Disposal of Dredged Material from the Atlantic Intracoastal Waterway

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Introduction

The Atlantic Intracoastal Waterway (AIWW) is a federally-maintained navigation channel that extends from Norfolk, VA to Key West, FL, a distance of approximately 1200 miles (Fig. 1). Under the Rivers and Harbors Act of 1938, the U.S. Army Corps of Engineers (USACE) is authorized to keep the channel of the AIWW at a depth of seven to twelve feet at mean low water and to conduct regular maintenance activities on the waterway, including dredging. The USACE Engineering Regulation 1105-2-100 directs the USACE to develop Dredged Material Management Plans (DMMPs) for all Federal navigation projects that lack sufficient capacity to accommodate maintenance dredging over the next 20 years (74 FR §13423). The DMMP is a planning document that ensures not only that sufficient disposal facilities are available for at least the next 20 years, but also that maintenance dredging activities are performed in an environmentally acceptable manner, use sound engineering techniques, and are economically justified. The DMMP addresses dredging needs, disposal capabilities, capacities of disposal areas, environmental compliance requirements, potential beneficial uses of dredged material, and indicators of continued economic justification (USACE 2013a).

Figure 1. Map of the Atlantic Intracoastal Waterway (AIWW) in the southeast

In March 2014, the USACE released a draft Environmental Assessment and DMMP for the Savannah District AIWW, proposing to use a combination of new and existing dredged material disposal sites, open water placement of sandy dredged material, and Ocean Dredged Material Disposal Sites for disposal of AIWW dredged material over the next 20 years. In order to assist the Coastal Resources Division of the Georgia Department of Natural Resources in reviewing this document, this report provides general background on dredged material disposal (Part One) and describes the specific dredged material disposal policies and activities in North Carolina and South Carolina, and the northeastern portion of Florida (Part Two).

Part One: Background

Historical dredged material disposal practices

Unconfined disposal of dredged material refers to either open water or marsh disposal with no confining or outflow control structures. Before passage of federal environmental legislation in the late 1960s and early 1970s, (e.g., the National Environmental Policy Act and the Clean Water Act), material from dredging operations was usually treated as waste and deposited into unconfined areas in the waters and wetlands adjacent to navigation channels (McFetridge, Taylor, and Roach 2010). In unconfined disposal, the heavier material (sand) released from the discharge pipe tends to settle in place while the finer grade material (silt, mud) is more mobile. Consequently, it is possible for fine material from navigational dredging operations to encroach onto wetland areas outside of the disposal area, resulting in the reduction of any existing salt marsh habitat (USACE 2014b).

Historically, unconfined disposal of dredged material has resulted in the loss of wetlands adjacent to the dredged area. Statewide, Florida has lost an estimated 60,000 acres, or 8%, of estuarine habitat to permitted dredge-and-fill activities (FL-DEP 2010). As an example, an area extending 3.5 miles on either side of St. Johns Inlet and 10 miles up the St. Johns River has lost 36% of marsh habitat, primarily because of dredge-and-fill practices since 1943 (FL-DEP 2010). In Nassau County, dredging activities along the AIWW are among the primary causes of marshland loss (FL-DEP 2010). Likewise, changes in water flow resulting from altered littoral morphology in South Carolina, including the creation and maintenance of the AIWW, has resulted in increased salinity in many tidal freshwater wetlands (Tufford 2005).

Unconfined disposal can also lead to the creation of spoil islands. Over time, spoil islands may stabilize, allowing vegetation to take hold and form habitat suitable for use by shorebirds and migrating birds (PBS&J 2008). For instance, from 1953 to 1961, spoil from the dredging of the AIWW along the Indian River Lagoon in Florida resulted in the creation of 137 islands ranging in size from less than 1.2 acres to more than 7.5 acres (University of Florida 2008; FL-DEP 2012). Although these islands are now used for educational and recreational purposes, those with the highest percentage of native plants and animals are considered environmentally sensitive and have been set aside for conservation (FL-DEP 2012). A 1990 state survey identified 205 animal species on these islands, which also contain some of the most important bird rookeries in the Indian River Lagoon area (University of Florida 2008).

Current dredged material disposal practices

The USACE's Civil Works program is responsible for the operation and maintenance of inland waterways including the AIWW. Funding for maintenance and construction of inland waterways is included in the President's Budget proposal and subsequently funded through Congressional appropriations. Since passage of the Water Resources Development Act of 1986, the costs of dredging projects associated with operations and maintenance of inland waterways have been paid for solely through federal expenditures (Stern 2014).

Mitigation requirements

Under the 1986 Water Resources Development Act, construction of confined disposal facilities for dredged material placement along the AIWW must include a plan to mitigate any environmental harm resulting from the project. However, environmental damage caused by the dredging activity itself is not subject to mitigation requirements (Samet 2009). The Act requires the USACE to implement all civil works mitigation prior to, or concurrently with, project construction (33 U.S.C. § 2283(a)). Mitigation costs are included in the project budget and include the costs of lands, easements, rights-of-way, and relocations needed to implement the mitigation (33 U.S.C. § 2283(c)).

The Water Resources Development Act of 2007 establishes minimum standards for civil works project mitigation, defines the elements that must be included in mitigation plans and requires the USACE to monitor civil works mitigation until ecological success is achieved. It also requires the USACE to consult annually with state and federal resource agencies on the progress made for each civil works mitigation plan (33 U.S.C. § 2283(d)(3)). Every USACE project requiring a supplemental environmental impact statement or assessment, a general reevaluation report, or any other internal reevaluation must meet the same mitigation standards required of other governmental entities and private parties under the Clean Water Act § 404 program, namely the requirement of a ratio of more than two acres of mitigation for every acre of permitted impacts to wetlands (33 U.S.C. §2283(d)(3)(A)) (Samet 2009). They must also comply with the following minimum mitigation standards:

- The implementation of mitigation for fish and wildlife losses unless a specific finding is made that the project would cause only "negligible adverse impacts to fish and wildlife" (33 U.S.C. § 2283(d)(1)).
- The restoration to all possible extent of the same or greater ecosystem and habitat values lost to the civil works project (33 U.S.C. § 2283(d)(1)) (Samet 2009).

Today, the preferred methods for disposal of material dredged from navigation channels is placement in confined disposal facilities or open water, or relocation for beneficial use. The Federal Standard, which the USACE must follow when determining dredged material disposal methods, is defined as the least costly environmentally acceptable dredged material disposal alternative that is consistent with sound engineering practices (33 C.F.R.§335.7).

Beneficial use

Beneficial use involves the placement or use of dredged material for a productive purpose. The USACE is required to give full and equal consideration to all practicable alternatives, including beneficial uses of dredged material, when evaluating disposal options (33 C.F.R. §337.9). Ten broad categories of beneficial uses have been identified based on the functional use of the dredged material or placement site. These include:

- Habitat restoration/enhancement (wetland, upland, island, and aquatic sites including use by waterfowl and other birds);
- Beach nourishment (using dredged material (primarily sandy material) to restore beaches subject to erosion);

- Agriculture, forestry, horticulture, and aquaculture (using dredged material to replace eroded topsoil, elevate the soil surface, or improve the physical and chemical characteristics of soils;
- Parks and recreation (using dredged material as the foundation for parks and recreational facilities; for example, waterside parks providing such amenities as swimming, picnicking, camping, and/or boating);
- Strip mine reclamation and landfill cover for solid waste management (using dredged material to reclaim strip mines, to cap solid waste landfills, or to protect landfills);
- Shoreline stabilization and erosion control (fills, artificial reefs, submerged berms, etc.);
- Construction and industrial use (including port development, airports, urban, and residential);
- Material transfer (fill, dikes, levees, parking lots, and roads); and
- Multiple purpose (using dredged material to meet several needs simultaneously, such as habitat development, recreation, and beach nourishment, which might all be supported by a single beneficial use project)(Bailey et al. 2010; USEPA/USACE 2004).

Generally, beneficial use involves, or is performed in addition to, confined placement in some form, although some beneficial uses might technically be considered unconfined disposal (e.g., wetland creation, island creation, or beach nourishment) (USEPA)/USACE 2004). Although beneficial use of dredged material may be more environmentally friendly than alternative disposal methods, (e.g. spoil island creation), the volume of dredged sediment available for such uses is limited by current technical (i.e., ability to move sediment to where it can be used), environmental (i.e., suitability for beach placement), and economic (i.e., too expensive to move) issues. Because of these constraints, there are situations where placement in a confined disposal facility or open water disposal may be an environmentally and economically acceptable alternative (Bailey et al. 2010).

Confined disposal

Confined disposal is the placement of dredged material into a diked nearshore or upland confined disposal facility that separates the disposal area from any adjacent water and prevents dredged material from coming into contact with the adjacent water during placement (Fig. 2) (USEPA/USACE 2004). Confined disposal facilities may be situated in upland, nearshore, or island locations, and a confined disposal facility in any type of locality may contain terrestrial, wetland, or aquatic habitat (USEPA/USACE 2004).

The containment area within the confined disposal facility allows for dredged material to settle while the remaining discharge water is

Figure 2. Confined disposal facility

Buck Island, FL is an example of a confined dredged material facility located in the nearshore area. Dredged material from Jacksonville Harbor is placed in Buck Island and is subsequently used beneficially as construction grade material.

(Jacksonville Harbor, FL DMDF Construction (C), March 2014)
http://www.saj.usace.army.mil/Portals/44/docs/CongressionalFS/J/Jacksonville_Harbor_FL_DMDF_C_CFS14.pdf

routed from the disposal area, often back into the waters from which the material originated. Once dried, the dredged material can be removed from the containment site to free up capacity for the next dredging event (PBS&J 2008). The dried material may be used to provide sediment for beach nourishment projects or for some other beneficial use. Placement of dredged material in a confined disposal site may also occur when the material does not meet the criteria for direct beach placement due to an excessive amount of finely graded material (fines), when the proposed placement beach lacks the necessary capacity to absorb the sand, or (in some areas) if sand placement must take place during the marine turtle nesting season. As long as it meets state standards, dredged material that contains both beach quality sand and a large amount of fines may be placed in the nearshore (PBS&J 2008).

Dredged material that is contaminated by toxic substances (e.g., heavy metals) requires the implementation of special measures to prevent the pollutants from leaching out of confined disposal facilities. Such leakage can occur through surface water discharges during filling, settling, and dewatering operations, rainfall surface runoff, groundwater seepage, atmospheric evaporation, or direct uptake by plants and wildlife. Preventative measures that minimize the impacts of contaminated dredged material include operational modification, treatment, site controls (e.g., liners or covers), and other site management actions (USEPA/USACE 2004).

Open water disposal

Open water disposal involves placement of dredged material into rivers, lakes, estuaries, or oceans. Open water sites can be designed to either retard diffusion of the dredged material away from the bottom through mounding, or to allow erosion of the dredged material away from the disposal site by currents and/or wave action (USEPA/USACE 2004).

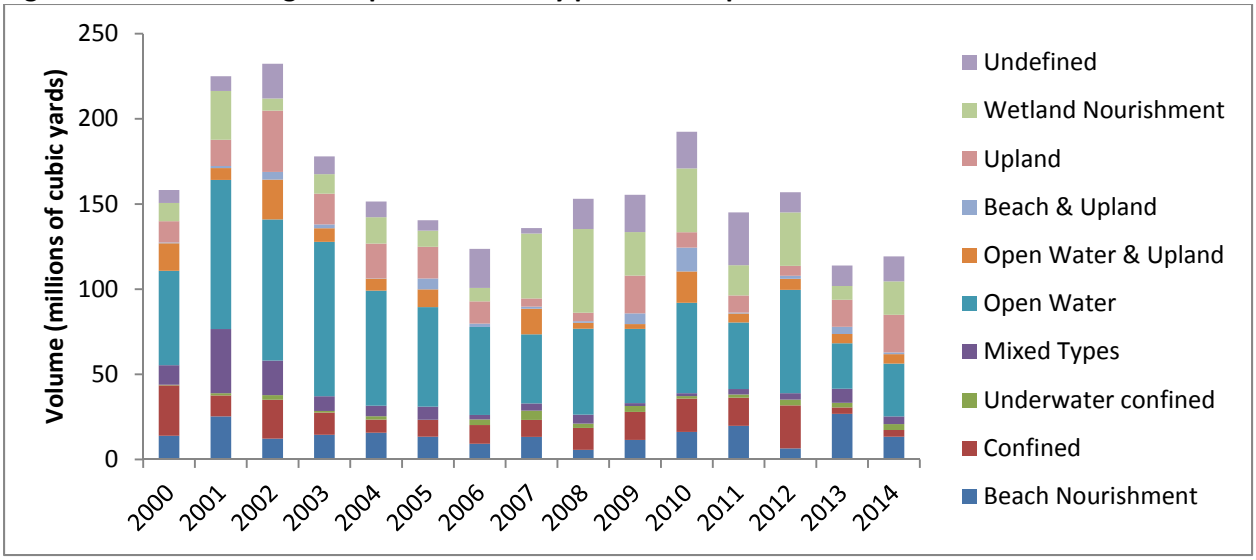
When dredged material is disposed of in the ocean, it is placed in an ocean offshore disposal area called an Ocean Dredged Material Disposal Site (ODMDS). In this process, dredged material is transported by barge or hopper dredge to the ODMDS and then released into the water and allowed to settle to the ocean floor. Designation of an ODMDS within state waters (i.e., within three miles of shore) must be approved by the state and the US Environmental Protection Agency (EPA) under the Marine Protection, Research, and Sanctuaries Act. If the ODMDS is located outside of state waters, only EPA approval is required (PBS&J 2008).

