maintenance dredging activities would meet the requirements of Sections 401 and 303 of the Clean Water Act (CWA).

Alternative C (Proposed Action)

In addition to the effects described under Alternative B, the proposed nearshore placement of dredged material has the potential to temporarily increase turbidity levels; however, the effects are expected to be localized and minor. The sediments that would be used for nearshore placement would contain a minimum 60% sand content and sand particles are less likely to remain suspended in the water column than finer clay and silt particles.

Changes in bottom topography from placement along the nearshore have the potential to alter circulation patterns; however, USACE intends to discharge the sediments as a slurry in a shore-parallel form in shallower waters to facilitate migration of sediments onshore. There should be minimal, if any, adverse effects on circulation patterns. BU placement of dredged material in the nearshore is intended to nourish the eroded shoreline.

On 11 April 2023, USACE submitted a CWA Section 401 water quality certification request to SCDHEC. To date, SCDHEC has not issued the water quality certification. A Section 401 water quality certification requirement shall be waived if a certifying authority fails to act on a request for certification within the reasonable period of time (40 CFR 121.9(a)), which is six months unless otherwise agreed (40 CFR 121.6(c)). In order to allow SCDHEC additional time to prepare the overall 401 certification for AIWW O&M dredging activities, USACE has invoked a partial waiver of the water quality certification requirement allowed under 40 CFR §121.9(b), which is limited to and necessary for the 2024 sediment rehandling and beneficial use project in the Breach Inlet area of the AIWW. USACE provided the requisite written notification of its intent to exercise a waiver on 11 January 2024 to satisfy the certification requirement (40 CFR 121.9(b)). Upon issuance of a Section 401 water quality certification, USACE intends to adhere to the conditions of that certification for future AIWW O&M dredging activities. USACE has otherwise determined that the proposed dredging and placement activities meet the requirements of Sections 401 and 303 of the CWA. No significant impacts would occur to water quality under the Proposed Action Alternative.

4.2 Noise

Alternative A (No Action Alternative)

Under the No Action Alternative, the proposed dredging and placement activities would not occur; therefore, no direct or indirect project related noise impacts would occur.

Alternative B (Existing O&M Activities)

Under Alternative B, maintenance dredging along the waterway would result in temporary noise impacts from the dredge and survey vessels. An increase in underwater noise levels could also occur from the dredge equipment or from the pinging of the survey equipment; however, noise from these activities is typically low energy and unlikely to cause damage (Todd et al 2014). Maintenance dredging cycles typically last for approximately 4 months; therefore, any impacts that would occur would be temporary and minor.

Alternative C (Proposed Action)

Alternative C would have similar effects described under Alternative B and would also include temporary and minor impacts associated with BU placement along Sullivan's Island and Isle of Palms. Beach placement would require construction equipment on the beach and there would be increased noise levels associated with construction activities; however, these would return to normal once maintenance activities are complete.

4.3 Aesthetics (Visual Resources)

Alternative A (No Action Alternative)

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

Alternative B (Existing O&M Activities)

Under Alternative B, dredging and placement activities would result in temporary and minor adverse effects to aesthetics. The waterway is popular for recreational boating and fishing many areas adjacent to the waterway are natural, wildlife managed areas that are open to the public such as the ACE Basin, Waccamaw National Wildlife Refuge, and Santee Coastal Reserve. During maintenance dredging activities, dredge vessels and equipment would be present in the waterway, disturbing the viewscape from land and on the waterway. Any adverse effects to aesthetics would cease once dredging and placement activities are complete.

Alternative C (Proposed Action)

Alternative C would have similar effects described under Alternative B but would also include impacts associated with placement along the nearshore and beach areas of Sullivan's Island and

Isle of Palms. During construction, dredged sediments would be pumped via pipeline to the beach and nearshore areas which would temporarily disrupt the beauty of the beach environment for landowners along the beachfront, visitors to the beach, and boaters in the construction vicinity. These effects would be temporary and would cease once construction is complete. Long-term, BU placement of dredged sediments would improve aesthetics along the beachfront by restoring areas lost to erosion.

4.4 Recreation

Alternative A (No Action Alternative)

Under the No Action Alternative, the proposed maintenance activities would not occur. Overtime, this would result in increased shoaling which could adversely affect recreational and commercial boating activities on the AIWW.

Alternative B (Existing O&M Activities)

Under Alternative B, maintenance dredging of the waterway could temporarily impact recreational boating and other water activities during construction activities; however, maintenance dredging of the waterway would prevent shoaling that could limit passage on the waterway and potentially ground recreational vessels. Impacts to recreation are expected to be minimal and would cease once construction is complete.

Alternative C (Proposed Action)

Effects under Alternative C would be similar to those described under Alternative B but would also include temporary and localized impacts associated with placement along the shoreline of Sullivan's Island and Isle of Palms. During construction activities, beach and nearshore areas would not be accessible for recreation. Construction is expected to last approximately 4 months and areas would reopen once construction is complete. BU placement would benefit recreation by restoring areas of the beach lost to erosion from storms.

4.5 Benthic Organisms

Alternative A (No Action Alternative)

Under the No Action Alternative, the proposed dredging and placement activities would not occur; therefore, no direct or indirect project related impacts to benthic organisms would result.

Alternative B (Existing O&M Activities)

Under Alternative B, O&M activities are expected to result in temporary and minor adverse effects to benthic organisms. Dredging activities could impact benthic communities through removal of benthic organisms and their habitat. According to Stickney and Perlmutter (1975), maintenance dredging along the AIWW has been shown to completely displace infaunal communities; however, both species diversity and composition returned to pre-dredging levels within a month of post-dredging. Stickney and Perlmutter (1975) also found little change in sediment composition between dredging events for the AIWW.

In-water placement of dredged materials could result in direct burial or smothering of less motile species; however, effects should be minimal. Van Dolah et al. (1979) investigated the effects of dredged material placement at the Dewees Inlet in-water placement site and found that dredge material placement resulted in no widespread long-term effects on benthic communities. These results were likely due to use of several disposal sites, good flushing patterns in the area, rapid recolonization from adjacent areas, and similarity of sediment composition. Van Dolah et al. (1984) investigated the effects of in-water disposal at the N. Edisto placement area. The study found that detrimental effects on benthic macrofauna were minimal due to 1) strong tidal currents which rapidly dispersed the moderate amount of mud sediments released; 2) surface disposal, which allowed for wider dispersal; and 3) disposal during late autumn, a period of low faunal recruitment.

Designated shellfish harvesting areas can be found throughout the project area. Several shoaling areas (Bulls Bay to Sullivans Island, Dawhoo River at N. Edisto, S. Edisto at Raccoon Island, Ashe Island, and Brickyard Creek at Jack Island) are classified as “approved shellfish harvesting”. Typically, dredging is conducted in deeper waters and therefore, is unlikely to restrict access to or degrade shellfish harvesting areas; however, USACE would notify SCDHEC 30 days prior to dredging in any designated shellfish harvesting areas. If possible, areas open to shellfish harvesting would be dredged during the closed shellfish harvesting season.

Alternative C (Proposed Action)

In addition to the effects described under Alternative B, beach and nearshore placement activities could result in adverse effects to benthic communities from burial or smothering of less motile intertidal species, increased turbidity in the surf zone, and changes in the sand grain size or beach profile. These impacts are expected to be temporary and minor since historically, studies demonstrate that South Carolina beaches experience rapid recovery (one to six months) of beach sediment characteristics and infauna post-construction (Bergquist et. al, 2008; Van Dolah et al., 1992; Van Dolah et. al., 1994; Jutte et al., 1999). BU placement is intended to restore beach areas lost to erosion, thereby increasing habitat for benthic organisms.

4.6 Fish and Wildlife Resources

Alternative A (No Action Alternative)

Under the No Action Alternative, the proposed dredging and placement activities would not occur; therefore, no direct or indirect project related impacts to fish and wildlife resources would result.

Alternative B (Existing O&M Activities)

Under Alternative B, dredging and placement activities could result in temporary and minor impacts to fish and wildlife resources. During dredging and in-water placement activities, marine mammals and fish species are likely to avoid the area and return once activities cease. Dike raising and placement of dredged material in DMMA's could temporarily displace some migratory bird species that frequent these areas, but effects would be minimal since placement would occur in a single location for each shoaling area and species would have additional foraging resources nearby. To reduce the risk of impacts to manatees, standard manatee safety conditions would be implemented. To reduce the potential for entrainment/impingement of fish larvae, eggs, and juveniles, USACE intends to adhere to NMFS recommended time of year restrictions, as practicable (Appendix F).

Alternative C (Proposed Action)

In addition to the effects described under Alternative B, Alternative C would also include the temporary loss of foraging habitat for shorebird species. Placement activities along the beach and nearshore typically result in the burial or suffocation of less motile benthic species; however, these impacts are expected to be temporary since benthic recruitment would begin once construction activities cease. Long-term, BU placement would increase foraging habitat for shorebirds by restoring beach areas lost to erosion.

4.7 Air Quality

Alternative A (No Action Alternative)

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

Alternative B (Existing O&M Activities)

Under Alternative B, temporary impacts to air quality would occur during maintenance dredging and placement activities due to emissions from dredging and survey vessels, and heavy equipment used at DMMA locations. Impacts would be localized and temporary, and air quality

levels are expected to return to normal once activities cease. All counties covering the waterway, DMMA, and in-water placement areas (Horry, Georgetown, Charleston, Colleton, and Beaufort) are designated as in attainment for all principal pollutants. The short-term effects from vessels and equipment associated with the project would not affect this status.