Volume and placement of dredged material

Since 2000, the volume of dredged material in the U.S. has averaged approximately 150 million cubic yards per year. As shown in Figure 3, the prevalence of different categories of dredged material disposal has changed over time. Although the largest overall volume of dredged material continues to be disposed of in the ocean and open water, the percentage of material disposed of in this manner dropped from a high of 51% in 2003 to 26% in 2014 (USACE, NDC 2015). Likewise, the percentage of dredged material disposed of in confined facilities has dropped from a high of 19% in 2000 to 6% in 2013 and 2014. The percentage of dredged material used in beach nourishment projects has fluctuated between 4% and 14% from 2000-2014, except for 2013 when 24% of dredged material was disposed of in this manner. The percentage of dredged material used for wetland restoration nearly doubled after 2006. In the period of 2000-2006, wetland restoration accounted for 8% of dredged material disposal;

this percentage increased to 19% from 2007-2014 (USACE, NDC 2015). The remaining disposal categories listed in Figure 3 do not consist strictly of one placement type (i.e., mixed types may include confined and beach nourishment) and, therefore, were not included in the above analysis.

Figure 3. National dredged disposal volume by placement option: 2000-2014



Key:

Undefined: undefined or unknown at the time of data entry
Wetland Nourishment: wetland restoration in which dredged material is directly placed in a wetland area
Upland: placement of dredge material within a confined placement facility located above the adjacent water surface
Beach & Upland: combination of upland confined placement and beach nourishment
Open Water & Upland: combination of open water and upland confined placement of dredged material
Open Water: placement of dredged material in rivers, lakes, estuaries, or oceans
Mixed types: dredging operation that uses more than one dredged material placement alternative
Underwater confined: placement of dredge material within a confined placement facility located beneath the water surface
Confined: placement of dredged material within diked nearshore or upland confined placement facilities that enclose and isolate the dredged material from adjacent waters
Beach Nourishment: beach restoration in which dredged material is directly placed onto an eroded beach

Source: USACE, Navigation Data Center (File name: Parent Directory dredging-v-xslx found at: http://www.navigationdatacenter.us/db/dredging/contract/)

Part Two: North Carolina, South Carolina, and northeastern Florida

Overview

This section provides a summary of the dredging and mitigation activities on the AIWW in the three states that are the focus of this report: North Carolina, South Carolina, and northeastern Florida. This is followed by specific information about each state's section of the AIWW, disposal practices, mitigation activities, recent dredging projects, and a regulatory summary. Information on relevant state and local statutes for each state can be found in the Appendices.

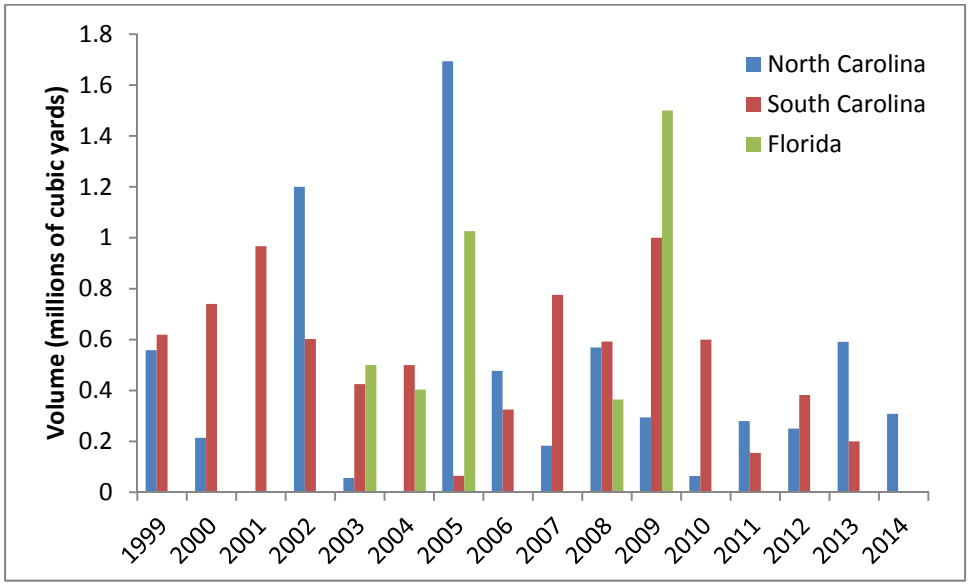
Funding allocation

When making allocation decisions about operations and maintenance funding, the USACE gives priority to the coastal inland waterways with the highest commercial traffic based on "assessments of the risk and consequence of a failure" (USACE 2015b). From 2011 to 2015 North Carolina, South Carolina, and Florida (Jacksonville to Miami) have received federal funding for operation and maintenance activities along the AIWW of $12.3 million, $2.6 million, and $4.1 million respectively (USACE 2015a). The President's Budget for FY 2016 proposes a further $2.6 million (NC), $100,000 (SC), and $700,000 (FL) for operation and maintenance projects along the AIWW (USACE 2015b).

Total volume

The total volume of material dredged from the AIWW from 1999-2014 in the three states is shown in Figure 4. Note that these numbers are far lower than the national totals shown in Figure 3. Despite the occurrence of major dredging events in the AIWW in South Carolina (2009) and Florida (2002 and 2005), North Carolina has dredged the most material over the past few decades[1](Fig. 4). During this time, North Carolina dredged a total of 7.9 million cubic yards of sediment from the AIWW, South Carolina dredged 3.8 million cubic yards, and Florida dredged 6.7 million cubic yards (USACE NDC 2015).

Figure 4. Volume of dredged material from AIWW by State: 1999-2014.



[1] This only includes projects for which dates are available from the USACE.

Source: USACE, Navigation Data Center (File name: Parent Directory dredging-v-xslx found at: http://www.navigationdatacenter.us/db/dredging/contract/)

Placement

Table 1 provides a summary of past and present dredged material disposal practices by North and South Carolina and northeast Florida. Historically, dredged material disposal decisions were determined by short-term economic concerns such as engineering, cost, and operation. As a result, easements and unconfined disposal areas were established on land along the AIWW which included wetlands. Because of stronger regulatory processes prompted by increased environmental awareness, unconfined placement of dredged material is no longer a means of long-term maintenance of the AIWW. Restrictions against the unconfined placement of dredged material in wetlands are contained in Section 404 of the Clean Water Act as well as in many state regulations (Adams et al. 2011). For the three states considered here, specific restrictions can be found in NCGS § 113-229(h)(2)(i); S.C. Reg. 30-12(l); and F.S. §373-400.

Table 1. Current and historic placement practices by state.

		Current placement			Historic placement		
		NC	SC	FL	NC	SC	FL
Confined	Upland	X	X	X			
	Nearshore (wetlands)	X	X				
Unconfined	Open water	X	X		X	X	
	Nearshore (wetlands)				X	X	X
Beneficial Use	Beach nourishment	X	X	X			

Information in the table was obtained from a survey of USACE documents, including DMMPs, and relevant state statues available in this report.

Confined disposal facilities along the AIWW can be found in areas classified as marine and estuarine wetlands, freshwater emergent wetlands, freshwater forested wetlands, and estuarine and marine deep water. Table 2 shows the habitats where confined disposal facilities are located in North and South Carolina and northeast Florida. Estuarine wetlands are defined tidal habitats and adjacent tidal wetlands; palustrine includes tidal areas where salinities are less than 0.5 as well as non-tidal wetlands; lacustrine includes isolated areas lacking trees, shrubs, or emergent vegetation. See Appendices D, E and F for a complete list of habitats affected by confined disposal projects in each state.

Table 2. Land use classification of confined disposal areas

	Wetlands			Open water	Upland
	Estuarine	Palustrine	Freshwater		
North Carolina	X		X	Spoil islands	X
South Carolina	X	X	X		X
NE Florida			X		X

Table compiled with information from: Marine Cadastre (NOAA) http://coast.noaa.gov/nationalviewer/ and National Wetland Inventory Mapper (FWS) http://www.fws.gov/wetlands/data/mapper.HTML

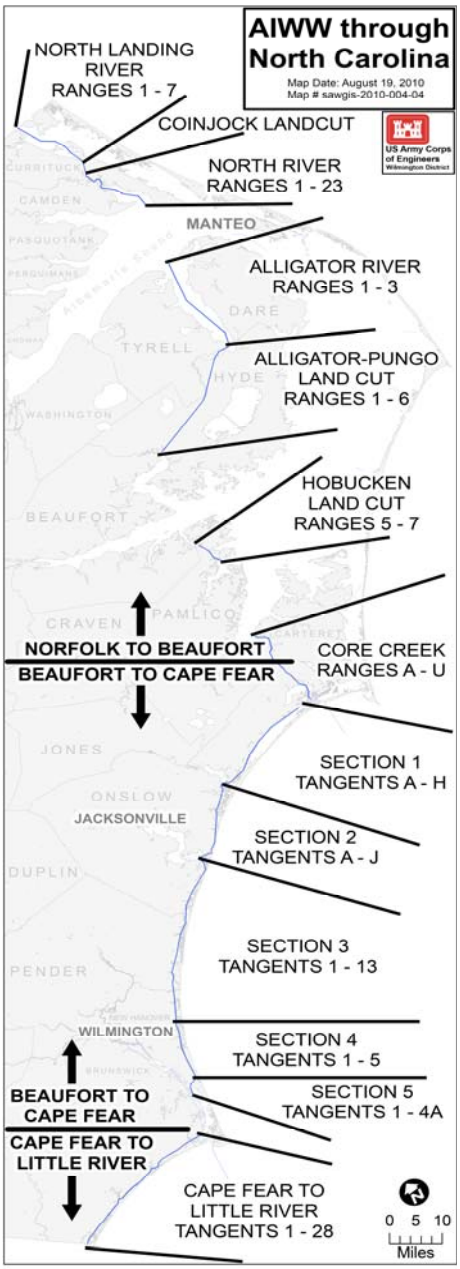
The varying sediment composition of dredged material found in North and South Carolina and northeast Florida affects which disposal placement types are available for dredging projects. Based on data collected in 2007-2008, the North Carolina portion of the AIWW contains a mix of fine- and coarse-grained material that allows for upland and beach placement alternatives for the dredged material (Adams et al. 2011). The northern portion of the South Carolina AIWW also contains a mix of fine- and coarse-grained material suitable for upland and beach placement. However, southern portions of the South Carolina AIWW are made up of very fine sediment suitable only for upland disposal placement (Adams et al. 2011). Florida AIWW sediments found in the Nassau Sound area (i.e., Nassau and Duval Counties) are fine to medium sand containing fine-grained silts and clays. Although this sediment is not eligible for beach placement, sediments found further south in the state are suitable and available for beach placement (Adams et al. 2011).

North Carolina

AIWW

Although the AIWW in North Carolina (Fig 5) has been dredged since 1919, many sections were only dredged in the 1940s during its construction (Adams et al. 2011). At this time, the USACE obtained easements for perpetual channel and spoil disposal that ran most of the length of the AIWW. Following completion of the main channel, the land covered by these easements was used for dredged material disposal (USACE, Wilmington District 2015). Table 3 shows the record of USACE-held easements along the AIWW.

Figure 5. Map of AIWW in North Carolina



(USACE, http://www.saw.usace.army.mil/Portals/59/d

Table 3. USACE easements on the AIWW in North Carolina

Easement type	Narrative	Area (acres)	Date(s) acquired
Full rights	Perpetual channel and spoil disposal easement	11,280	1929 1930 1931 1932 1940 1957
Full rights	Obtained easement for disposal of dredged material	604	1966 1981 1985 2006
Full rights	Spoil disposal easement (Island Tract)	215	2010
Partial rights	Released rights to dispose of dredged material and right to dig and cut away lands	381	1981 1985
Full release	Released by quitclaim deed	920	1957 1958 2001 2006
Leased property	- New Hanover Co. - NC Wildlife Resource Commission - NC Division of Parks and Recreation -New Hanover Co. - Sublet to Carolina Beach	72	8/1/2001-7/31/2026

Source: USACE Wilmington District Channel and Landuse Data KMZ; available at: http://www.saw.usace.army.mil/Missions/Navigation/GoogleEarthInfo/GoogleEarth.aspx

The North Carolina portion of the AIWW contains many spoil islands created by the unconfined disposal of dredged material into open water prior to the early 1970's. Several of these are now managed as bird

sanctuaries, as they provide nesting and feeding habitat for shorebirds and migratory birds. Ferry Slip and South Pelican Islands are small dredged material disposal areas in the lower Brunswick River that are not confined and are managed by the Audubon Society as a sanctuary for nesting waterbirds. The islands are entirely made up of dredged sand and are periodically renourished by the USACE when suitable, beach-quality sand is available (USACE 2014c). Battery Island and the Lower Cape Fear River Bird Nesting Islands are mostly dredge spoil islands located within the tidal region of the Cape Fear River (USACE 2014c).