Alternative C (Proposed Action)

Effects associated with Alternative C would be similar to Alternative B but would also include temporary effects associated with construction equipment used for beach placement. The effects would be minor and would cease once construction is complete. The short-term effects would not change the in-attainment status for Charleston County.

4.8 Threatened and Endangered Species

Alternative A (No Action Alternative)

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

Alternative B (Existing O&M Activities)

Under Alternative B, the West Indian manatee is the only species under the jurisdiction of USFWS that may present within the project area. Dredging and in-water placement activities may affect but are not likely to adversely affect the West Indian Manatee. If construction occurs between June 1 and September 30, Standard Manatee Safety Guidelines would be implemented to ensure protection of manatees.

Species under the jurisdiction of NMFS include Atlantic sturgeon, shortnose sturgeon, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. Maintenance dredging and placement activities are covered under the 2020 South Atlantic Regional Biological Opinion (SARBO). USACE intends to adhere to all applicable project design criteria per the 2020 SARBO; therefore, additional consultation with NMFS under ESA is not required.

Alternative C (Proposed Action)

Under Alternative C, USACE determined that BU activities may affect but are not likely to adversely affect the West Indian manatee, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, or seabeach amaranth under the jurisdiction of FWS. A determination of may affect, not likely to adversely modify has been made for rufa red knot proposed critical habitat. A determination of may affect, likely to adversely affect has been made for piping plover, rufa red knot, and loggerhead sea turtle.

BU placement along the beaches and nearshore of Sullivan's Island and Isle of Palms may result in temporary adverse effects on piping plover, rufa red knot, and the loggerhead sea turtle during construction. Beach placement may have direct and indirect impacts on piping plover and rufa red knot through disturbance, temporary decreases of food resources, and/or modification of habitat; however, maintaining foraging and/or roosting opportunities outside of active construction areas would minimize project impacts to these species. Long-term, BU placement along the beach and nearshore would increase habitat for piping plover and rufa red knot species.

During the construction phase, potential adverse effects to sea turtles (primarily loggerhead sea turtles) include disturbance of existing nests (potentially missed during surveys), disturbance of females attempting to nest, and disorientation of emerging hatchlings. In addition, heavy equipment would be required to construct the beach profile. This equipment would have to traverse the beach portion, which could result in harm to nesting sea turtles, their nests, and emerging hatchlings. To minimize impacts to nesting sea turtles, a nest relocation program would be implemented if construction activities extend into turtle nesting season. Long-term, nearshore and

beachfront placement of dredged material would restore beach areas, providing additional nesting habitat for sea turtle species. Detailed information regarding ESA species and potential adverse effects is provided in the biological assessment in Appendix C.

Per Section 7 of the ESA, USACE submitted a biological assessment (BA) and entered into formal consultation with FWS on 27 March 2023. FWS issued a biological opinion (BO) and conference opinion (CO) on 8 September 2023. All terms and conditions of the BO (Appendix C) will be adhered to.

Species under the jurisdiction of NMFS include Atlantic sturgeon, shortnose sturgeon, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle and whale species. Maintenance dredging and placement activities, including beneficial use activities, are covered under the 2020 South Atlantic Regional Biological Opinion (SARBO). USACE intends to adhere to all applicable project design criteria per the 2020 SARBO; therefore, additional consultation with NMFS under ESA is not required.

4.9 Navigation

Alternative A (No Action Alternative)

Under the No Action Alternative, the proposed dredging and placement activities would not occur; therefore, no direct or indirect project related impacts on navigation would result; however, without maintenance dredging, sediments would accumulate in the waterway which could impede passage for commercial and recreational vessels.

Alternative B (Existing O&M Activities)

Under the Proposed Action Alternative, temporary and minor impacts to navigation would occur during dredging and survey activities, and placement in the in-water areas. Waterway areas where maintenance activities would occur may be temporarily unavailable due to the presence of dredge and/or survey equipment; however, the work would not span the entire width of the waterway so passage would still be available. Maintenance activities provide a long-term beneficial effect on navigation by providing safe and reliable passage for vessels utilizing the AIWW.

Alternative C (Proposed Action)

Effects under Alternative C would be similar to Alternative B but would also include nearshore placement of dredged material. Nearshore placement would occur in the swash/surf zone and material would be pumped to the nearshore via pipeline. This would result in minimal adverse effects to navigation due to the small construction area relative to the open ocean. Construction is expected to last approximately 4 months. Beach placement activities should have no effect on navigation.

4.10 Climate/Climate Change

Alternative A (No Action Alternative)

Under the No Action Alternative, the proposed dredging and placement activities would not occur; therefore, no direct or indirect project related impacts on climate change would result. Sea level rise for coastal South Carolina is expected to continue at a rate of at least one inch every two years (NOAA 2023).

Alternative B (Existing O&M Activities)

Climate change and sea level rise are largely attributed to human activities that increase atmospheric concentrations of carbon dioxide and other greenhouse gases (GHG). Carbon dioxide emissions associated with fuel consumption are the primary contributor to greenhouse gas emissions associated with dredging projects. For each gallon of diesel fuel used during dredging, approximately 22.2 lbs. of CO₂ are emitted (EIA 2014). On average, dredge vessels consume

approximately 129 gallons of diesel per hour. Dredge operations are expected to occur 24/7 for a period of approximately 4 months. For the AIWW, the dredging cycle occurs approximately every 3 years on average, depending on funding and need. Under Alternative B, dredging vessel activities would be expected to result in approximately 1,164 metric tons of CO₂ emissions per year on average, representing 0.000023 % of 2022 total US CO₂ emissions. (This estimate does not include maintenance activities.) Therefore, dredging activities are expected to have a negligible effect on climate change.

Based on an estimated \$51 per metric ton of CO₂, and an annual 1,164 metric tons of CO₂ emissions, the social cost of carbon emissions for Alternative B would be \$59,364.

Alternative C (Proposed Action)

Alternative C would have similar effects as Alternative B but would also include emissions associated with beach nourishment activities. Equipment that is typically utilized for beach nourishment includes two bulldozers and one front-end loader. On average two bulldozers would burn approximately 28 gallons of fuel per hour and one loader would burn approximately 12 gallons of fuel per hour. Bulldozers would remain running approximately 18 hours/day, seven days per week, for the estimated 4-month construction period (2016 hours). The loader would run approximately 4 hours/day (448 hours). Based on an average beach nourishment cycle of 2 years (dredging cycle for Breach Inlet), beach nourishment activities would be expected to generate approximately 902 metric tons of CO₂ emissions per year on average, representing .000018 % of 2021 total U.S. CO₂ emissions. The total CO₂ emissions that would be generated by Alternative C would be 2066 metric tons per year on average, representing 0.000041 % of 2022 total U.S. CO₂ emissions. Therefore, Alternative C is expected to have a negligible effect on climate change.

Based on an annual 2066 metric tons of CO₂ emissions, the social cost of greenhouse gas for Alternative C would be \$105,366. While the social cost of greenhouse gas for Alternative C is higher than Alternative B, BU placement is expected to mitigate effects of climate change and sea level rise by restoring beach areas lost to erosion from large storm events.

4.11 Essential Fish Habitat

Alternative A (No Action Alternative)

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

Alternative B (Existing O&M Activities)

Under Alternative B, dredging activities have the potential to temporarily degrade water quality, and adversely affect fish eggs, larvae, and small juvenile fish. Dredging of the waterway would cause bottom sediments to become suspended in the water column. Suspended matter can interfere with the passage of light, increase turbidity levels, reduce dissolved oxygen levels, and inhibit foraging ability in benthic-feeding fishes (Bellwood and Fulton 2008).

To minimize impacts to water quality, USACE would utilize a cutterhead suction dredge for maintenance dredging of the waterway. Cutterhead dredges produce the least amount of suspended sediments, which usually occur along the bottom portion of the water column. Typically, suspended particles and turbidity tend to be localized in the immediate vicinity of the cutterhead dredge, and decrease with increasing distance from the dredge site. Studies indicate elevated sediment levels can occur up to 1,100 feet from a dredge excavation site, but concentrations significantly decrease within one hour (Blair et al 1990, Neff 1985).

Demersal and pelagic fish eggs, larvae, and juveniles are highly susceptible to entrainment by suction dredges due to their inability to escape the suction area around the intake pipe (McNair and Banks 1986). Conducting dredge operations during migration periods increases the potential for entrainment, especially for bottom dwelling fish, larval oysters, and post-larval white and brown shrimp (Van Dolah et al. 1984). Avoiding O&M activities in coastal inlets and the waterway from March through May would reduce the potential for larval entrainment (Wickliffe et al. 2019). Avoiding O&M activities during the summer months would allow for growth of larval and juvenile life stages (Wickliffe et al. 2019).

Many EFH species forage on infaunal and bottom dwelling organisms such as worms, crustacean, and other EFH prey types. O&M activities can adversely impact these prey types through removal or burial of the organisms, reducing foraging opportunities for managed species (Newell et al. 1998, Van der Veer et al. 1985). According to Stickney and Perlmutter (1975), maintenance dredging along the AIWW has been shown to completely displace infauna communities; however, both species diversity and composition returned to pre-dredging levels within a month of post-dredging. Stickney and Perlmutter (1975) also found little change in sediment composition between dredging events for the AIWW.