As environmental considerations became more important after passage of the National Environmental Policy Act and the Clean Water Act, disposal in confined upland areas, open ocean disposal, and beneficial use of dredged material was encouraged. An example of this policy change, the Eagle Island Confined Disposal Facility is the largest existing upland disposal site for material dredged from the Wilmington Harbor project. The site is approximately 880 acres and is dominated by a monoculture of common reed (*Phragmites australis*) (USACE 2014c).

A Final Environmental Impact Statement for maintenance of the North Carolina portion of the AIWW was completed in 1975 and a Supplemental Information Report for maintenance of the AIWW side channels of Pelletier Creek, Carteret County, North Carolina was finalized in 1983 (Owens 2014). Although the AIWW is authorized to be maintained at a minimum depth of 12 feet relative to mean low water for most of its length in North Carolina, lack of federal funding has forced the USACE to prioritize which portions of the AIWW are maintained by giving precedence to areas with high commercial traffic and shoaling intensity. This policy has resulted in the neglect of many segments of the AIWW in North Carolina (CC-SPO 2008). However, the USACE's Wilmington District was recently awarded $2.6 million of federal funding to perform "routine maintenance dredging within the high commercial use segment of the AIWW in support of the Port of Morehead City (Newport River to the Virginia state line)" (USACE 2015c). In addition, the USACE's Civil Works budget for FY2016 is requesting another $2.6 million for operations and maintenance activities along the AIWW in North Carolina (USACE 2015b). Federal funding has not been available to do a full-scale Dredged Material Management Plan for the AIWW in North Carolina since the early 1980s (Owens 2014).

Dredged material disposal

Existing dredged material management strategies in North Carolina include beach placement of sandy material (generally found in vicinity of inlet areas) and upland confined disposal of non-sandy material. Under current North Carolina law, dredged material must either be disposed of in confined facilities located 30 feet landward of the normal water level or normal high water level of coastal shorelines, or, if suitable, deposited on beaches for nourishment projects (15A NCAC 07H.0208(b)(1)(B)(C)(E)[2]; 07H.0209(d)(10)[3]). Suitable dredged material is that which has been allowed to dry prior to placement and consists of only clean sand of acceptable grain size, free from pollutants (15A NCAC 07H.0208(b)(8)(A)(ii)(C)(ii)[4]). In the event that more beach-quality sand is dredged than is available

[2] Effected 1979; last amended 2012
[3] Effected 1977; last amended 2010
[4] Effected 1979; last amended 2012

placement space, this sand may be placed in confined disposal facilities for the purpose of retention until more beach space opens up. This is in keeping with the state's policy of preserving sediment within the active coastal sand system rather than being permanently lost through placement in an offshore disposal site (USACE 2000b).

North Carolina uses dredged material for a wide variety of environmental beneficial uses including wetland and shoreline restoration. In 2009, collaboration between the USACE and the North Carolina Department of Environment and Natural Resources resulted in the Wanchese Marsh (Dare County) project (Fig. 6). This project created approximately 12 acres of estuarine creek and marsh habitat using material from maintenance dredging of the Manteo-Oregon Inlet Channel and Side Channel. Eight acres of estuarine creek and marsh habitat are protected from erosion with a 500 by 700 foot stone dike. The project also contains a one-acre oyster reef and another acre of replanted native marsh vegetation (USACE 2013b).

Figure 6. Wanchese Marsh Section 201 of AIWW in North Carolina

USACE (http://www.saw.usace.army.mil/Missions/EcosystemR

Many beach nourishment projects in North Carolina have employed dredged material. Maintenance dredging activities in the area of the Bogue Inlet and the AIWW conducted in the winter of 2013-14 resulted in the placement of nearly 50,000 cubic yards of dredged material on nearby beaches (CC-SPO2014). During the Wilmington Harbor Deepening Project in 2000, beach quality sand obtained from navigation channel maintenance was primarily disposed of on the shorelines of Bald Head Island and Oak Island (USACE 2000b). Maintenance dredging of the AIWW at the Beaufort to Cape Fear River Reach in 1989 produced about 280,000 cubic yards of predominantly sand material for placement on the ocean beaches at Atlantic Beach and Pine Knoll Shores in Carteret County (NC-DNRCD 1989). Subsequent maintenance dredging performed in 2008 resulted in 168,000 cubic yards of material being placed on 2,000 feet of beach in these areas (CC-SPO 2008).

Since 1999[5], North Carolina has disposed of AIWW dredged material almost entirely through placement in confined disposal sites in upland locations or through beach nourishment projects (Table 4).

Table 4. AIWW Dredged disposal by type in NC: 1999-2013

Year	Area	Volume yd^3	Disposal type
1999	AIWW-Inlet Xings	300,000	Beach nourishment
1999	AIWW-Thru Channel/AlliPungo	319,000	Upland
2000	AIWW Inlet Crossings	476,000	Beach nourishment
2000	AIWW Inlet Xings	264,000	Beach nourishment

[5] The earliest date for which dredged material contract data is available for South Carolina.

2001	AIWW Thru Channel/Peltier Cr	967,000	Upland
2002	AIWW-Swansboro/SC State Line	602,000	Beach & upland
2003	AIWW-Core Creek-Sec 2 (Opts)	425,000	Upland
2004	AIWW- Inlet Crossings	500,000	Open water
2005	AIWW-Inlet Crossings Bear To Bro	65,000	Beach nourishment
2006	AIWW Inlet-Lwf, Shal.Bog, Nr	325,000	Beach nourishment
2007	AIWW-MHC Interior	776,000	Beach & upland
2008	AIWW	592,254	Mixed types
2009	AIWW -Maintenance Dredging	500,000	Mixed types
2009	AIWW - Maintenance Dredging Bear In- Shall	500,000	Beach & upland
2010	AIWW- Thru Channels	600,000	Confined
2011	AIWW -NR Inlet to ShalloInl	154,669	Undefined
2012	AIWW, Inlet Crossings	382,400	Beach nourishment
2013	AIWW Inlet Crossing	200,000	Beach & upland

Legend:

Undefined: undefined or unknown at the time of data entry
Upland: placement of dredge material within a confined placement facility located above the adjacent water surface
Beach & Upland: combination of upland confined placement and beach nourishment
Open Water: placement of dredged material in rivers, lakes, estuaries, or oceans
Mixed types: dredging operation that uses more than one dredged material placement alternative
Confined: placement of dredged material within diked nearshore or upland confined placement facilities that enclose and isolate the dredged material from adjacent waters
Beach Nourishment: beach restoration in which dredged material is directly placed onto an eroded beach

Dredge Statistical Program, Navigation Data Center, USACE
(http://www.navigationdatacenter.us/db/dredging/contract/)

Mitigation

No mitigation activities associated with past or present dredging projects are currently taking place in North Carolina. However, as shown in Table 5, there is ongoing mitigation for construction of the Wilmington Harbor expansion project in North Carolina. In addition, construction activities associated with two upland confined disposal sites along the AIWW in northeast Florida are undergoing mitigation.

Table 5: USACE Civil Works Mitigation Projects in North Carolina

Project Name	Mitigation Requirements	Mitigation Progress to Date	Estimated completion date
Wilmington Harbor, North Carolina – 96 Act	Island 13: Restoration of 30.4 acres primary nursery (including 3.4 acres intertidal marsh) on Cape Fear River dredged material disposal island 13. Prevention of Degradation Lands: Acquisition of 700 acres riparian wetland habitat buffer on NE Cape Fear River, including river shoreline and two tributaries, which serve to protect 29 acres estuarine primary nursery area.	Island 13: Restoration of 30.4 acres of marsh and intertidal habitat is complete and was determined successful in 2005 after 3 years of monitoring. POD Lands: The entirety of the 700 required acres have been acquired (including 29 acres of estuarine primary nursery area) as of June 10, 2011.	2016

Adapted from Table 2 of the Seventh Annual Status Report on USACE Construction Projects Requiring Mitigation Under Section 906 of the Water Resources Development Act of 1986 (Feb 2015) available at: http://www.usace.army.mil/Portals/2/docs/civilworks/Project%20Planning/rap/fy2014_MitigationRep_3Feb2015.pdf

Recent dredging projects

Although they do not include AIWW projects, below are descriptions of recent federal dredging projects in North Carolina.

Draft Integrated Feasibility Report and Environmental Assessment, Wilmington Harbor Navigation Improvements (June 2014) (USACE 2014c).[6]

This project plans to relocate the Entrance Channel, Reach 1 up to 150 feet away from the shoal that forms on the east side of the channel. The material dredged from the relocation of the Entrance Channel, Reach 1 is not beach compatible and will be placed in the Wilmington ODMDS (located about 5 nautical miles offshore) or other upland disposal sites. The project also proposes to widen the Battery Island channel in order to increase the available turning radius for ships from approximately 2,850 ft to approximately 3,900 ft. For the Battery Island Turn, all sediments dredged during initial construction and maintenance will be placed in the Wilmington ODMDS because of the high percentage of fine grain sediments and because the dredged material may contain some rock and cemented sand.

Review Plan for the Wilmington Harbor Draft Integrated Dredged Material Management Plan and Environmental Assessment (March 2014) (USACE 2014g)[7]

This DMMP recommends continuation of prior operation and management methods for the maintenance dredging of Wilmington Harbor. Typical disposal practices for the Harbor and surrounding channels include use of the Eagle Island confined disposal facility, mid-River upland disposal sites, the beaches of Bald Head Island, Fort Caswell and Oak Island, and the Wilmington ODMDS. Minimal changes to current maintenance practices proposed by the DMMP include improvements at the existing Eagle Island disposal site, including potential dike raises and expansion, and restoration and improvements at the Disposal Area 3 and Disposal Area 4 sand recycling islands.[8] There will also be modifications to the current beach disposal plan. In the past, beach disposal locations have been determined on a time/dredging cycle basis. In the future, shoaled material will be placed on the nearest beach.

Draft Integrated Dredged Material Management Plan and Environmental Impact Statement, Port of Morehead City (October 2013) (USACE 2013a)[9]

Approximately 1 million cubic yards of dredged material are removed from the Morehead City Harbor annually. Maintenance dredging along the navigation channel has historically been conducted every 2 to 3 years, with placement in either the confined disposal area at Brandt Island or on the beaches of Bogue Banks. Brandt Island has been used for dredged material disposal since 1955. From 1978 through 2005, capacity in Brandt Island was periodically restored when dredged material from the Island was pumped

[6] No information on completion of the Final Draft is available.
[7] No information on completion of the Final Draft is available.
[8] The review plan did not further elaborate on these activities.
[9] No information on completion of the Final Draft available.

onto the adjacent beaches of Fort Macon State Park and Atlantic Beach in order to mitigate any erosion caused by channel maintenance. In 2005, the Wilmington District re-classified dredged material from parts of Morehead City Harbor as unsuitable for beach placement based on results from a soil investigation and to satisfy new State rules indicating a preference for the retention of beach-quality sand within the littoral system (NCGS §113-229(h)(2)(i)). Because of this change in state policy, only fine-grained dredged material has been disposed of on Brandt Island since 2005. Coarse-grained material (greater than or equal to 80% sand)has been disposed of on the beaches of Fort Macon State Park and Atlantic Beach, within the existing nearshore placement area (Nearshore West), in the Morehead City ODMDS, or on the shoreline of Pine Knoll Shores as part of a beneficial use of dredged material project. Because current maintenance dredged material disposal practices, without modification, will result in the need for "new" or expanded disposal sites or modified disposal options, including beneficial uses, by 2028, development of a DMMP was necessary. "*The proposed DMMP provides nearly unlimited disposal capacity for the Morehead City Harbor navigation project by recommending the following: continued use of Brandt Island without expansion, disposal of coarse-grained material on the beaches of Fort Macon State Park, Atlantic Beach, and Shackleford Banks, expansion of the Nearshore West placement area, a new Nearshore East placement area and continued use of the Morehead City ODMDS." "The proposed base plan will provide more than adequate disposal capacity to maintain the Morehead City Harbor navigation project to the fully authorized dimensions for at least the next 20 years."* [quotes taken from the draft DMMP/EIS]

Regulatory summary

In North Carolina, dredging and the disposal of dredged material are regulated by the North Carolina Department of Environment and Natural Resources (DENR). Any dredge-and-fill project taking place in estuarine waters, tidelands, marshlands, or state-owned lakes requires a permit. Permits are granted for projects that will not prevent public water use; negatively affect adjoining property owners; adversely impact water supplies, or public health, safety, and welfare; or adversely affect wildlife or fisheries. Beach quality dredged material from navigational channels in or around estuarine waters may be used for beach nourishment depending on sediment characteristics, but may not be permanently removed from the coastal system from which it was obtained; such material must be disposed of on a beach or nearshore area where it is environmentally compatible. In addition, all dredged material must be confined so that sediments cannot reenter adjacent water bodies and, when possible, allow effluent to be returned to dredged areas.