To avoid adverse impacts to EFH and federally managed species, USACE would implement best management practices (BMPs) provided in the 2023 *Programmatic Essential Fish Habitat Consultation for United States Army Corps of Engineers Activities and Projects Regularly Undertaken in South Carolina* (PEFHC), as practicable (Appendix F). Therefore, Alternative B would not result in significant effects on EFH managed species.

Alternative C (Proposed Action): In addition to effects described under Alternative B, beach and nearshore placement along Sullivan's Island and Isle of Palms could result in temporary and minor adverse effects to EFH managed species from loss of foraging opportunities and water quality impacts. BU placement activities could result in the burial or smothering of less motile intertidal benthic species; however, these impacts are expected to be temporary and minor since benthic recruitment would be expected to begin once construction is complete. Historically, studies demonstrate that South Carolina beaches experience rapid recovery (one to six months) of beach sediment characteristics and infauna post-construction (Bergquist et. al, 2008; Van Dolah et al., 1992; Van Dolah et. al., 1994; Jutte et al., 1999). Placement of dredged sediments in the nearshore could result in increased turbidity; however, the surf zone is a highly dynamic environment characterized by turbulent flows and intense sediment transport. Turbidity from the deposition of dredged sediments would not have a significant effect on water quality.

Placement activities along the nearshore also have the potential to disrupt spawning and migration for managed species if conducted in areas containing sensitive marine habitats; however, there are no hard bottom resources in the project area and BU activities would not impact marsh wetlands. BU placement is expected to occur during the fall and winter months, as practicable, to avoid periods of high biological activity. Dredging, nearshore placement, and beach placement activities are covered under the 2023 *Programmatic Essential Fish Habitat Consultation for United States Army Corps of Engineers Activities and Projects Regularly Undertaken in South Carolina* (PEFHC) found in Appendix F. USACE intends to adhere to the BMPs provided in the PEFHC. Therefore, Alternative C would not result in significant effects to EFH resources. In accordance with the requirements of the programmatic EFH consultation document, USACE will submit an EFH consultation verification form for each O&M dredging activity. The EFH consultation verification form for a sediment rehandling and beneficial use project in the Breach Inlet area of the AIWW is included in Appendix F.

4.12 Hazardous, Toxic, and Radioactive Waste

Alternative A (No Action Alternative)

Under the No Action Alternative, the proposed dredging would not occur; therefore, no direct or indirect project related impacts to hazardous, toxic, or radioactive waste would occur.

Alternative B (Existing O&M Activities)

According to Engineering Regulation 1165-2-132, dredged materials and sediments that lie beneath navigable waters that are proposed for dredging would qualify as hazardous or toxic wastes only if they are located within the boundaries of a site designated by the USEPA or a state agency under CERCLA for a removal or remedial action. Utilizing the USEPA NEPA Assist Tool, no hazardous, toxic, or radioactive waste sites were identified within or directly adjacent to the waterway, upland DMMAs, or in-water placement areas.

Since maintenance dredging activities along the AIWW have been ongoing since the 1940s, previously unknown hazardous, toxic, or radioactive waste sites are not likely to be discovered. In 2021, sediment samples were collected at 20 locations in the waterway for chemical analysis. The analysis confirmed that hazardous and toxic materials are not present in the bottom sediments above levels of concern (Appendix H). In addition, dredge contractors would be required to provide a spill prevention, control, and containment response plan for all dredging activities including dredge material placement work.

Alternative C (Proposed Action)

Impacts associated with Alternative C, are similar to those described under Alternative B. No direct or indirect project related impacts on hazardous, toxic, or radioactive waste would occur under the Proposed Action.

4.13 Cultural Resources

Alternative A (No Action Alternative)

Under the No Action Alternative, the proposed O&M activities would not occur; therefore, no direct or indirect project related impacts on cultural or historic resources would result.

Alternative B (Existing O&M Activities)

For cultural resources, the threshold for significant impacts includes any disturbance that cannot be mitigated and affects the integrity of a historic property such as 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 any action that disturbs a resource that has importance to a traditional group under the American Indian Religious Freedom Act (AIRFA), EO 13007, and the 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 because of the completed project, such as increased vehicular or pedestrian traffic in the vicinity of the resource.

The Area of Potential Effect (APE) for Alternative B has been defined as the federal navigation channel and existing dredge material placement areas. Actions anticipated within the APE would consist of dredging in the channel and placement of dredged material in the existing DMMAs and in-water placement areas. Impacts to cultural resources could result from activities which include soil disturbance, soil compaction, and rut formation. Soil disturbing activities have

the potential to destroy stratigraphy and site integrity which could adversely affect a site's NRHP eligibility. Soil compaction caused by placement of dredge pipes and dredged material have the potential to destroy site integrity resulting in adversely affecting the site's potential to yield specific data that addresses important research questions. Placing dredge pipe on top of archaeological sites could cause ruts to form, which can potentially cause artifacts to become exposed, erode soil, and cause overall damaging effects to the site's depositional integrity affecting its potential to yield significant data to build upon the region's history or prehistory.

Under Alternative B, dredging of the federal navigation channel and placement of dredged material in previously approved sites would not negatively affect cultural resources.

Alternative C (Proposed Action)

The APE for Alternative C is similar to Alternative B but includes the surrounding shoreline of Sullivan's Island and Isle of Palms. In addition to the activities evaluated under Alternative B, this alternative includes beneficial use placement along the nearshore and beaches of Sullivan's Island and Isle of Palms. BU placement would be accomplished by transporting a slurry of sand materials via pipeline to the beach or the swash/surf zone (nearshore) to replace sand eroded from past storm events. Materials piped to the nearshore would be placed within a highly dynamic area and would be transported to the beach by wave action.

In accordance with Section 106 of the NHPA, USACE reviewed the APE surrounding the Sullivan's Island and Isle of Palms project areas. Two sites, 38CH189 and 38CH433, are documented near the proposed DMMA's along Breach Inlet. Site 38CH189 is comprised of a shell and artifact concentration that has previously been dredged and redeposited and determined to be not eligible. Site 38CH433 has likewise been impacted by previous dredging activities. It is documented as an artifact and shell scatter with no integrity, and therefore not eligible. One wreck is identified near the dredge area, but little is known about this wreck. To protect what is left of these resources, an avoidance zone will be indicated for these resources and at least a 50-foot buffer will be implemented to ensure no impacts. Based on these results, the Corps determined that there is conditional no adverse effect for cultural resources due to the implementation of avoidance buffers.

Two historic shipwreck sites are documented off the coast of the Isle of Palm placement area. Site 38CH53 is the remains of the Georgiana-Mary Bowers, a Confederate blockage runner. Site 38CH77 is also comprised of the remains of a Confederate blockage runner. Due to their distance from the undertaking and current sediment coverage, no impacts are anticipated for these two sites. An avoidance buffer of at least 50-feet will be applied if equipment is positioned near those resources. No resources were identified within a close proximity to the proposed Sullivan's Island placement area. Any inadvertent discoveries will require a work stoppage and further consultation.

USACE has determined that there is no adverse effect to NRHP listed, or eligible resources as defined in 36 CFR 800.16(i). Although no direct impacts are anticipated, avoidance buffers will be put in place around any identified resources to aid in their preservation. The State Historic Preservation Office and Tribes will be consulted on any scope changes or inadvertent discoveries.

4.14 Wetlands

Alternative A (No Action Alternative)

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

Alternative B (Existing O&M Activities)

Under Alternative B, during maintenance dredging activities, no direct impacts would occur to wetlands. Dredging activities do not span the entire width of the channel and a large majority of the

areas adjacent to the channel where dredging occurs are upland DMMA's. In addition, dredging and survey vessels would operate at low speeds to avoid causing erosion along the banks where wetlands could be present.

Alternative C (Proposed Action)

Impacts associated with Alternative C are similar to those described for Alternative B. BU placement along the nearshore of Sullivan's Island and Isle of Palms would avoid marsh areas located in the inlets. Alternative C would not result in any impacts to wetlands.

4.15 Socioeconomics and Environmental Justice

Alternative A (No Action Alternative)

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

Alternative B (Existing O&M Activities)

Under Alternative B, maintaining the waterway benefits the economy by providing safe passage for commercial, cargo, and recreational vessels which provide jobs, recreational opportunities, and tax revenue. Approximately one-third of the census tracts along the waterway are identified as low income and vulnerable to climate change effects such as flooding. Maintaining the waterway to its authorized depth of 12 feet provides a beneficial effect by retaining water storage capacity that would be lost if sediments were allowed to accumulate.

Alternative C (Proposed Action)

Alternative C is similar to Alternative B but also includes three census tracts associated with BU placement along the beaches and nearshore of Sullivan's Island and Isle of Palms. None of the three census tracts are identified as disadvantaged and 94% of the population in this area is identified as white. BU placement is intended to restore the eroded public beach areas and provide a beneficial effect on the economy by supporting the retail and commercial industries that depend on the tourist population in this location. Restoring the beach areas also provides protection to structures adjacent to the beach. The Proposed Action Alternative would not cause or contribute to disproportionately high, adverse effects on minority or low-income areas.

4.16 Coastal Barrier Resource System

Alternative A (No Action Alternative)

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

Alternative B (Existing O&M Activities)

For Reach 1A, there is the potential for the future removal of 100,000 yd³ of dredged sediments from within Unit M01 with placement in an upland placement site that falls within the boundaries of Unit M01. For Reach 2, there is the potential for the removal of up to 500,000 yd³ of dredged sediments from within Unit M05 with placement in either an upland placement area located inside the unit or the Dewees Inlet in-water placement site that is located partially within Unit M05. For Reach 3, there is the potential for the removal of approximately 1,500 yd³ of material from Unit M10 that would be placed in a nearby DMMA located outside of CBRS Unit M10. The CBRA exception found in 16 U.S.C. 3505(a)(2) for the maintenance or construction of improvements of existing federal channels applies to this project. USACE would consult with USFWS under CBRA and invoke the exception for existing navigation channels prior to dredging in any of these units.

Alternative C (Proposed Action)

The effects described under Alternative B would apply to Alternative C. The BU placement areas along Sullivan's Island and Isle of Palms are not located within any CBRS units.

4.17 Coastal Zone Resources

Alternative A (No Action Alternative)

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

Alternative B (Existing O&M Activities)

Under Alternative B, maintenance dredging would result in short-term, localized impacts to the water column and sub-bottom habitat such as increased turbidity, reduced dissolved oxygen, and loss of benthic communities in the dredged areas. However, these areas would be expected to return to normal once dredging activities cease. In addition, BMPs, including measures to prevent pollutants from entering the water or migration of sediments, would be implemented as appropriate. Maintenance dredging is not expected to cause shoreline erosion, result in creation of stagnant water, interfere with commercial navigation, or obstruct the natural flow of navigable waters.

Alternative C (Proposed Action)

In addition to the effects described under Alternative C, the Proposed Action also involves BU placement of dredge material along the beaches and nearshore of Isle of Palms and Sullivans Island which is intended to replace sand loss from erosion. It is not expected to alter drainage patterns, existing dune ridges or natural vegetation. Placement materials would consist of natural sediments containing no construction debris, toxic material or other foreign matter and would have a composite grain size distribution similar to that of the native beach material. During construction, adverse impacts could include interference with fish spawning/migration in nearshore areas and smothering/burial of benthic communities on the beach and nearshore; however, these effects would be temporary and localized.

The proposed action would not result in negative impacts on adjacent property owners or dune areas. While the proposed BU placement of sand could restrict access to the beach and nearshore areas of Sullivan's Island and Isle of Palms, this would only occur during construction activities and would be of limited scope. The proposed dredging and dredge placement activities would have no adverse effects on wetlands and would not result in any long-term adverse impacts to geographic areas of concern.

USACE has determined that the proposed action is consistent to the maximum extent practicable with the enforceable policies of the South Carolina Coastal Zone Management Program. A Coastal Zone Consistency (CZC) request was submitted to SCDHEC-OCRM on April 11, 2023. OCRM concurred with this determination and issued a CZC conditional concurrence on 29 September 2023 (Appendix D).

5 CUMULATIVE IMPACTS

This EA also considers the effects of cumulative impacts as required in 40 C.F.R. § 1508.7 and concurrent actions as required in 40 CFR § 1508.25. A cumulative impact, as defined by the CEQ (40 C.F.R. § 1508.7) is the “...*impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts 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

In 2019, approximately 1,327,649 yd³ of dredged material was removed from Reach 2 of the AIWW and placed in existing DMMAs.

In 2021, approximately 40,000 to 80,000 yd³ of dredged material was removed from the Folly River entrance channel and placed along Folly Beach nearshore associated with a BU pilot project.

Currently, approximately 630,000 yd³ of dredged materials are being removed from Reach 3 of the AIWW and placed in the N Edisto River open water placement site.

In late September 2023, approximately 550,000 yd³ of materials are expected to be dredged from Murrells Inlet and placed on Garden City beach and Huntington Beach State Park.

In late February/March 2024, approximately 190,000 yd³ of materials are expected to be dredged from Town Creek and placed nearshore of Lighthouse Island.

Nourishment of Edisto Beach is planned for late 2024/early 2025. Approximately 1.1 million yd³ of material would be dredged from an existing and approved offshore borrow site.

Nourishment of Myrtle Beach is planned for 2024 to address damage from Hurricane Ian. Material would be dredged from an existing and approved offshore borrow site.

Nourishment of Folly Beach is planned for late 2024/early 2025. Approximately one million yd³ of material would be dredged from the Folly River entrance channel.

Nourishment of Pawleys Island is planned for early 2025 to address damage from Hurricane Ian. Material would be dredged from an existing and approved offshore borrow site.

5.2 Resource Areas Evaluated for Cumulative Effects

Implementation of the proposed action would have no or negligible effects on Noise, Aesthetics, Recreation, Fish and Wildlife Resources, Air Quality, Navigation, Climate Change, Hazardous and Toxic Waste, Cultural Resources, Wetlands, Environmental Justice, and Coastal Barrier Resource Systems. As such, these resources were not carried forward into the cumulative effects analysis.

5.2.1. Water Quality

The proposed action, when considered with past, present, and reasonably foreseeable future projects, would not result in significant impacts to water quality. The proposed action could increase water turbidity and suspended sediments during dredging and dredge placement activities; however, these effects would be temporary and localized and turbidity levels should

return to normal once activities cease. Since studies have demonstrated that arsenic is naturally occurring in this region due to high concentrations found in basement rock, arsenic levels detected above the ERL/TEL in sediment samples along the AIWW would not be expected to result in unacceptable adverse impacts to aquatic, mammalian, or wildlife resources. The present and future actions are required to adhere to local, state, and federal regulations and BMPs, which are designed to limit negative impacts to water quality. Compliance of present and future projects with these regulations, combined with implementation of BMPs for the proposed action, would minimize any potential for adverse cumulative impacts. A Section 401 water quality certification request was submitted to SCDHEC on 11 April 2023. To date, SCDHEC has not issued the water quality certification. On 11 January 2024, USACE informed SCDHEC of its intent to exercise a partial waiver of the water quality certification requirement allowed under 40 CFR §121.9(b) for the 2024 sediment rehandling beneficial use project in the Breach Inlet area of the AIWW. This partial waiver applies only to the 2024 sediment rehandling beneficial use project and does not apply to future AIWW O&M dredging activities.

5.2.2. Benthic Organisms

The proposed action, when considered with past, present, and reasonably foreseeable future projects, would not result in significant impacts to benthic organisms. Dredging and beach placement activities would result in temporary, localized impacts to benthic communities with recovery expected within 6 months. In-water placement activities are expected to result in minimal disturbance to benthic macrofauna. Upland placement of dredged material is not expected to adversely affect benthic communities. Minimization measures would include conducting activities during late fall/early winter, as practical, when benthic recruitment is low, and placement of beach quality sand for beach nourishment activities.

5.2.3. Threatened and Endangered Species

The proposed action, when considered with past, present, and reasonably foreseeable future projects, would not result in significant impacts to federally listed species. USACE determined that the project is not likely to adversely affect (NLAA) the green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, seabeach amaranth, and West Indian manatee, or adversely modify or destroy proposed rufa red knot critical habitat. The project is likely to adversely affect (LAA) the piping plover, rufa red knot, and loggerhead sea turtle. USACE provided these determinations in a BA submitted to FWS on 27 March 2023 (Appendix C). By letter dated 8 September 2023, the service concurred with these determinations and issued a BO (Appendix C). USACE will adhere to all terms and conditions of the BO, including the reasonable and prudent measures (RPMs) that the Service considers necessary or appropriate to minimize the impacts of incidental take on listed species. Therefore, the proposed action is not likely to jeopardize the continued existence of the species listed above and is not likely to adversely modify or destroy the proposed rufa red knot critical habitat.

Maintenance dredging and placement activities, including beneficial use activities, are covered under the 2020 South Atlantic Regional Biological Opinion (SARBO). USACE intends to adhere to all applicable project design criteria per the 2020 SARBO; therefore, additional consultation with NMFS under ESA is not required.

5.2.4. 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 intends to follow recommended BMPs included in the 2023 *Programmatic Essential Fish Habitat Consultation for United States Army Corps of Engineers Activities and Projects Regularly Undertaken in South Carolina* to avoid

significant individual or cumulative adverse effects on EFH or living marine resources under the jurisdiction of NMFS. In accordance with the requirements of the programmatic EFH consultation document, USACE will submit an EFH consultation verification form for each O&M dredging activity.

5.2.5. Coastal Zone Resources

The proposed action would avoid and minimize impacts to water quality and other coastal resources to the maximum extent practicable by conducting the work in a manner consistent with the Coastal Zone Management Program's Dredging and Dredge Material Disposal Policies. USACE would implement appropriate BMPs to minimize the migration of sediments and implement safety measures to prevent the release of oil, tar, trash, debris, and other pollutants. BU placement of dredged sediments along the nearshore and beaches of Sullivan's Island and Isle of Palms would benefit identified Areas of Resource Significance by restoring beach areas lost to erosion from past storm events. No Geographic Areas of Particular Concern would be impacted. USACE determined the proposed dredging and dredge placement activities are consistent with the certification requirements of the CZMA. USACE determined the proposed action, when considered with past, present, and reasonably foreseeable future projects, would not result in significant impacts to coastal zone resources. A CZC request for the proposed action was submitted to OCRM on April 11, 2023. OCRM issued a CZC conditional concurrence on 29 September 2023.

6 PUBLIC INVOLVEMENT AND COORDINATION

The Draft Supplemental EA and Draft Finding of No Significant Impact (FONSI) were published on USACE public media outlets announcing the availability of the EA for a 30-day review and comment on 29 August 2023.