Operation and maintenance activities by the USACE for all federal navigation channels are exempted from the DENR's dredge-and-fill permit requirement. These activities include dredging and disposal of dredged material in Areas of Environmental Concern (i.e., the estuarine and ocean system, the ocean hazard system, public water supplies, and natural and cultural resource areas). Despite this exemption, the USACE must conform to the conditions described above to the maximum practical extent in order to be consistent with the North Carolina Coastal Management Plan (15A NCAC 07K .0401, NC-DCM 2013).

A summary of relevant regulations for dredged material disposal in North Carolina can be found in Table 6.

Table 6: Dredged material disposal regulatory matrix for North Carolina.
(For more detailed information, see Appendix A)

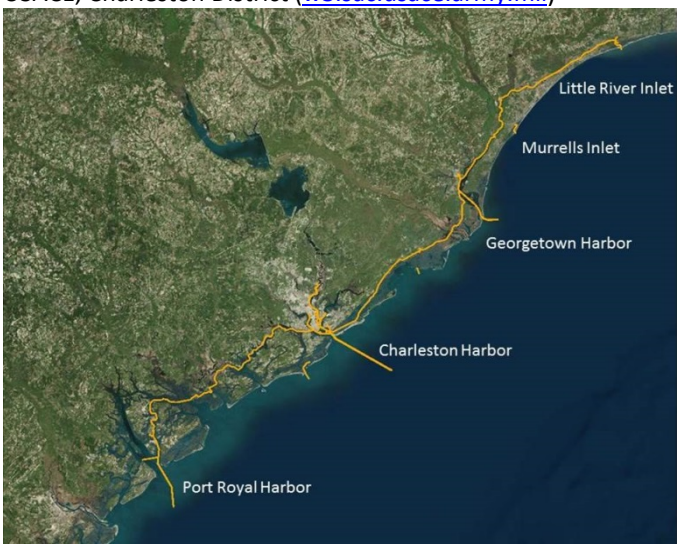
Statute or Policy/Permit	Authority	Description
Dredge-and-Fill Law ***Permit***	DENR, Division of Coastal Management	Any dredge-and-fill project taking place in estuarine waters, tidelands, marshlands, or state-owned lakes requires a permit. Permits will be granted for projects that will not prevent public water use; negatively affect adjoining property owners; adversely impact water supplies, or public health, safety, and welfare; or adversely affect wildlife or fisheries.
Policy on the Beneficial Use of Dredged Materials from the Excavation or Maintenance of Navigation Channels	DENR, Division of Coastal Management	It is state policy that beneficial use of dredged material be employed whenever practicable. The state also encourages restoration of estuarine waters and public trust areas adversely impacted by existing disposal sites or practices.
Policy on Large Scale Beach Dredge-and-Fill Projects	North Carolina Marine Fisheries Commission	It is the policy of the NC MFC that all assessments for large-scale beach dredge-and-fill projects should be based on best available science and take into account the cumulative impacts associated with other beach dredge-and-fill projects in NC and adjacent states as well as other large-scale coastal engineering projects that are ecologically related.
Coastal Area Management Act ***Consistency Review***	DENR, Division of Coastal Management	Contains numerous requirements for the disposal of dredged material in coastal areas (e.g., all dredged material in estuarine and ocean systems must be confined away from coastal wetlands and stabilized to prevent reentry into the adjacent wetlands; no dredged material may be placed on regularly flooded wetlands).
Federal Coastal Zone Management Act ***Consistency Review***	DENR, Division of Coastal Management	All federal dredging projects must be consistent with the enforceable policies of the North Carolina coastal management program.
Clean Water Act §401 ***Water Quality Certificate***	DENR, Division of Water Quality	Required for any federally permitted activity that may result in a discharge to waters of the U.S., resulting in degradation of state waters or violation of state water quality standards.

South Carolina

AIWW

The 235 miles of the AIWW in South Carolina (Fig.7) were constructed from 1881 to the late 1930s. What began as the combination of several local improvement projects in the natural waterway was extended to Charleston and subsequently to Beaufort by 1937, and was largely completed by 1940 (Parkman 1983).

Figure 7. Map of AIWW in South Carolina
USACE, Charleston District (w3.sac.usace.army.mil)



The USACE prioritizes federal funding for AIWW maintenance dredging based on the amount of cargo carried annually on barges in high-use commercial areas and shallow-draft inlets (AIWA 2014). Therefore, USACE's Charleston District (encompassing the entire South Carolina coastal area) has received limited funding for navigational maintenance dredging in recent years, and has been limited to activities such as management of dredged material disposal sites and easement holdings. The AIWW was last dredged in South Carolina in 2010 with funds obtained from the American Recovery and Reinvestment Act (Findlay 2015). At present, stretches of the AIWW in South Carolina have been experiencing capacity issues, with some areas reporting depths as shallow as one foot at low tide (Young 2013). However, the USACE Charleston District was recently awarded $2.4 million of federal funding that will be used for condition surveys of the AIWW, assessment of real estate needs to resolve encroachments[10], permit review, and maintenance of mosquito abatement in confined disposal areas (USACE 2015c).

Dredged material disposal

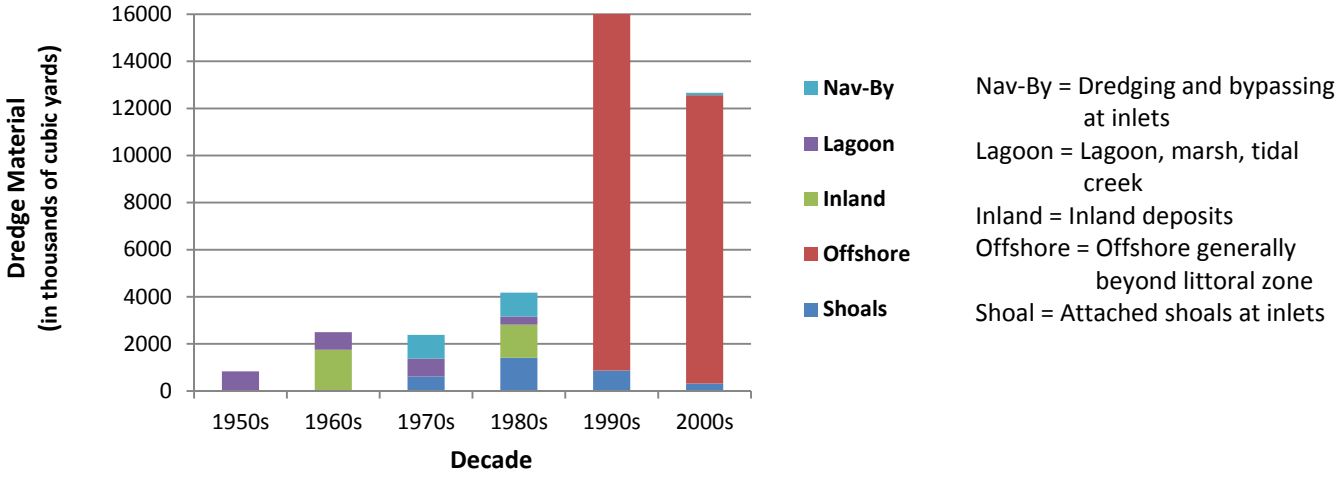
According to South Carolina law, dredged material must be placed in approved Ocean Dredged Material Disposal Sites (ODMDS) or permanent upland confined disposal sites (S.C Reg. 30-12(G)(2)(f))[11]. Due to the presence of mud and clay along the channel bottom, confined upland disposal is the primary management strategy throughout the Charleston operational reaches. Upland disposal sites are preferred, but ocean disposal will be allowed where upland alternatives are not feasible (S.C. Reg. 30-12(I)(2)(a)(b)). At present, and only when the material is predominantly sandy in nature, unconfined open water disposal occurs in the Charleston District. Use is based on tides and currents ability to wash dredged material offshore (Adams et al. 2011).

South Carolina also allows dredged material to be used for beach nourishment under certain conditions. The dredged material must consist of the grain size and quality suitable for nourishment of a specific beach area and, where possible, the nourishment project must be performed in concert with a

[10] The 2015 Work Plan did not elaborate further on the nature of these activities.
[11] S.C. Reg. Chapter 30 became effective May 29, 1978.

navigation project (S.C. Reg. 30-13(N)(2)).The first beach nourishment project in South Carolina was at Edisto Beach in 1954. This project involved 830,000 cubic yards of poor-quality material dredged from the back-barrier salt marsh and placed along one mile of eroding shoreline (Kana 2012). Folly Spit, a short 2,000-ft segment at the down coast end of Folly Beach, received 11 additions of sand in connection with disposal of Folly River navigation project sediments between 1979 and 2000 (Kana 2012). Today, although the use of offshore borrow areas[12] as a source of beach nourishment material is preferred over marsh and tidal lands (Fig. 8), dredged material from navigation channels may still be used for beach placement when practicable. For example, the draft DMMP[13] for the AIWW along Jasper County proposes to beneficially use dredged material for beach nourishment at the south end of Hilton Head Island or Daufuskie Island or Dredged Material Confinement Area 14B (USACE 2014a).

Figure 8. Trends in borrow areas for beach nourishment in South Carolina: 1954 – 2009
Adapted from Kana (2012)



Since 2003[14], South Carolina has disposed of AIWW dredged material through placement in confined or upland disposal sites (Table 7).

Table 7. AIWW dredged disposal by type in South Carolina: 2003-2009

Year	Area	Volume yd^3	Disposal type
2003	AIWW Charleston to Port Royal	500,000	Upland
2004	AIWW 04 Chas -Port Royal	403,800	Confined
2005	AIWW Winyah Bay- Charleston	1,026,100	Upland
2008	AIWW Maintenance Dredging	364,700	Confined
2009	AIWW Maintenance Dredging	1,500,000	Confined

[12] The term "borrow area" refers to an area where material (i.e., sand) has been dug for use at another location. (Merriam-Webster www.merriam-webster.com/dictionary/barrow%20pit).
[13] No information on completion of the Final Draft available.
[14] The earliest date for which dredged material contract data is available for South Carolina.

Key:

Upland: placement of dredge material within a confined placement facility located above the adjacent water surface

Confined: placement of dredged material within diked nearshore or upland confined placement facilities that enclose and isolate the dredged material from adjacent waters

Dredge Statistical Program, Navigation Data Center, USACE
(http://www.navigationdatacenter.us/db/dredging/contract/)

Mitigation

No mitigation activities associated with past or present dredging projects are currently taking place in South Carolina.

Recent dredging projects

Below is a description from a recent federal dredging project in South Carolina. Although it does not involve dredging along the AIWW, it does encompass a dredging event in federal channels connected to Charleston Harbor and the dredged material disposal methods employed are similar to those that would be used for the AIWW.

Final Environmental Assessment, Additional Advanced Maintenance Dredging, Charleston Harbor, South Carolina (September 2009) (USACE 2009)
Deepening of the navigation channel in Charleston Harbor has occurred periodically for well over 100 years. The purpose of this Environmental Assessment is to revise a 1996 Feasibility Report and Environmental Assessment for the deepening of the federal navigation channel within Charleston Harbor to reflect two to four feet of additional advanced maintenance dredging at five specific locations within the federal channel. The anticipated average annual maintenance dredging needs from the federal channels are approximately 2.2 million cubic yards. In the past, Morris Island, Drum Island, and Daniel Island have been used for dredged material disposal. However, Morris Island was not deemed to be within an economical pumping distance from any lower or upper harbor shoals due to the long distance and the fact that much of the island dike along the ocean is eroding. Drum Island is too small to be used for routine disposal events from dredging the navigation channel. Daniel Island is owned by the South Carolina State Ports Authority, and the Ports Authority did not renew the easement to the USACE after January 1998. Most of the material that was previously placed in Daniel Island is now transported to the Charleston ODMDS or to the Clouter Creek Disposal Area. Due to these constraints, about "*1.4 million cubic yards of this project's total dredged material will be disposed of in the Charleston ODMDS of which about 310,000 cubic yards is from the additional advanced maintenance areas. About 840,000 cubic yards of the total would go to the Clouter Creek diked upland disposal area of which about 330,000 cubic yards are from the additional advanced maintenance areas.*"[quotes taken from the Final Environmental Assessment] Both the Clouter Creek site and the ODMDS are anticipated to provide a sufficient 20-yeardisposal capacity for harbor maintenance.

Regulatory summary

In South Carolina, dredging and the disposal of dredged material are regulated by the Department of Health and Environmental Control (DHEC). The state Coastal Zone Management Act (CZMA) contains specific regulatory standards for projects involving dredging and filling within four critical areas of the state including coastal waters, tidelands, beaches, and beach dune systems. It also discourages construction of new erosion control devices in favor of preserving and restoring South Carolina's beaches through a policy of retreat and re-nourishment.