Notification letters were sent to the following:

- **Tribes**
 - Absentee-Shawnee Tribe of Indians of Oklahoma
 - Alabama-Quassarte Tribal Town
 - Catawba Indian 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
 - Seminole Tribe of Florida

- **Federal Agencies**
 - U.S. 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

7 ENVIRONMENTAL COMPLIANCE

7.1 Clean Air Act of 1972

The Clean Air Act (CAA) as amended (42 U.S.C. §7401 to §7671q) was designed to control air pollution on a national level by regulating air emissions from stationary and mobile sources. Among other things, the CAA authorizes USEPA to protect public health and public welfare by establishing National Ambient Air Quality Standards for criteria pollutants and by establishing standards for emissions of hazardous air pollutants. All counties covering the project area (Horry, Georgetown, Charleston, Colleton, and Beaufort) are designated as in attainment for all principal pollutants. The short-term effects from construction equipment associated with the project would not significantly affect air quality in the study area. Air quality permits would not be required for this project.

7.2 Clean Water Act of 1972 – Section 401 and Section 404

The Clean Water Act (CWA) (33 USC §1251 et seq.) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The CWA sets goals to eliminate discharges of pollutants into navigable waters, protect fish and wildlife, and prohibit the discharge of toxic pollutants in quantities that could adversely affect the environment. Sections of the CWA that would apply to the proposed action are Section 401, regarding state water quality certifications that existing water quality standards would not be violated; and Section 404, regarding the discharge of dredged or fill material into Federally regulated waters of the U.S., including wetlands. A 404(b)(1) analysis (Appendix G) has been completed to address impacts to jurisdictional waters associated with placement activities. On 11 April 2023, USACE submitted a CWA Section 401 water quality certification request to SCDHEC. To date, SCDHEC has not issued the water quality certification. A Section 401 water quality certification requirement shall be waived if a certifying authority fails to act on a request for certification within the reasonable period of time (40 CFR 121.9(a)), which is six months unless otherwise agreed (40 CFR 121.6(c)). In order to allow SCDHEC additional time to prepare the overall 401 certification for AIWW O&M dredging activities, USACE has invoked a partial waiver of the water quality certification requirement allowed under 40 CFR §121.9(b), which is limited to and necessary for the 2024 sediment rehandling and beneficial use project in the Breach Inlet area of the AIWW. USACE provided the requisite written notification of its intent to exercise a waiver on 11 January 2024 to satisfy the certification requirement (40 CFR 121.9(b)). Upon issuance of a Section 401 water quality certification, USACE intends to adhere to the conditions of that certification for future AIWW O&M dredging activities. USACE has otherwise determined that the proposed dredging and placement activities meet the requirements of Sections 401 of the CWA.

7.3 Coastal Barrier Resources Act of 1982

The Coastal Barrier Resources Act (CBRA) is administered by the USFWS and encourages the conservation of storm prone and dynamic coastal barriers by restricting federal expenditures that could encourage development in these areas. There are three CBRS units (M01 near Little River, M05 near Dewees Island, and M10 near Fenwick cut) that could be affected by maintenance dredging of the AIWW. The CBRA exception found at 16 U.S.C. 3505(a)(2) for “the maintenance or construction of improvements of existing federal navigation channels (including the Intracoastal Waterway) and related structures (such as jetties), including the disposal of dredge materials related to such maintenance or construction,” applies to this project. USACE will consult with FWS under CBRA prior to each dredging cycle. Therefore, the project would be in full compliance with CBRA.

7.4 Coastal Management Zone Act of 1972

The Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. §1451 to §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 CZMA requires each Federal agency activity performed within or outside the coastal zone that affects land or water use, or natural resources of the coastal zone, to be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved state management programs. The South Carolina Coastal Management Program (CMP) was authorized in 1977 under SC's Coastal Tidelands and Wetlands Act (CTWA), and OCRM is responsible for implementation of the state's program. The goals of the CMP are attained by enforcement of the policies of the State as codified within the South Carolina Code of Regulations (SC Code of Regulations Chapter 30). In accordance with the CZMA, USACE has determined that the Federal action would be carried out in a manner that is fully consistent with the enforceable policies of the CMP to the maximum extent practicable. A CZC request was submitted to OCRM on April 11, 2023. OCRM issued a CZC conditional concurrence on 29 September 2023.

7.5 Endangered Species Act of 1973

The Endangered Species Act of 1973, as amended, 16 U.S.C. §1531, et seq. (P.L. 93-205), was implemented to protect critically imperiled species from extinction. USACE has determined that the project may affect but is not likely to adversely affect the West Indian manatee, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and seabeach amaranth, and is not likely to adversely modify or destroy proposed critical habitat for the rufa red knot. The project may affect, is likely to adversely affect the piping plover, rufa red knot, and loggerhead sea turtle. USACE submitted a BA to initiate formal consultation with FWS on 27 March 2023. FWS concurred with these determinations in their BO issued on 8 September 2023. USACE intends to adhere to the terms and conditions of the BO, including reasonable and prudent measures FWS considers necessary or appropriate to minimize the impacts of incidental take on listed species. This fulfills the requirements applicable to the Action for completing consultation under §7(a)(2) of the Endangered Species Act of 1973, as amended.

USACE has determined that the proposed project falls under the scope of the NMFS 2020 South Atlantic Regional Biological Opinion (SARBO), for federally listed marine species. The project would be implemented in compliance with the 2020 SARBO. As such, no additional coordination is required with NMFS.

7.6 Environmental Justice (EO 12898)

According to EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, each federal agency must conduct its programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination under, such programs, policies, and activities, because of their race, color, national origin, or income level. Total minority populations combined (i.e., all non-white and Hispanic or Latino racial groups) comprise approximately 27 percent of the population in the project area. Beneficial effects of the project, including safe navigation of the waterway and more sustainable public beaches, would benefit the public. The areas proposed for BU placement have sufficient public access and parking. No disproportionate, adverse effects to minority or low-income populations would result from the proposed maintenance dredging and dredge placement activities.

7.7 Fish and Wildlife Coordination Act of 1934

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

7.8 Floodplain Management (EO 11988)

EO 11988 requires federal agencies to avoid, to the extent practicable, the modification of floodplains, and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. Maintenance dredging of the AIWW has been ongoing since the 1940s. No new areas of dredging and no new DMMAs are proposed. The proposed BU placement of material along Sullivan's Island and Isle of Palms would occur within the floodplain; however, the intent is to replace sand in areas eroded from storms and would not induce development. The project would be compliant with the requirements of EO 11988.

7.9 Protection of Wetlands (EO 11990)

EO 11990 requires that each Federal agency provide leadership and take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. The project would not result in the destruction, loss or degradation of wetlands. Therefore, the project would be compliant with the requirements of EO 11990.

7.10 Migratory Bird Treaty Act and EO 13186

The Migratory Bird Treaty Act (MBTA) of 1918 (16 USC §§ 703-712) prohibits the killing, capturing, trading, selling, or transport of protected migratory bird species without prior authorization of the FWS. MBTA applies only to migratory bird species that are native to the United States or U.S. territories. EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, requires that environmental analysis conducted by federal agencies under NEPA, evaluate the effects of federal actions on migratory birds with emphasis on species of concern. The proposed project would restore beach areas lost to erosion from past storms, providing additional foraging habitat for migratory bird species including the federally threatened rufa red knot. The project would comply with MBTA and EO 13186.

7.11 National Environmental Policy Act of 1969

The National Environmental Policy Act (NEPA) of 1969, as amended, (42 USC § 4321 et seq.) provides a commitment that Federal agencies will consider, document, and publicly disclose the environmental effects of their actions. NEPA documents must provide detailed information regarding the purpose and need statement, the proposed action and alternatives, including the No Action Alternative, the environmental impacts of the alternatives, appropriate mitigation measures, and any adverse environmental impacts that cannot be avoided if the project is implemented. Agencies are required to demonstrate that decision makers have considered these factors prior to undertaking actions. This supplemental EA was prepared to document the effects of the proposed project, and the document was subject to public review and a 30-day comment period. The project is compliant with NEPA.

7.12 Marine Mammal Protection Act of 1972

The Marine Mammal Protection Act (MMPA) (16 U.S.C. §1361 to §1423h), prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S. The USACE does not anticipate the take of any marine mammal during any activities associated with the proposed project. Dredging would utilize hydraulic cutterhead dredge with transport by pipeline to

the placement areas. To ensure the protection of any manatees present in the project area, incorporation of standard manatee conditions would be implemented during construction activities. The project would be compliant with MMPA.

7.13 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (16 U.S.C. §1801 to §1891d) requires preparation of an Essential Fish Habitat (EFH) Assessment and coordination with NMFS. Routine maintenance dredging and placement activities, including beneficial use nearshore and beach placement for the AIWW are covered under the 2023 *Programmatic Essential Fish Habitat Consultation for United States Army Corps of Engineers Activities and Projects Regularly Undertaken in South Carolina (PEFHC)*. USACE intends to follow the recommended BMPs of the PEFHC, as practicable. In accordance with the requirements of the programmatic EFH consultation document, USACE will submit an EFH consultation verification form for each O&M dredging activity.

7.14 Executive Order 13112, Invasive Species

EO 13112 requires that Federal agencies take steps to prevent the introduction and spread of invasive species, and to support efforts to eradicate and control invasive species that are established. The proposed project would require the mobilization of dredge equipment, possibly from other geographical regions, which has the potential to transport species from one region to another. Such introduction of species to new habitats can result in their out-competing native species. USACE follows standard protocols, such as cleaning of all equipment prior to use, to minimize the risk of introducing invasive species.

7.15 National Historic Preservation Act of 1966

Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations, 36 CFR Part 800, provides a regulatory framework for the identification, documentation, and evaluation of historic and cultural resources that may be affected by Federal undertakings. Under Section 106 of the Act, Federal agencies must consider the effects of their undertakings on historic properties, including resources that are listed or are eligible for listing in the NRHP, and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. Additionally, a Federal agency must consult with any tribe that attaches religious and cultural significance to such properties. USACE has determined there is no adverse effect to NRHP listed or eligible resources as defined in 36 CFR 800.16(i). Although no direct impacts are anticipated, avoidance buffers will be placed around any identified resources to aid in their preservation. SHPO and Tribes will be consulted on any scope changes or inadvertent discoveries. In accordance with 36 C.F.R. §800.4(d)(1)(i), USACE's responsibilities under Section 106 of NHPA have been fulfilled.

8 COMMITMENTS

The USACE shall comply with the applicable conditions of the FWS BO, 2020 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 maintenance dredging and dredge placement activities for the AIWW by adhering to the below conditions:

Magnuson-Stevens Fishery Conservation and Management Act:

- USACE would adhere to the recommended Best Management Practices included in the *2023 Programmatic EFH Consultation for USACE Activities Regularly Undertaken in South Carolina*.
- USACE will submit an EFH consultation verification form for each future O&M dredging activity.

Section 106 of the National Historic Preservation Act:

- USACE would abide by the required minimum 50 foot buffers for sites 38CH189 and 38CH433, located near Breach Inlet, and sites 38CH53 and 38CH77, located off the coast of Isle of Palms.

Endangered Species Act:

USFWS Biological and Conference Opinion, Atlantic Intracoastal Waterway:

Mandatory Applicable Terms and Conditions:

1. The above RPMs should be included in the permit application/project plans and must be implemented in the proposed project.
2. A conference call between representatives of the Corps, Corps' contractor, SCESFO, SCDNR, shorebird surveyor(s), and the permitted sea turtle surveyors must be held prior to project construction. At least ten business days advance notice will be provided prior to conducting this meeting/call. The meeting/conference call will provide an opportunity for explanation and/or clarification of the protection measures.
3. Beach compatible fill must be placed on the beach or in any associated dune system. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Such material must be predominately of carbonate, quartz or similar material with a particle size distribution ranging between 0.062mm and 4.76mm (classified as sand by either the Unified Soils or the Wentworth classification), must be similar in color and grain size distribution (sand grain frequency, mean and median grain size and sorting coefficient) to the material in the historic beach sediment at the disposal site, and must not contain:
 - a. Greater than five percent, by weight, silt, clay or colloids passing the #230 sieve;
 - b. Greater than five percent, by weight, fine gravel retained on the #4 sieve (- 2.25φ);
 - c. Coarse gravel, cobbles or material retained on the 3/4 inch sieve in a percentage or size greater than found on the native beach;

- d. Construction debris, toxic material or other foreign matter; and
- e. Material that will result in cementation of the beach.

If rocks or other non-specified materials appear on the surface of the filled beach in excess of 50% of background in any 10,000 square foot area, then surface rock should be removed from those areas. These areas must also be tested for subsurface rock percentage and remediated as required. If the natural beach exceeds any of the limiting parameters listed above, then the fill material must not exceed the naturally occurring level for that parameter on nearby native beaches.

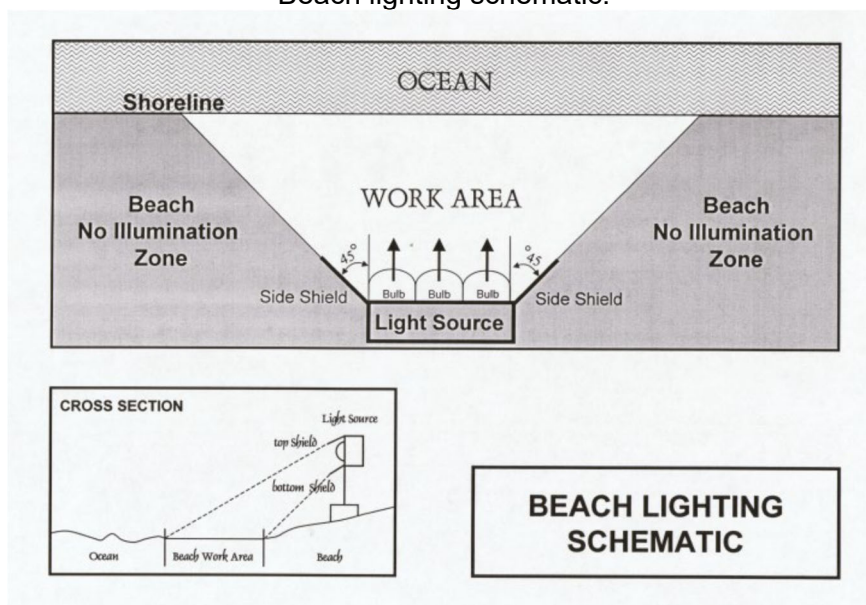
These standards must not be exceeded in any 10,000 square foot section extending through the depth of the nourished beach. If the native beach exceeds any of the limiting parameters listed above, then the fill material must not exceed the naturally occurring level for that parameter on nearby native beaches.

- 4. Daily early morning surveys for sea turtle nests will be required if construction overlaps with the sea turtle nesting season (May 1 – October 31). Nesting surveys must be conducted until the last nest relocated out of the project area is inventoried if work will begin before October 31. If nests are constructed in areas where they may be affected by construction activities, the nests must be relocated per the following requirements.
 - a. Nesting surveys and nest relocation will only be conducted by personnel with prior experience and training in nesting survey and nest marking procedures. Surveyors must have a valid SCDNR permit. Nesting surveys must be conducted daily between sunrise and 9:00 AM.
 - b. Only those nests that may be affected by sand placement activities will be relocated. Nests requiring relocation will be moved no later than 9:00 AM the morning following deposition to a nearby self-release beach site in a secure setting where artificial lighting will not interfere with hatchling orientation. Relocated nests will not be placed in organized groupings. Relocated nests will be randomly staggered along the length and width of the beach in settings that are not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, or subject to artificial lighting. Nest relocations in association with construction activities must cease when construction activities no longer threaten nests.
 - c. Nests deposited within areas where construction activities have ceased or will not occur for 75 days or nests laid in the nourished berm prior to tilling must be marked and left in situ unless other factors threaten the success of the nest. The turtle permit holder will install an on-beach marker at the nest site. No activity will occur within this area, nor will any activities occur which could result in impacts to the nest. Nest sites will be inspected daily to assure nest markers remain in place and the nest has not been disturbed by the project activity.
- 5. During the sea turtle nesting season, nighttime storage of construction equipment not in use must be off the beach to minimize disturbance to sea turtles. Staging areas for construction equipment must be located off the beach. Nighttime storage of construction equipment not in use must be off the beach to minimize disturbance to sea turtle nesting and hatching activities. In addition, all construction pipes placed on the beach must be located as far landward as possible without compromising the integrity of the dune system. Pipes placed parallel to the dune must be 5 to 10 feet away from

the toe of the dune if the width of the beach allows. Temporary storage of pipes must be off the beach to the maximum extent possible. If the pipes are stored on the beach, they must be placed in a manner that will minimize the impact to nesting habitat and must not compromise the integrity of the dune systems.

6. Predator-proof trash receptacles must be installed and maintained during construction at all beach access points used for the project construction to minimize the potential for attracting sea turtle nest predators. The contractors conducting the work must provide predator-proof trash receptacles for the construction workers. All contractors and their employees must be briefed on the importance of not littering and keeping the project area trash and debris free.
7. The Corps must hire nighttime monitors to patrol the beach at night in the project area if nighttime construction activities and equipment occur during the nesting season. Monitors must patrol the length of the pipeline within the active nighttime construction area for nesting females May 1 – August 31. Beginning July 1, sea turtle monitors must check all nests on a nightly basis after 9 pm within 1,000 feet of the active nighttime project area that have been incubating for 45 days until three nights after the first sign of emergence or the inventory of the nest contents.
8. Direct lighting of the beach and nearshore waters must be limited to the immediate construction area during nesting season and must comply with safety requirements. Lighting on all equipment must be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface and nesting beach while meeting all Coast Guard, Corps EM 385-1-1, and OSHA requirements. Light intensity of lighting equipment must be reduced to the minimum standard required by OSHA for General Construction areas, in order not to misdirect sea turtles. Shields must be affixed to the light housing and be large enough to block light from all on-beach lamps from being transmitted outside the construction area or to the adjacent sea turtle nesting beach.

Beach lighting schematic.