Dredge-and-fill activities, including maintenance dredging of federal navigation channels and disposal of dredged material by the USACE, are exempt from the critical area permit requirement described above. However, DHEC retains the authority to review all such proposed dredge-and-fill activities under federal CZMA consistency review (S.C. Code §48-39-130(D)(4)).

A summary of relevant regulations for dredged material disposal in South Carolina can be found in Table 8.

Table 8. Dredged material disposal regulatory matrix for South Carolina. (For more detailed information, see Appendix B.)

Statute or Policy/Permit	Authority	Description
Beachfront Management Act (Coastal Tidelands and Wetlands Act)	Department of Health and Environmental Control	Requires the DHEC to create a comprehensive state beach management plan that sets guidelines and requirements for approval of beach nourishment projects.
Dredge-and-Fill standards	DHEC, Office of Ocean and Coastal Resource Management	Sets standards for dredge-and-fill activities in wetlands that are deemed to fulfill a legitimate public need.
Standards for Creation of Navigation Channels and Access Canals	DHEC, Office of Ocean and Coastal Resource Management	Sets standards designed to minimize the adverse effects of the disposal of dredged material.
Standards for the Deposition of Dredged Material	DHEC, Office of Ocean and Coastal Resource Management	Sets standards to prevent and minimize impacts to the marine and aquatic environment resulting from the deposition of dredged material
Federal/State Coastal Zone Management Act ***Consistency Review***	DHEC, Office of Ocean and Coastal Resource Management	The OCRM reviews development activities taking place in the eight coastal counties. The policies for dredged material disposal include: • Avoid placing dredged material on high value natural habitats such as salt, brackish or freshwater wetlands; submerged vegetation; oyster reefs or tidal guts to the maximum extent feasible; • Demonstrate that any proposed upland dredged material disposal sites be stabilized and maintained where necessary to prevent erosion and direct water run-off; • Avoid blocking natural channels with dredged material where water disposal is necessary while minimizing impacts to existing water circulation;

		• Consider temporal aspects of spoil deposition such as impacts on spawning seasons, fish migrations, waterfowl nesting and wintering areas, and mosquito control; and • Consider minimizing negative impacts on valuable terrestrial wildlife or vegetative habitats for upland dredge disposal sites
Clean Water Act §401 ***Water Quality Certificate***	DHEC, Office of Environmental Quality Control	When assessing the water quality impacts of a proposed project, the OEQC considers the intended purpose of the activity, whether the activity is water related, and whether there are any feasible alternatives to the activity. All potential direct and indirect water quality impacts of the project are also taken into account.

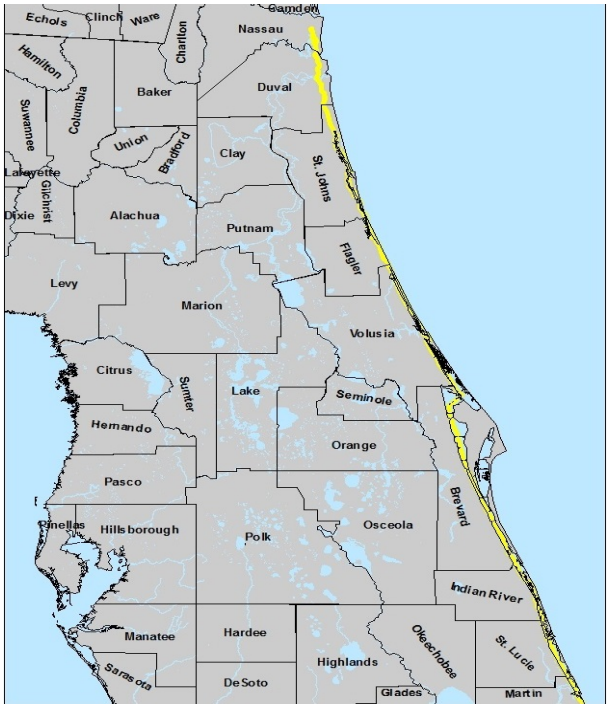
Northeast Florida

AIWW

The AIWW in Florida (Fig. 9) is managed and maintained by a special state-taxing district, the Florida Inland Navigation District (FIND). When FIND was formed in 1927, it was granted perpetual easements along the AIWW, most of which were located entirely in state waters and included open water areas and salt marsh. Many private landowners with wetlands adjacent to the AIWW also granted easements allowing for unconfined dredged material disposal on their property to FIND, (Brownell and Adams 2014).

By the early 1980s, the amount of space remaining in existing dredged material disposal sites was insufficient to meet Florida's dredged material disposal needs, either because they were too small or because they were located in environmentally sensitive areas. In the mid-1980s, most of the remaining easements on the AIWW were made up of either open water or remnant spoil islands (FIND 2015b).

Figure 9. Map of AIWW in northeast Florida



This report covers the eastern coastal counties of Nassau, Duval, St. Johns, Flagler, Volusla, Brevard, Indian River, and St. Lucie. (Florida Fish and Wildlife Conservation Commission - Fish and Wildlife Research Institute, http://atoll.floridamarine.org)

To address the loss of dredged material disposal options along the AIWW, FIND, in cooperation with the USACE, the Florida Department of Regulation, and the Florida Department of Natural Resources, conducted an initial study in 1986 to determine the 50-year dredged material disposal needs of two counties, Nassau and Duval. The study also identified sites where dredged material could be placed while awaiting beneficial use. The final report resulted in the identification and acquisition of seven sites which, along with one existing site, would be sufficient to manage all dredged material for 50 years in these two counties (Abecassis 2005).

The initial FIND study proved successful enough for the group to continue its efforts to evaluate and update the number of dredged material management sites throughout the Florida AIWW. The program is made up of three main elements: (1) plan development and property acquisition, (2) facility permitting and construction, and (3) facility operation (FIND 2015a). The property acquisition process has two phases. Phase I involves identifying all areas within reasonable distance of the AIWW that could meet the management and road access requirements for confined upland disposal. Phase II consists of field inspections that document and evaluate the potential site's environmental characteristics including

delineation of wetlands and the assessment of vegetation, habitat, and the presence of protected wildlife, previous land disturbances (e.g., logging, mining), or other environmental restrictions. Following each site inspection, candidate sites are either eliminated or preliminary design and site plans, site operation and management plans, and a summary of expected costs for site development and operation are drawn up. Sites are then ranked by location, mapped area, containment area, capacity, maximum pumping distance, comprehensive plan designation, predominant habitat, and, if necessary, limiting factors (Brownell and Adams 2014).

When fully implemented, this program will consist of 53 permanent containment facilities and eight beach placement sites (Brownell and Adams 2014). According to FIND, "the estimated 23 million cubic yards of sediment that is anticipated to be dredged from the AIWW over the next 50 years contains a possible 12 million cubic yards of beach quality sand. The other 11 million cubic yards of sediment, which have silt levels too high for beach placement, will be temporarily stored in 53 upland containment sites for subsequent employment for other beneficial uses. An additional 3 million cubic yards of beach quality materials will be returned to the coastal system through transportation from existing disposal sites in the vicinity of ocean inlets to ocean beaches" (FIND 2015a).

Dredged material disposal

South Carolina primarily disposes of dredged material in confined upland disposal facilities. It does not use confined marsh or open water, or unconfined open water disposal for dredged material disposal (Adams et al. 2011). Florida's beach nourishment policy recognizes that dredged material from navigation projects may often serve as a source of sand for coastal areas undergoing critical erosion. Indeed, Florida was one of the first states to recognize that maintenance dredging of coastal channels and beach nourishment projects were not integrated and as a consequence, dredged materials were being disposed of in ways that did not support beach nourishment projects near the dredging site (Hedrick 2000).The Florida Department of Environmental Protection is now authorized to ensure that all construction and maintenance dredging projects involving beach quality sand dispose of this material on an adjacent eroding beach or, if placed elsewhere, an equivalent quality and quantity of sand from an alternative location is placed on the adjacent eroding beach. Furthermore, on an average annual basis, a quantity of beach quality sand equal to the natural net annual longshore sediment transport must be placed on the adjacent eroding beach (F.S. §161.142(1)(2)).

In 2008, Florida implemented an updated Strategic Beach Management Plan (SBMP) to serve as a "comprehensive, long-range, statewide program of beach erosion control; beach preservation, restoration, and nourishment; and storm and hurricane protection" (FL-EPD 2008a).The Plan outlines maintenance strategies for inlets and critically eroded beaches in various sub-regions of the state. Beach quality sand may be obtained from upland confined dredged material facilities, maintenance dredging of navigation projects, or offshore borrow areas (FL-EPD 2008a). For example, the SBMP for the Northeast Atlantic Coast Region calls for the placement of beach compatible sand from maintenance dredging of the AIWW near the 3.1 mile segment of critically eroded beach along the southern portion of Amelia Island. Dredging of this segment of the AIWW is scheduled for every 3 to 5 years, and 900,000 cubic yards of beach quality sand from these projects has been placed on a portion of this beach in 1997,

2001, and 2006 (FL-EPD 2008b). The Plan calls for the maintenance of the Amelia Island project through continued beach nourishment from the Sawpit Creek Cut segment of the AIWW (FL-EPD 2008b).

Mitigation

Construction activities associated with two upland confined disposal sites along the AIWW in northeast Florida are undergoing mitigation (Table 9).

Table 9: USACE Civil Works Mitigation Projects in NE Florida

Project Name	Mitigation Requirements	Mitigation Progress to Date	Estimated completion date
Inland Waterway Jacksonville-Miami, FL (Construction Upland Disposal Sites IR-2 and SL-2)	Create 6 acres of wetland mangrove and upper marsh and obtain perpetual conservation easement over an additional 1.2 acres of on-site wetlands.	(1) 6 acres of wetland mangrove and upper marsh created from a former citrus grove by grading to establish hydrology and by planting. (2) Perpetual conservation easement over an additional 1.2 acres of on-site wetlands. (3) Monitoring ongoing. Baseline mitigation monitoring report, April 2013, indicates presence of native wetland and aquatic species. Planted red mangroves in one area are struggling. Subsequent annual monitoring in April 2014 indicates loss of red mangroves in this area.	2018

Adapted from Table 2 of the Seventh Annual Status Report on USACE Construction Projects Requiring Mitigation Under Section 906 of the Water Resources Development Act of 1986 (Feb 2015) available at: http://www.usace.army.mil/Portals/2/docs/civilworks/Project%20Planning/rap/fy2014_MitigationRep_3Feb2015.pdf

Recent dredging projects

Since 1999[15], Florida has disposed of AIWW dredged material through placement in confined upland disposal sites or through beach nourishment projects (Table 10).

Table 10. AIWW dredged disposal by type in northeast Florida: 1999-2014

Year	Area	Volume yd^3	Disposal type
1999	IWW St. Johns Co. Matanzas	558,000	Beach nourishment
2000	AIWW, Nassau Co, Sawpit	214,000	Undefined
2002	IWW - Haulover Canal, MD	1,200,000	Upland
2003	IWW-OWW Crossroads	55,700	Upland
2005	IWW ST JOHNS CO (PV, S Reach)	1,200,000	Upland
2005	IWW Volusia Co. (S. Reach)	300,000	Upland
2005	IWW - St. Aug, Xrds, BHI	194,000	Beach & upland
2006	IWW Dade Co (BH Inlet)	33,000	Beach nourishment
2006	AIWW-Nassau Co.	444,000	Beach & upland
2007	IWW-St Johns Co (Matanzas)	183,000	Beach nourishment

[15] The earliest date for which dredged material contract data is available for Florida.

2008	IWW Volusia Co.-Middle & North	569,000	Beach & upland
2009	IWW-Crossroads	51,900	Upland
2009	IWW-Palm Valley North Reach	242,000	Upland
2010	IWW Bakers Haulover	38,000	Beach nourishment
2010	IWW Cr to AR/Venice Inlet	26,000	Beach nourishment
2011	MATOC IWW Matanzas	280,000	Beach nourishment
2012	MATOC IWW St. Augustine	250,000	Beach nourishment
2013	MATOC IWW-Sawpit	591,000	Beach nourishment
2014	MATOC IWW IR-R1	308,000	Undefined

Key:

Undefined: undefined or unknown at the time of data entry
Upland: placement of dredge material within a confined placement facility located above the adjacent water surface
Beach & Upland: combination of upland confined placement and beach nourishment
Beach Nourishment: beach restoration in which dredged material is directly placed onto an eroded beach

Dredge Statistical Program, Navigation Data Center, USACE (http://www.navigationdatacenter.us/db/dredging/contract/)

Below are descriptions of planned or recent dredging projects along the Florida portion of the AIWW.