9. During the sea turtle nesting season, the contractor must not extend the beach fill more than 500 feet (or other agreed upon length) along the shoreline between dusk and dawn and the following day until the daily nesting survey has been completed and the beach cleared for fill advancement. An exception to this may occur if there is permitted sea turtle surveyor present on-site to ensure no nesting and hatching sea turtles are present within the extended work area. If the 500 feet is not feasible for the project, an agreed upon distance will be decided on during the preconstruction meeting. Once the beach has been cleared and the necessary nest relocations have been completed, the contractor will be allowed to proceed with the placement of fill and work activities during daylight hours until dusk at which time the 500-foot length (or other agreed upon length) limitation must apply. If any nesting turtles are sighted on the beach within the immediate construction area, activities must cease immediately until the turtle has returned to the water and the sea turtle permit holder responsible for nest monitoring has relocated the nest.
10. Sand compaction must be monitored in the area of sand placement immediately after completion of the project and prior to May 1 for three subsequent years unless compaction results are within the native beach range after the first subsequent year. If tilling is needed, the area must be tilled to a depth of 24 inches. Each pass of the tilling equipment must be overlapped to allow more thorough and even tilling. All tilling activity must be completed at least once prior to nesting season. An electronic copy of the results of the compaction monitoring must be submitted to the SCESFO prior to any tilling actions being taken or if a request not to till is made based on compaction results. The requirement for compaction monitoring can be eliminated if the decision is made to till regardless of post construction compaction levels. Additionally, out-year compaction monitoring, and remediation are not required if placed material no longer remains on the dry beach.
 - a. Compaction sampling stations must be located at 500-foot intervals along the sand placement template. One station must be at the seaward edge of the dune/bulkhead line (when material is placed in this area), and one station must be midway between the dune line and the high water line (normal wrack line).
 - b. At each station, the cone penetrometer must be pushed to a depth of 6, 12, and 18 inches three times (three replicates). Material may be removed from the hole if necessary to ensure accurate readings of successive levels of sediment. The penetrometer may need to be reset between pushes, especially if sediment layering exists. Layers of highly compact material may lie over less compact layers. Replicates must be located as close to each other as possible, without interacting with the previous hole or disturbed sediments. The three replicate compaction values for each depth must be averaged to produce final values for each depth at each station. Reports will include all 18 values for each transect line, and the final six averaged compaction values.
 - c. If the average value for any depth exceeds 500 pounds per square inch (psi) for any two or more adjacent stations, then that area must be tilled immediately prior to May 1.
 - d. If values exceeding 500 psi are distributed throughout the project area but in no case do those values exist at two adjacent stations at the same depth, then consultation with the SCESFO will be required to determine if tilling is required. If a

few values exceeding 500 psi are present randomly within the project area, tilling will not be required.

- e. Tilling must occur landward of the wrack line and avoid all vegetated areas three square feet or greater with a three square foot buffer around the vegetated areas.
11. Visual surveys for escarpments along the project area must be made immediately after completion of the sand placement and within 30 days prior to May 1 for three subsequent years if sand in the project area still remains on the dry beach. Escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet must be leveled and the beach profile must be reconfigured to minimize scarp formation by the dates listed above. Any escarpment removal must be reported by location. If the project is completed during the early part of the sea turtle nesting and hatching season, escarpments may be required to be leveled immediately, while protecting nests that have been relocated or left in place. The SCESFO must be contacted immediately if subsequent reformation of escarpments that interfere with sea turtle nesting or that exceed 18 inches in height for a distance of 100 feet occurs during the nesting and hatching season to determine the appropriate action to be taken. If it is determined that escarpment leveling is required during the nesting or hatching season, the SCESFO will provide a brief written authorization within 30 days that describes methods to be used to reduce the likelihood of impacting existing nests. An annual summary of escarpment surveys and actions taken must be submitted to the SCESFO.

Shorebirds

12. The placement area must be surveyed for piping plovers and red knots by qualified individuals before project construction to document presence/absence of each species. Three surveys should be spaced at least 3 days apart so surveys must start at least 10 days before project construction activities begin. Surveys should be scheduled to start two hours after high tide. Piping plovers and red knots will be counted and band combinations (flags, flag color, flag code, band color, and band code) on any banded birds will be recorded. Band combinations must be confirmed through a 20-60x spotting scope and/or a digital camera (DSLR camera with 150-600 mm lens). Coordinates will be recorded in decimal degrees for each bird or flock of birds. Survey data must be entered into an Excel spreadsheet provided by the Service's SCESFO.

Mandatory Reasonable and Prudent Measures:

The Service believes the reasonable and prudent measures (RPMs) we describe in this section for the piping plover, rufa red knot, and loggerhead sea turtle are necessary or appropriate to minimize the impact, i.e., the amount or extent, of incidental take caused by the Action.

1. Conservation Measures included in the permit application/project plans (Section 2 of this BO) must be implemented (unless revised in the Terms and Conditions) in the proposed project.
2. A meeting/conference call between representatives of the Corps, Corps' contractor, SCESFO, SCDNR, HBSP staff, shorebird surveyor(s) and the permitted sea turtle surveyor(s) must be held prior to the commencement of work on this Action.
3. The Corps will use beach compatible sand for sand placement.

Sea Turtles

4. The Corps will hire sea turtle monitors to survey the project area daily during the sea turtle nesting season (May 1 – October 31) or until the last nest relocated out of the project area is inventoried. Surveys for nesting sea turtles must be conducted within the project area if work will occur during a portion of the nesting season. If nests are laid within the sand placement footprint, the eggs must be relocated to minimize sea turtle nest burial, crushing of eggs, or nest excavation. Nest relocation will be on a selected area of beach that is not expected to experience daily inundation by high tides or known to routinely experience severe erosion and egg loss, predation, or subject to artificial lighting.
5. The Corps' contractor(s) will store construction equipment and materials for project construction in a manner that will minimize impacts to sea turtles to the maximum extent practicable. For example, the Corps will limit vehicle and equipment usage to intertidal areas below the most recent high tide line to minimize impacts to dune vegetation and sand compaction.
6. The Corps' contractor will install and maintain predator-proof trash receptacles during project construction at all beach access points used for project construction to minimize the potential for attracting predators of sea turtles.
7. The Corps must hire nighttime monitors with sea turtle experience to patrol the beach at night in the project area if nighttime construction activities and equipment occur during the nesting season.
8. During the sea turtle nesting season, the Corps' contractor must not extend the beach fill more than 500 feet along the shoreline and must confine work activities within this area between dusk and the following day's nesting survey unless nighttime monitors patrol the beach to reduce the impacts to emerging sea turtles and burial of new nests.
9. The Corps will monitor sand compaction and conduct tilling (non-vegetated areas) if needed immediately after completion of the sand placement work and prior to the next three nesting seasons to reduce the likelihood of impacting sea turtle nesting and hatching activities.
10. The Corps will monitor escarpment formation and conduct leveling if needed immediately after completion of the sand placement project and prior to the next three nesting seasons to reduce the likelihood of impacting sea turtles.

Shorebirds

11. The placement areas must be surveyed for piping plovers and red knots by qualified individuals before project construction to document presence/absence of each species.

NMFS 2020 SARBO Applicable Project Design Criteria:

- 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 hatchlings 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 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, sidescan 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 μ Pa (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.

Coastal Zone Consistency Concurrence Conditions:

- In the event that any historic or cultural resources and/or archaeological materials are found during the course of work, the applicant must notify the State Historic Preservation Office and the South Carolina Institute of Archaeology and Anthropology. Historic or cultural resources consist of those sites listed in the National Register of Historic Places and those sites that are eligible for the National Register. Archaeological materials consist of any items, fifty years old or older, which were made or used by man. These items include, but are not limited to, stone projectile points (arrowheads), ceramic sherds, bricks, worked wood, bone and stone, metal and glass objects, and human skeletal materials.
- The proposed activity must follow recommendations and/or guidance from the US Fish and Wildlife Service regarding the potential to effect the piping plover, rufa red knot, loggerhead sea turtle, and seabeach amaranth.
- For areas on Sullivans Island and Isle of Palms where proposed beneficial use of material is proposed:
 - a. Only clean sand, free from all potential sources of pollution, must be used for beach renourishment.
 - b. Sand used must consist of appropriate grain sizes, quality, and color to be compatible for beach renourishment. If muddy sediments or excessively coarse sediments (rocks, large shell fragments, etc.) are observed while sand is being placed on the beach, dredging of that portion of the borrow area must be terminated immediately and the dredge must be moved to another location.

c. Qualified personnel, under the direction of a registered professional geologist or registered professional engineer, must be present on the beach during sand pumping activities to monitor the sediment quality and correlate it with borrow area conditions.

d. If accumulations of mud rollers or coarse sediments (rocks, large shell fragments, etc.) exceed the equivalent of one 15-cubic yard dump truck per 100 linear feet of beach, the material must be removed from the beach using hand labor or a beach-sweeping device as soon as practicable upon completion of the section or upon completion of the project.

Section 401 of the CWA Certification Conditions:

To date, SCDHEC has not issued the Section 401 water quality certification. On 11 January 2024, USACE provided notice in writing of its intent to invoke a partial waiver of the water quality certification requirement allowed under 40 CFR §121.9(b) for the 2024 sediment rehandling and beneficial use project in the Breach Inlet area of the AIWW. This partial waiver applies only to the 2024 sediment rehandling and beneficial use project, and does not apply to future AIWW O&M dredging activities. For future AIWW O&M dredging activities, assuming the subsequent issuance of a water quality certification, USACE will comply with all applicable conditions in that water quality certification.

9 REFERENCES

- Blair, S.M., B.S. Flynn, S. Markley. 1990. Characteristics and assessment of dredge related mechanical impact to hard-bottom reef areas off northern Dade County, FL. *Diving for Science* 90.
- Brown, C.L. and R. Clark. 1968. Observations on dredging and dissolved oxygen in a tidal waterway. *Water Resources Research* 4:1381-1384.
- Council of Environmental Quality (CEQ). 2022. Climate and Economic Justice Screening Tool. <https://screeningtool.geoplatform.gov/> (accessed May 2023).
- Institute of Water Resources. (n.d.) Waterborne Commerce Statistics Center. <http://www.iwr.usace.army.mil/About/Technical-Centers/WCSC-Waterborne-Commerce-Statistics-Center/> (accessed Feb 2022).
- James, Stephen R., W. Wilson, and E. Gifford. February 2022. Cultural Resources Survey for the Charleston to Port Royal Channel Realignment, Beaufort and Charleston Counties, South Carolina. Draft report prepared for the U.S. Army Corps of Engineers, Charleston District by Panamerican Consultants, Inc. Memphis, Tennessee.
- Johnson, S.A. 1981. Estuarine dredge and fill activities: A review of impacts. *Environmental Management* 5: 427-440.
- Long E.R., L.J. Field, and D.D. MacDonald. 1998. Predicting toxicity in marine sediments with numerical sediment quality guidelines. *Environmental Toxicology Chemistry* 17:714–727.
- McNair, E.C., Jr., and G.E. Banks. 1986. Prediction of Flow Fields Near the Suction of a Cutterhead Dredge, *American Malacological Bulletin*, Special Edition No. 3, pp 37-40.
- National Marine Fisheries Service (NMFS), Office of Protected Species. 2020. South Atlantic Regional Biological Opinion for Dredging and Material Placement Activities in the Southeast United States. St. Petersburg, Florida.
- National Oceanic and Atmospheric Administration Fisheries. (N.D.) Common Bottlenose Dolphin. www.fisheries.noaa.gov/species/common-bottlenose-dolphin. (accessed June 2022).
- Neff, J.F. 1985. Biological effects of drilling fluids, drill cuttings, and produced waters. In: D.F. Boesch and N.N. Rabalais (eds). *The long-term effects of offshore oil and gas development: An assessment and research strategy*.
- Newell, R.C., L.J. Seiderer, and D.R. Hitchcock. 1998. The impact of dredging works in coastal waters: a review of the sensitivity to disturbance and subsequent recovery of biological resources on the seabed. *Oceanography and Marine Biology: An Annual Review* 36: 127–178.
- Paris P., A. Leach, and D.R. Corbett. 2023. Potential long-term disturbance associated with beach nourishment – insights and observations from Pea Island National Wildlife Refuge, Outer Banks, North Carolina; *Heliyon* 9(1): e12816.

- Rosenberg, R. 1977. Effects of dredging operations on estuarine benthic macrofauna. *Marine Pollution Bulletin* 8:102-104.
- Sanger, D.M., 1998. Physical, chemical and biological environmental quality of tidal creeks and salt marshes in South Carolina estuaries. PhD Dissertation, University of South Carolina, Columbia, SC.
- Scott, G. I., M. H. Fulton, R. F. Van Dolah, P. B. Key, J. W. Daugomah, P. P. Maier, E. F. Wirth, M. Levison, N. Hadley, S. Layman, B. C. Thompson, E. D. Strozier, and P. L. Pennington. 1994. Ecotoxicological assessment of effluent and sediments from the Savannah Harbor dredged materials disposal areas in Wright River Estuary of South Carolina. USDOC/NOAA/NMFS/SEFSC/Charleston Laboratory, Marine Ecotoxicology Division, Charleston, SC.
- Scott, G.I., M.H Fulton, D. Bearden, K. Chung, M. Sanders, A. Dias, L.A. Reed, S. Sivertsen, E.D. Strozier, P.B. Jenkins, J.W. Daugomah, P. Pennington, J. DeVane, P.B. Key, A.K. Leight, and W. Ellenberg. 1998. Chemical contaminant levels in estuarine sediment of the Ashepoo–Combahee–Edisto River (ACE) Basin National Estuarine Research Reserve and Sanctuary Site: NOS/NCCOS/CCEHBRC, Charleston, SC.
- Simpson, R.G., D.M. Allen, S.A. Sherman, and K.F. Edwards. 2015. Fishes of the North Inlet estuary: a guide to their identification and ecology. Belle W. Baruch Institute Special Publication. University of South Carolina. 143 pp.
- Smith, E.R., F. D'Alessandro, G.R. Tomasicchio, and J.Z Gailani. 2017. Nearshore placement of a sand dredged mound. *Coastal Engineering* 126: 1–10.
- South Carolina Department of Health and Environmental Control. 2020. South Carolina 303(d) List of Impaired Waters & TMDLS. <https://scdhec.gov/bow/south-carolina-303d-list-impaired-waters-tmdls>. (accessed Feb 2022).
- South Carolina Department of Natural Resources (SCDNR). 2019. Summary of Living Shoreline Research to Inform Regulatory Decision-Making in South Carolina. Charleston, SC: South Carolina Marine Resources Division. Technical Report No. 110. 49 pp.
- South Carolina Department of Natural Resources. 2020. Characterization of the Ashepoo-Combahee-Edisto (ACE) Basin, South Carolina. <https://www.dnr.sc.gov/marine/mrri/acechar/biological/mammals.html>. (accessed May 2022).
- Statista. 2021. Number of Registered Recreational Boats in the United States in 2021, by state. <https://www.statista.com/statistics/1155988/us-recreational-boating-vessels/> (accessed Feb 2022).
- Stickney, R.R., and D. Perlmutter. 1975. Impact of Intracoastal Waterway maintenance dredging on a mud bottom benthos community. *Biological Conservation* 7: 211-226.
- Todd, Neil P.M., A.C. Paillard, K. Kluk, E. Whittle, and J.G. Colebatch. 2014. Vestibular receptors contribute to cortical auditory evoked potentials. *Hearing Research* 309: 63-74.
- University of Massachusetts Amherst (UMA). 2017. Restore and protect natural shorelines: Use living shoreline techniques. Massachusetts Wildlife Climate Action Tool. <http://www.climateactiontool.org> (accessed July 2023).

- U.S. Army Corps of Engineers. 2022. South Atlantic Coastal Study. <https://www.sad.usace.army.mil/SACS/> (accessed June 2023).
- U.S. Army Corps of Engineers. 1976. Maintenance Dredging of Atlantic Intracoastal Waterway, South Carolina. Final Environmental Statement and Statement of Findings.
- U.S. Army Corps of Engineers. 2006. Operation and Maintenance Work on the AIWW Disposal Site 1006/1027S W-C Adjacent to the Isle of Palms Connector in Charleston County, South Carolina.
- U.S. Environmental Protection Agency. 2000. Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data. Office of Transportation and Air Quality. Technical Report No. EPA420-R-00-002.
- U.S. Environmental Protection Agency. 2015. Non-attainment Areas for Criteria Pollutants (Green Book). <http://www.epa.gov/oar/oaqps/greenbk/index.html>. (accessed May 2022).
- U.S. Environmental Protection Agency. 2016. What Climate Change Means for South Carolina. EPA 430-F-16-042. Available online: [Document Display | NEPIS | US EPA](#) (accessed June 2022).
- U.S. Fish Wildlife Service. 2022. Information for Planning and Consultation. <https://ipac.ecosphere.fws.gov/location/index> (accessed February 2023).
- U.S. Fish Wildlife Service. (n.d.) Santee National Wildlife Refuge. <https://www.fws.gov/refuge/santee>. (accessed April 2022).
- U.S. Fish Wildlife Service. (n.d.) Waccamaw National Wildlife Refuge. <https://www.fws.gov/refuge/Waccamaw>. (accessed March 2022).
- Vallianos, L. 1990. Beach and Nearshore Placement of Dredged Material Dredged from Federally Authorized Navigation Projects. Institute for Water Resources Policy Study 90-PS-1. USACE, Institute for Water Resources.
- Van der Veer, H., M.J.N. Bergman, and J.J. Beukema. 1985. Dredging Activities in the Dutch Wadden Sea effects on microbenthic infauna. Netherlands Journal for Sea Research 19:183-190.
- Van Dolah, R.F., D.R. Calder, D.M. Knott, and M.S. Maclin. 1979. Effects of dredging and unconfined disposal of dredged material on macrobenthic communities in Sewee Bay, South Carolina. South Carolina Marine Resources Center Technical Report No. 39. South Carolina Wildlife and Marine Resources Department.
- Van Dolah, R.F., D.R. Calder, and D.M. Knott. 1984. Effects of dredging and open-water disposal on benthic macroinvertebrates in a South Carolina estuary. Estuaries 7:28-37.
- Wickliffe, L.C., F.C. Rohde, K.L. Riley, and J.S. Morris, Jr. (eds). 2019. Seasonal Conservation Measures for Fisheries during Coastal Development Activities in the Carolinas. NOAA Technical Memorandum NOS NCCOS. 267 pp.

- Wilber, D.H. and D.G Clarke. 2007. Defining and assessing benthic recovery following dredging and dredged material disposal. Proceedings XXVII World Dredging Congress 2007. Orlando, Florida.
- Wilber, D., D. Clarke, D. Ray, and R. Van Dolah. 2009. Lessons learned from biological monitoring of beach nourishment projects. Proceedings of the Western Dredging Associations' Twenty-Ninth Technical Conference (Tempe, Arizona). pp. 262-924.
- Wong, P.P., I.J. Losada, J.P. Gattuso, J. Hinkel, A. Khattabi, K.L. McInnes, Y. Saito, and A. Sallenger, 2014: Coastal systems and low-lying areas. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 361-409.