Final Environmental Assessment, Maintenance Dredging the Intracoastal Waterway Reach I Indian River County, Florida (May 2014) (USACE 2014d)
The USACE, Jacksonville District, is proposing to conduct periodic maintenance dredging of the Indian River County, Florida portion of the AIWW in the vicinity of Sebastian Inlet. Dredged material would be placed in the previously constructed Dredged Material Management Area IR-2, the site of a former abandoned citrus grove and mangrove impoundment. The IR-2 diked containment basin, perimeter ditch and access roads cover approximately 60 acres of the abandoned citrus land, while the remaining 119-acres were preserved and improved with native vegetation to provide a 200-ft to 350-ft buffer from surrounding neighbors (FIND 2011). IR-2 is designed to accommodate the projected 50-year Reach I dredged material storage requirement of approximately 430,000 cubic yards (USACE 2014d). The site also allows for the future removal of dredged materials for beneficial reuse (FIND 2011).

Final Environmental Assessment, Maintenance Dredging the Intracoastal Waterway Reach I and Portion of Reach II St. Lucie County, Florida (May 2014) (USACE 2014e)
The USACE, Jacksonville District, is proposing to conduct periodic maintenance dredging of the St. Lucie County, Florida portion of the AIWW in the vicinity of Ft. Pierce Inlet. Dredged material would be placed in the previously constructed Dredged Material Management Area SL-2, located about 3,300 ft south of the Indian River/St. Lucie County line. SL-2 is designed to accommodate the area's projected 50-year dredged material storage requirement of 78,116 cubic yards.

Maintenance dredging, AIWW Sawpit Ranch 3 project (FIND 2013)
The AIWW Sawpit Reach 3 (Nassau County) project consisted of maintenance dredging of approximately 591,000 cubic yards of material from the AIWW channel and settling basins in Cuts 24-26A, 27, 27A, 27C, and adjoining advance maintenance areas in the waters of Sawpit Creek, the Amelia River, and Nassau Sound. The majority of the excavated material, 578,000 cubic yards, was placed in the Amelia Island

State Park beach disposal site. The pumping distance between dredging areas and beach placement ranged from 4 miles to 1.5 miles. The material from Cut-27, totaling 13,000 cubic yards, was not beach compatible and was placed upland in DMMA DU-2.

Regional General Permit (RGP) SAJ-93 for Maintenance Dredging of the Atlantic Intracoastal, Intracoastal and Okeechobee Waterways by the Florida Inland Navigation District - East Coast Florida (February, 2011) (USACE 2011)

The USACE authorized a Regional General Permit (SAJ-93) that provides authority for maintenance dredging activities conducted by FIND for the AIWW, the Intracoastal Waterway, and the Okeechobee Waterway along the east coast of Florida. Regional General Permit SAJ-93 "*does not authorize excavation of wetlands, such as mangroves or other forested or emergent aquatic habitats*", and is subject to several conditions, including the requirement that "*excavated spoil material must be deposited at self-contained upland areas that will prevent spoil material or return water from re-entering any navigable waterbody or from interfering with natural drainage. Alternatively, dredged material may be placed in a Corps-approved Dredged Material Management Area.*" *Furthermore, "[n]o temporary or secondary adverse effects to submerged aquatic vegetation or wetlands are authorized*". "*In the event that an unauthorized adverse impact occurs, FIND will coordinate with the USACE to quantify the impact, assess the ecological functional losses, and provide an in-kind compensatory mitigation plan for USACE review and approval*". [quotes taken from the *Regional General Permit*]

Regulatory summary

In Florida, AIWW dredging projects require the issuance of an Environmental Resource Permit (ERP) by the Florida Department of Environmental Protection (DEP). The authorization of an ERP requires the DEP to consider several environmental factors including adverse water quality impacts, adverse habitat impacts, and secondary and cumulative impacts to wetlands and other surface waters. Issuance of an ERP is also subject to a public interest test. If the project is located on state-owned submerged lands, it also requires a submerged land authorization. If the project is located in a manatee protection zone, a permit must be obtained from the Florida Fish and Wildlife Conservation Commission, and if the dredged material is going to be disposed of in an Ocean Dredged Material Disposal Site, the USACE needs to coordinate with the DEP's Outer Continental Shelf program. The process under which an ERP is issued also constitutes §401 state water quality certification and satisfies federal coastal consistency concurrence.

If a dredging project will include beach nourishment or placement of dredged material on beach or nearshore areas, a Joint Coastal Permit is required. This permit encapsulates and consolidates the processing of coastal construction permits, ERPs, and submerged land authorizations.

A summary of relevant regulations for dredged material disposal in Florida can be found in Table 11.

Table 11. Dredged material disposal regulatory matrix for Florida.
(For more detailed information, see Appendix C)

Statute or Policy/Permit	Authority	Description
Environmental Resource Permitting Program	Department of Environmental	Regulates all activities that will alter, impede, or otherwise change the flow of surface waters and

Permit	Protection/Authorized water management district	wetlands, including navigational dredging. Permit requires compliance with several environmental criteria and a public interest test.
Manatee Sanctuary Act ***Permit***	Florida Fish and Wildlife Conservation Commission/Local governments	Authorizes the FWC to permit activities that do not pose a serious threat to manatees. A serious threat exists if it will result in injury, death, disruption of normal habitat use or destruction of essential habitat. With FWC permission, local governments may establish their own manatee protection zones.
Submerged Lands Authorization ***Consent by rule, letter of consent, easement, lease***	Board of Trustees of the Internal Improvement Trust Fund	Required when dredging activities occur on state-owned submerged lands. Must be issued concurrently with ERP. Authorization considers water dependency, riparian rights, impact to state-owned resources, and preemption from other uses by the public.
Beach and Shore Preservation Act ***Permit***	Department of Environmental Protection, Bureau of Beaches and Coastal Systems	Directs the DEP to develop and maintain a Strategic Beach Management Plan for the restoration and maintenance of the state's critically eroded beaches. Also requires a coastal construction permit for activities that involve deposition or removal of beach material.
Joint Coastal Permitting ***Permit***	Department of Environmental Protection	Consolidates processing of coastal construction permits, ERPs, and submerged land authorizations. Required for beach nourishment projects or navigational channel dredging where spoil will be placed on beach or nearshore areas.
Florida Outer Continental Shelf Program ***Technical review and coordination***	Department of Environmental Protection	Conducts the state coordination and technical review, monitoring, and oversight of activities in federal waters in the Outer Continental Shelf to ensure they are consistent with state laws and do not damage state resources. Required for ocean disposal of dredged materials.
Federal/State Coastal Zone Management Act ***Consistency Review***	Coastal Zone Management Program	In coastal counties, issuance of an ERP also establishes a consistency concurrence that the federal activity is in compliance with the policies of the state coastal zone management program.
Clean Water Act §401 ***Water Quality Certificate***	Department of Environmental Protection	The issuance of an ERP constitutes the state's water quality certification – there is no separate §401 certification program.

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Appendix A. North Carolina Dredged Material Disposal Policies

In North Carolina, dredging and the disposal of dredged material are regulated by the Division of Coastal Management, North Carolina Department of Environment and Natural Resources.

North Carolina Dredge-and-Fill Law

Statutory reference: NCGS §113-229
Permit/Assessment: Permit
Lead Agency: DENR, Division of Coastal Management

Any dredge-and-fill project taking place in any estuarine waters, tidelands, marshlands, or State-owned lakes requires a permit from the Division of Coastal Management (DCM). As part of the application for this permit, the disposal area must be identified (NCGS §113.229(a)(b)). Applications for permits are circulated by the DCM among all State agencies and, at the discretion of the Secretary of Environment and Natural Resources, any federal agency that has jurisdiction over the area affected by the proposed project so that such agencies will have an opportunity to raise any objections they might have. Permits will be granted for dredge or fill projects that are not expected to prevent use of the water by the public; take away from the value or enjoyment of the land of adjoining property owners; adversely impact water supplies, or public health, safety, and welfare; or adversely affect wildlife or fisheries (NCGS §113-229(e)).General permits may be obtained that allow excavation within existing canals, channels, basins and ditches in estuarine and public trust waters for the purpose of maintaining previous water depths (15A NCAC 07H.1500).

Beach-quality material dredged from navigational channels within nearshore, beach or inlet shoal systems (in or about estuarine waters) may not be permanently removed from the affected coastal system. Instead, the dredged material must be disposed of on an ocean beach or shallow active nearshore area where it is environmentally acceptable and compatible with other beach uses. In addition, all dredged material must be encased or entrapped in such a manner as to minimize its moving back into the affected water (NCGS §113-229(h)(2)(i)).

Maintenance of Federal Navigation Channels

Statutory reference: 15A NCAC 07K .0401
Permit/Assessment: Permit exemption
Lead Agency: DENR, Division of Coastal Management

Operation and maintenance activities of all federal navigation channels under the authority of the USACE are exempted from the CAMA permit requirement. These activities include dredging and disposal of dredged material in Areas of Environmental Concern (the estuarine and ocean system, the ocean hazard system, public water supplies, and natural and cultural resource areas. However, activities exempted by this requirement must be consistent to the maximum extent practicable with the North Carolina Management Plan (NCDENR-DCM 2015).

Beneficial Use of Dredged Materials from the Excavation or Maintenance of Navigation Channels Policy

Statutory reference: 15A NCAC 07M.1101
Lead Agency: DENR, Division of Coastal Management

Certain dredged material disposal practices may result in removal of material important to the sediment budget of ocean and inlet beaches. This may, particularly over time, adversely impact important natural beach functions especially during storm events and may increase long-term erosion rates. Ongoing channel maintenance requirements throughout the coastal area also lead to the need to construct new or expanded disposal sites as existing sites fill up. This is a financially and environmentally costly undertaking. In addition, new sites for disposal are increasingly harder to find because of competition from development interests for suitable sites. Therefore, it is the policy of the state that material resulting from the excavation or maintenance of navigation channels be used in a beneficial way wherever practical (15A NCAC 07M.1101).

In furtherance of this policy, the State encourages research on the beneficial use of dredged material, particularly poorly sorted or fine grained materials, and on innovative ways to dispose of this material so that it is more readily accessible for beneficial use. Restoration of estuarine waters and public trust areas adversely impacted by existing disposal sites or practices is in the public interest and will be encouraged at every opportunity. In addition, material in publicly owned disposal sites is available to anyone proposing a beneficial use consistent with this policy (15A NCAC 07M.1102).

Coastal Area Management Act

Statutory reference: NCGS §113A-100
Permit/Assessment: Permit
Lead Agency: DENR, Division of Coastal Management

Under the North Carolina Coastal Area Management Act (CAMA), estuarine and ocean systems include estuarine waters, coastal wetlands, public trust areas, and coastal shorelines (i.e., estuarine and public trust shorelines) (15A NCAC 07H .0201). Within these areas, all dredged material must be confined landward of flooded coastal wetlands and stabilized to prevent entry of sediments into the adjacent water bodies or coastal wetland sand (when possible) allow effluent to be returned to the dredged area. Dredged material from maintenance of channels and canals through irregularly flooded wetlands must be placed on non-wetland areas, remnant spoil piles, or disposed of by a method having no significant long-term wetland impacts. Under no circumstances may dredged material be placed on regularly flooded wetlands. New dredged material disposal areas may not be located less than 30 feet landward of the normal water level or normal high water level of coastal shorelines (15A NCAC 07H.0208 (b)(1)(B)C)(E); 07H.0209(d)(10)).

Dredged material may be used for beach nourishment if it is allowed to dry prior to placement and consists only of clean sand, free from pollutants and of acceptable grain size (15A NCAC 07H.0208 (b)(8)(A)(ii)(C)(ii)). Placing unconfined sand material in the water and along the shoreline is not allowed

as a method of shoreline erosion control, and dredged material may not be placed directly on the beach (15A NCAC 07H.0208(b)(8)(B)(C)(iii)).

North Carolina Marine Fisheries Commission Policy on Large-Scale Beach Dredge-and-Fill Projects

Lead Agency: North Carolina Marine Fisheries Commission

Large-scale beach dredge-and-fill projects should:

- Avoid, minimize, and offset damage to the marine and estuarine resources of North Carolina;
- Provide detailed analyses of possible impacts to each type of essential fish habitat (EFH), with careful detailed analyses of possible impacts to Habitat Areas of Particular Concern (HAPC) and Critical Habitat Areas (CHA), including short and long term, and population and ecosystem scale effects;
- Provide a full range of alternatives, along with assessments of the relative impacts of each on each type of EFH, HAPC, and CHA;
- Avoid impacts on EFH, HAPCs and CHAs that are shown to be avoidable through the alternative analysis, and minimize impacts that are not;
- Include assessments of potential unavoidable damage to marine resources, using conservative assumptions;
- Be conditioned on the avoidance of avoidable impacts, and should include compensatory mitigation for all reasonably predictable impacts to the marine and estuarine resources of North Carolina, taking into account uncertainty about these effects. Mitigation should be local, up-front and in-kind wherever possible; and
- Include baseline and project-related monitoring adequate to document pre-project conditions and impacts of the projects on the marine and estuarine resources of North Carolina.

All assessments for large-scale beach dredge-and-fill projects should:

- Be based upon the best available science, and be appropriately conservative so as to be prudent and precautionary; and
- Take into account the cumulative impacts associated with other beach dredge-and-fill projects in North Carolina and adjacent states, and other large-scale coastal engineering projects that are ecologically related (USACE 2007).

§401 Certification

Statutory reference: NCAC 02H.0500*et seq*.
Permit/Assessment: Water quality certificate
Lead Agency: DENR, Division of Water Quality

The North Carolina Department of Environment and Natural Resources, Division of Water Quality (NCDWQ) administers the state's §401 program. A §401 Water Quality Certificate is required for any federally permitted or licensed activity that may result in a discharge to waters of the U.S. Issuance of a

§401 certification verifies that a given project will not degrade Waters of the State or violate State water quality standards (NCDENR-DWQ 2015).The state's water quality certification regulations outline procedures for application, review, public notice, and public hearing (NCAC 02H.0500).

When issuing §401 certifications, NCDWQ may attach conditions to ensure compliance with all state and federal water quality standards. For example, in connection with the Morehead City Harbor DMMP of March 2012, the NCDWQ reissued general §401 certifications that cover beach disposal for Shackleford Banks and Fort Macon State Park, Atlantic Beach, and Pine Knoll Shores (NCDWQ Certificate #3908), nearshore sediment placement off Bogue and Shackleford Banks (NCDWQ Certificate # 3908), and upland diked disposal activities on Brandt Island (NCDWQ Certificate # 3888). The conditions under which these certifications were issued included but were not limited to:

- No waste, spoil, solids, or fill of any kind may occur in wetlands, waters, or riparian areas other than those established for use in this Certification without written authorization.
- The timing of the dredging and discharge must comply with dredging windows established by the NC Wildlife Resources Commission, NC Division of Marine Fisheries, and/or the US Fish and Wildlife Service in order to lessen impact on aquatic organisms and their reproduction. If activities must occur during periods of high biological activity (i.e. sea turtle nesting, fish spawning, or bird nesting), then biological monitoring may be required at the request of other state or federal agencies.
- The terminal end of the pipeline from the dredge into the retention area must be positioned at a maximum distance from spillways to allow adequate settling of suspended solids and a sufficient distance from any part of the dike so as to preclude dike erosion by the pipeline discharge. Effluent must be released waterward of emergent marsh or tidal flats when located within these systems.
- A water control structure must be installed at the intake end of the effluent leading from the retention area in order to ensure maximum settling of suspended solids and control of discharge volumes.
- The flow from the diked retention area must be contained by pipe, metal or wooden trough, or similar device to a point waterward of any emergent vegetation along the shoreline unless it can be clearly shown that a different design will result in less environmental impact.
- Sufficient freeboard must be maintained within the diked disposal area during the dredging operation to assure the integrity of the dike structure and the containment of the dredged material.
- Native forested vegetation must be re-established in any construction access or other temporary impact area within the next growing season following construction of a project.
- Hydraulic dredging projects that use an upland diked disposal basin with a return pipe for the return water must use the "two basin" design.
- The concentration of settleable solids in the effluent being discharged from the diked disposal area shall be no greater than 0.1 ml/l.
- The disposal area dikes must be stabilized with vegetative cover within one day after construction to minimize erosion (USACE 2013a).

Federal Coastal Zone Management Act

Statutory reference: 16 U.S.C. §1451 *et seq*.

Permit/Assessment: Consistency determination certificate
Lead Agency: DENR, Division of Coastal Management

Although federal dredging projects do not require a permit under the CAMA, they do require a consistency review under the federal Coastal Zone Management Act. The DCM administers this review for projects in the twenty designated coastal counties. Once the application is complete, DCM will review the proposed project for conformance with the enforceable policies of the state's certified coastal management program.

Based on comments given by the DCM in the consistency review for the Morehead City Harbor DMMP (2008), DMMP consistency reviews potentially involve concurrence with the management plan itself as well as concurrence with the actual dredging and disposal operations. To minimize the number of concurrence reviews, the DCM allows the USACE to combine these consistency submissions. While recognizing that the disposal of beach quality material onto a beach may or may not be within the scope of a proposed dredging operation, because the State's coastal management program encourages the placement of beach quality material onto the beach, the DCM encourages that the USACE comply with this state mandate to all possible extent. In addition, to ensure efficient management of dredged material, the DCM suggests that DMMPs focus on how this material can be moved immediately to a disposal location, such as a beach, to minimize the necessity for intermediate storage (USACE 2013b).

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Appendix B. South Carolina Dredged Material Disposal Policies

Beachfront Management Act (Coastal Tidelands and Wetlands Act)

Statutory reference: S.C. Code §48-39-250 *et seq*.
Permit/Assessment: Planning requirement
Lead Agency: Department of Health and Environmental Control

It is the policy of South Carolina to promote carefully planned nourishment as a means of beach preservation and restoration where economically feasible (S.C. Code §48-39-260 (5)). Beach nourishment is defined as the artificial establishment and periodic nourishment of a beach with sand that is compatible with the existing beach (S.C. Code §48-39-270(4)). The Act requires the DHEC to create a comprehensive beach management plan for the state including but not limited to development of guidelines and their coordination with appropriate agencies and local governments for the accomplishment of:

- Beach/dune restoration and nourishment, including the projected impact on coastal erosion rates, cost/benefit of the project, impact on flora and fauna, and funding alternatives;
- Maintenance of a dry sand and ecologically stable beach; and
- Development of a mitigation policy for construction allowed seaward of the setback line, which must include public access ways, nourishment, vegetation, and other appropriate means (S.C. Code §48-39-320).

The DHEC considers the following requirements before approving beach nourishment projects:

- Study must be given to the type (grain size and quality) of material most suitable for nourishment of a particular beach area;
- Borrow areas and sand for artificial nourishment must be carefully selected to minimize adverse effects. Where possible, artificial beach nourishment must be performed in concert with inlet stabilization or navigation projects;
- Dredging in the borrow areas may not be in conflict with spawning seasons or migratory movements of significant estuarine or marine species. Nourishment of beach areas must be scheduled so as not to interfere with nesting and brood-rearing activities of sea birds, sea turtles, or other wildlife species;
- All policies concerning dredging and filling cited at R.30–12(G) shall be applied to beach nourishment proposals (S.C. Reg. 30-13(N)(2)).

South Carolina Coastal Zone Management Act

Statutory reference: S.C. Code §48-39-1*et seq*.
Permit/Assessment: Consistency review
Lead Agency: DHEC, Office of Ocean and Coastal Resource Management

DHEC's Office of Ocean and Coastal Resource Management (OCRM) is the designated state coastal management agency and is responsible for the implementation of the state's Coastal Management

Program. In the critical areas of the coastal zone (i.e., coastal waters, tidelands, beaches and beach/dune systems), OCRM has direct permitting authority for location of disposal sites for dredged material (S.C. Code §48-39-130). The OCRM is authorized to the grant rights and easements to the Federal government for spoil disposal sites for purposes of maintenance of navigable waterways, including the AIWW. Outside of the critical areas in the coastal zone, DHEC, Office of Environmental Quality Control has permitting authority for dredged material disposal sites which are below mean high water.

The Coastal Zone Management Act contains specific regulatory standards for dredge-and-fill projects. It also discourages construction of new erosion control devices in favor of preserving and restoring South Carolina's beaches through a policy of retreat and nourishment (S.C. Reg. 30-12G).

Dredge-and-fill activities pertaining to the maintenance of the harbor channels and the collection and disposal of dredged materials by the USACE are exempt from the critical area permit requirement (S.C. Code §48-39-130(D)(4)). However, DHEC retains the authority to review and certify all such proposed dredge-and-fill activities under federal CZMA consistency review.

Dredge-and-Fill Standards

Statutory reference: S.C. Reg. 30-12(G)
Lead Agency: DHEC, Office of Ocean and Coastal Resource Management

Because the dredging and filling in of wetlands can always be expected to have adverse environmental consequences, the DHEC discourages this practice except in cases where such unavoidable environmental effects are justified if legitimate public needs are to be met. Where the DHEC determines that dredging activities are justified, the following standards, including but not limited to the following, will be applied:

- All dredge-and-fill activities not in the public interest will be discouraged except for erosion control (S.C. Reg. 30-12(C) or boat ramps(S.C. Reg. 30-12(B));
- Dredging and filling in wetland areas should be undertaken only if that activity is water-dependent and there are no feasible alternatives;
- To the maximum extent feasible, dredging and filling activities should be restricted in nursery area sand shellfish grounds and during periods of migration, spawning, and early development of important sport and commercial species;
- Dredging and excavation must not create stagnant water conditions, lethal fish entrapments, or deposit sumps or otherwise contribute to water quality degradation;
- Designs for dredging and excavation projects must, where feasible, include protective measures such as silt curtains, diapers, and weirs to protect water quality in adjacent areas during construction by preventing the dispersal of silt materials;
- Dredged materials must be deposited and contained in such a manner so as to prevent dispersal into adjacent wetland areas and, in all cases, new facilities must have permanent upland disposal

sites. Existing facilities must have either permanent upland disposal sites or EPA approved ocean disposal sites;

- Wetlands must not be utilized as depositories for waste materials except in accordance with the standards for the deposition of dredged material (R.30-I2(I)) and in the case of waste management systems (S.C. Reg. 30-12(J)); and
- In all cases, dredging activities must not be approved until satisfactory disposal sites have been acquired.

Standards for Creation of Navigation Channels and Access Canals

Statutory reference: S.C. Reg. 30-12(H)
Lead Agency: DHEC, Office of Ocean and Coastal Resource Management

The South Carolina Coastal Management Act sets forth specific standards designed to minimize the adverse effects of the disposal of dredged material. Certain dredging activities involve the creation and maintenance of navigation channels and access canals. These activities have a potential for severe environmental impacts and should meet a demonstrated public need.

Where the Department determines that dredging activities are justified, the following standards including but not limited to the following, will be applied:

- Dredging for establishment of new canals which involves permanent alteration of wetland habitats will be prohibited unless no feasible alternative exists. Establishment of canals for purposes of creating waterfront lots from inland property will be prohibited unless it can be demonstrated that there will be no significant environmental impacts on critical areas;
- To the extent feasible, project plans must utilize piers or catwalks, rather than channels or canals, to reach deeper water areas;
- Highland waterway construction that is slated to be tied into wetland areas must be constructed in the dry, if feasible, so that sloping and stabilization of the banks can be completed before the plug is removed for the connection to open waters. Where dry construction is not possible, temporary plugs or silt curtains at the end of canals connected to waterways should be maintained until all sediment settles out; and
- Alignment of channels and canals should make maximum use of natural or existing channels. Alignment of channels and canals should avoid shellfish beds, nursery areas, and spawning areas in wetlands (S.C. Reg. 30-12(H)).

Standards for the Deposition of Dredged Material

Statutory reference: S.C. Reg. 30-12(I)
Lead Agency: DHEC, Bureau of Water

The South Carolina Coastal Management Act provides standards to prevent and minimize impacts to the marine and aquatic environment resulting from the deposition of dredged material as follows:

- Upland disposal of dredged material is always preferred to wetland disposal. Vegetated wetlands, mudflats, and other wetlands may not be used for disposal of dredged materials unless there are no feasible alternatives;
- Open water and deep water disposal should be considered as an alternative if highland alternatives are not feasible only after consultation with the DHEC and other relevant state and federal agencies;
- Dredged materials containing hazardous levels of toxic material must never be disposed of in wetland areas and only in highland areas which are lined and diked with impervious materials. Hazardous materials will only be disposed of in open water ocean dumping sites when maximum safety has been demonstrated after review by the DHEC and other appropriate state and federal agencies;
- Dikes surrounding disposal areas should be shaped and vegetated immediately to minimize erosion, with outfalls positioned to empty into non-wetland areas;
- Future disposal sites will be reviewed on a case-by-case basis;
- Wherever feasible, existing disposal areas must be used to the fullest extent possible; this includes raising the height of the embankments to increase the holding capacity of the disposal area;
- Consideration must be given to the temporal aspects of spoil deposition (e.g., impacts on spawning, fish migrations, shellfish harvesting, waterfowl nesting and wintering areas, and mosquito control); and
- In all cases, dredging activities will not be approved until satisfactory disposal sites have been acquired (S.C. Reg. 30-12(I)).

§401 Certification

Statutory reference: S.C. Reg. 61-101
Permit/Assessment: Water quality certificate
Lead Agency: DHEC, Office of Environmental Quality Control

The Office of Environmental Quality Control (OEQC) in the DHEC is responsible for issuing §401 water quality certifications. When assessing the water quality impacts of a proposed project, the OEQC considers the intended purpose of the activity, whether the activity is water related, and whether there are any feasible alternatives to the activity. All potential direct and indirect water quality impacts of the project are also taken into account including: (1) impacts on existing and classified water uses; (2) physical, chemical, and biological impacts; (3) the effect on circulation patterns and water movement; and (4) the cumulative impacts of the proposed activity and reasonably foreseeable similar activities of the applicant and others.

A §401 water quality certification was issued for disposal of dredged material associated with the Charleston Harbor deepening project on May 2, 1995. Because the dredging and disposal methods proposed in the *Final Environmental Assessment for the Additional Advanced Maintenance Dredging of Charleston Harbor* did not substantially change and no new disposal locations were added, the USACE and the OEQC considered the previous water quality certification to still be valid (USACE 2009).

Federal Coastal Zone Management Act

Statutory reference: 16 U.S.C. §1451 *et seq*.
Permit/Assessment: Consistency determination certificate
Lead Agency: DHEC, Office of Ocean and Coastal Resource Management

Under the South Carolina Coastal Management Act, all federal actions and projects must be consistent with the S.C. Coastal Management Program. The Program contains the specific goals, objectives and policies necessary for the OCRM to review development activities taking place in the eight coastal counties. The policies for dredged material disposal include:

- Avoid placing dredged material on high value natural habitats such as salt, brackish or freshwater wetlands; submerged vegetation; oyster reefs or tidal guts to the maximum extent feasible;
- Demonstrate that any proposed upland dredged material disposal sites be stabilized and maintained where necessary to prevent erosion and direct water run-off;
- Avoid blocking natural channels with dredged material where water disposal is necessary while minimizing impacts to existing water circulation;
- Consider temporal aspects of spoil deposition such as impacts on spawning seasons, fish migrations, waterfowl nesting and wintering areas, and mosquito control; and
- Consider minimizing negative impacts on valuable terrestrial wildlife or vegetative habitats for upland dredged disposal sites (SCDHEC 2013).

In March 1995, the OCRM provided certification that the Charleston Harbor deepening project was consistent with the South Carolina Coastal Zone Management Program provided that (1) no freshwater wetlands were disturbed or altered without appropriate authorization, (2) all necessary state and federal permits and associated certifications were obtained, and (3) the proposed work did not contravene the policies of the Program. Because the dredging and disposal methods proposed in the Final Environmental Assessment for the Additional Advanced Maintenance Dredging of Charleston Harbor did not substantially change and no new disposal locations were added, the USACE and the OCRM considered the previous consistency determination to still be valid (USACE 2009).

References

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Appendix C. Florida Dredged Material Disposal Policies

Environmental Resource Permitting Program

Statutory reference: F.A.C. ch. 40C; F.S. §373-400
Permit/Assessment: Permit
Lead Agency: Department of Environmental Protection

Navigational and maintenance dredging of the AIWW requires an Environmental Resource Permit (ERP). The ERP program regulates the construction, alteration, maintenance, removal, modification, and operation of all activities in uplands, wetlands and other surface waters (whether publicly or privately owned) that will alter, divert, impede, or otherwise change the flow of surface waters. That includes dredging and filling in most surface waters and wetlands (whether isolated or connected to other waters). The program covers activities such as the dredging of navigation channels, filling of wetlands, and the construction of docks and seawalls. The ERP program is in effect throughout Florida, and applications are processed by either the DEP or one of Florida's authorized water management districts (FL-DEP 2007).

Evaluation criteria for all activities necessitating an ERP include, but are not limited to, requirements that the project:

- Not cause adverse water quantity impacts to receiving waters and adjacent lands;
- Not cause adverse flooding to on-site or offsite property;
- Not cause adverse impacts to existing surface water storage and conveyance capabilities;
- Not adversely impact the value of functions provided to fish and wildlife and listed species by wetlands and other surface waters;
- Not adversely affect the quality of receiving waters such that state water quality standards will be violated, which includes surface and ground waters. Anti-degradation of existing uses is generally met through compliance with the ERP permitting criteria;
- Not adversely impact the maintenance of surface or ground water levels or surface water flows; and
- Not cause adverse secondary impacts to water resources (F.A.C. ch. 40C-4.301).

Secondary impacts are those actions that are very closely related and directly linked to the proposed activity that may affect wetlands and other surface waters and that would not occur but for the proposed activity. Secondary impacts to the habitat functions of wetlands associated with adjacent upland activities are not considered adverse under the ERP program if buffers of a certain minimum size are provided abutting the wetlands (F.A.C. ch. 40C-4.301(1)(f)).

For the proposed activity to be permitted in wetlands and other surface waters it must be found not to be contrary to the public interest, or, if the activity is located in an Outstanding Florida Water (F.A.C. ch. 62-302) or an aquatic preserve (F.A.C. ch. 18-20) the activity must clearly be in the public interest (F.A.C. ch. 40C-4.302(1)). This determination is made by weighing the following criteria:

- Adverse effects on public health, safety, or welfare, or the property of others (based solely on environmental, not economic, considerations);
- Adverse effects on the conservation of fish and wildlife, including endangered and threatened species, or their habitats;
- Adverse effects on navigation or the flow of water, or causing harmful erosion or shoaling;
- Adverse effects on fishing or recreational values or marine productivity in the vicinity of the activity; temporal nature (whether the activity will be temporary or permanent);
- Adverse effects on or enhancement of significant historical and archaeological resources; and
- The current condition and relative value of the functions being performed by areas affected by the proposed regulated activity (F.S. §373-414(1)(a); F.A.C. ch. 40C-4.302).

An ERP applicant must also show that a regulated activity will not cause unacceptable cumulative impacts upon wetlands and other surface waters within the same drainage basin as the regulated activity for which a permit is sought. Cumulative impacts are residual adverse impacts to wetlands and other surface waters in the same drainage basin that have or are likely to result from similar activities (to that under review) that have been built in the past, that are under current review, or that can reasonably be expected to be located in the same drainage basin as the activity under review. Mitigation that fully offsets impacts within the drainage basin where the project impacts occur is assumed to not have any adverse cumulative impacts (F.A.C. ch. 40C-4.302(2)).

Certain specified activities are exempt from the requirement to obtain an ERP including maintenance dredging of existing navigational channels and canals. The DEP may grant dredging exemptions on a case-by-case basis for activities it determines will have only minimal or insignificant individual or cumulative adverse impacts on the water resource (F.S. §373.406(6)).

Manatee Protection Act

Statutory reference: F.S. §379.2431(2)
Permit/Assessment: Permit
Lead Agency: Florida Fish and Wildlife Conservation Commission

Under the Manatee Sanctuary Act, the Florida Fish and Wildlife Conservation Commission (FWC) is authorized to establish restrictions to protect manatees from harmful collisions with motorboats and from harassment; to protect manatee habitat, such as seagrass beds, from destruction by boats or other human activity; and to provide limited safe havens where manatees can rest, feed, reproduce, give birth or nurse undisturbed by human activity (F.A.C. ch. 68C-22.001).These restrictions can prohibit or limit entry into an area as well as limit what activities can be performed in the area. Permits for regulated activities are issued only when the FWC finds that the proposed activity will not pose a serious threat to manatees, and that the activity is justified. A serious threat to manatees exists if, due to the nature, location, or frequency of the proposed activity, its conduct can be reasonably expected to result in either (1) injury or death to manatees, (2) a significant disruption of the manatee's normal use, behavior or migratory patterns, or (3) disturbance which would lead to or cause destruction of essential manatee habitat. In making its determination, the FWC considers the following factors:

- Patterns of manatee use of the area, both seasonal and year-round;
- The number of manatees known or assumed to occur in or seasonally use the area;
- The manatee mortality trends within the area;
- The existence of features within the area which are essential to the survival of, or are known to attract, manatees, such as seagrasses or other food sources, favorable water depths, and fresh or warm water sources;
- The cumulative effect of the requested activities in light of other permits previously granted or currently being considered by the Commission and known vessel traffic patterns and densities in the area; and
- The characteristics of the waterway and of the vessel(s)/motor(s) which would be operated by the applicant (F.A.C. ch. 68C-22.003(1)(a)).

Local governments are also authorized to establish manatee protection zones through the adoption of a local ordinance. These zones must be approved by FWC before they can take effect (F.S. § 379.2431(2)(p)). However, local manatee protection zones cannot include waters within the main channel of the Florida portion of the IWW or waters within 100 feet of the waterway.

Submerged lands authorization

Statutory reference: F.A.C. ch. 253, ch. 18-21
Permit/Assessment: Consent by rule, letter of consent, easement, lease
Lead Agency: Board of Trustees of the Internal Improvement Trust Fund

In addition to ERPs, activities that are located on submerged lands owned by Florida also require authorization for such use. Such lands generally extend waterward from the mean high water line (of tidal waters) or the ordinary high water line (of fresh waters) both inland and out to the state's territorial limit (approximately three miles into the Atlantic Ocean). Submerged lands authorization is required when dredging activities occur on state-owned submerged lands. Applications for both a submerged land authorization and an individually-processed ERP cannot be completed until all the information required for both has been supplied, and the ERP and the state submerged land authorization must be issued concurrently.

Submerged land authorizations are usually in the form of consent by rule, letter of consent, easement, or lease. Authorizations consider issues such as water dependency, riparian rights, impacts to submerged land resources, and preemption from other uses of the water by the public. These considerations originate from Public Trust Doctrine. In Florida, public lands owned by the State and the resources upon them are held in trust by the Board of Trustees of the Internal Improvement Trust Fund for the benefit of all of the people for a public use, such as fishing, boating, and swimming. The Board of Trustees is comprised of the Governor, the Attorney General, the Chief Financial Officer, and the Commissioner of Agriculture.

Beach and Shore Preservation Act

Statutory reference: F.S. § 161.011 *et seq*.

Permit/Assessment: Permit
Lead Agency: Department of Environmental Protection, Bureau of Beaches and Coastal Systems

The Beach and Shore Preservation Act directs the DEP to develop and maintain a Strategic Beach Management Plan for the restoration and maintenance of the state's critically eroded beaches. This includes, but is not limited to, erosion control, hurricane protection, coastal flood control, shoreline and offshore rehabilitation, and regulation of work and activities likely to affect the physical condition of the beach or shore (F.S. §161.021(2)).

The Act also requires a coastal construction permit for activities that involve deposition or removal of beach material including dredging projects that include dredged material placement on beaches for nourishment or restoration purposes (F.S. §161.041(1)).The DEP is authorized to ensure that all construction and maintenance dredging projects involving beach quality sand dispose of this material on an adjacent eroding beach or, if placed elsewhere, an equivalent quality and quantity of sand from an alternative location is placed on the adjacent eroding beach. Furthermore, on an average annual basis, a quantity of beach quality sand equal to the natural net annual longshore sediment transport must be placed on the adjacent eroding beach (F.S. §161.142(1)(2)).The DEP also ensures that any disposal of beach quality sand obtained from federal navigational dredge projects is on, or in the nearshore area of the adjacent eroding beach. DEP may consider permitting nearshore or upland disposal of this beach quality sand if emergency conditions exist (F.S. §161.142(5)).

DEP is directed to periodically review innovative technologies for beach nourishment and, on a limited basis, authorize, through the permitting process, experimental projects that are alternatives to traditional dredge-and-fill projects to determine the most effective and less costly techniques for beach nourishment (F.S. §161.082).

Joint Coastal Permitting

Statutory reference: F.S. §379.2431(2)
Permit/Assessment: Permit
Lead Agency: Department of Environmental Protection

The DEP has consolidated processing of applications for coastal construction permits, environmental resource permits and sovereign submerged lands authorizations into a joint coastal permit (JCP). Activities seaward of the mean high-water line or Erosion Control Line along the Atlantic Ocean or associated inlets that are located on state-owned submerged lands and are likely to affect the distribution of sand along the beach require a JCP. Examples of such activities include beach restoration or nourishment; construction of erosion control structures such as groins and breakwaters; public fishing piers; maintenance of inlets and inlet-related structures; and dredging of navigation channels that include disposal of dredged material onto the beach or in the nearshore area.

Florida Outer Continental Shelf Program

Permit/Assessment: Technical review and coordination
Lead Agency: Department of Environmental Protection

The Outer Continental Shelf (OCS) Program is responsible for conducting the DEP's technical review of - and coordinating the state's review, oversight, monitoring and response to - activities that occur in federal waters on the OCS to ensure consistency with state laws and policies and that these activities do not adversely affect state resources. Among other activities, the OCS Program is responsible for the ocean disposal of dredged material (e.g., ports and channels). The Program coordinates with federal and state agencies, local governments, interest groups and applicants to ensure projects meet the primary objective of avoiding and minimizing impacts to natural resources. Because many proposals involve issues that concern other agencies, the Program also works closely with the Florida Coastal Management Program, the Florida State Clearinghouse, and federal partner agencies, including the USACE and the EPA (FL-DEP 2014).

§401 certification

Lead Agency: Department of Environmental Protection

Florida does not have special water quality standards for wetlands; water quality standards applicable to other surface waters are applied to wetlands, with consideration given to natural daily and seasonal fluctuations (F.A.C. ch. 62-302,). Likewise, Florida does not have a separate program for granting or waiving §401 water quality certifications; the issuance of an ERP also constitutes the state's water quality certification.

Federal Coastal Zone Management Act

Statutory reference: 16 U.S.C. § 1451 *et seq*.
Permit/Assessment: Consistency determination certificate
Lead Agency: Coastal Zone Management Program

Florida's Coastal Zone Protection Act contains requirements related to coastal zone management and wetland protection, including consistency and coordinated review of all pertinent coastal construction activities. For activities in coastal counties, issuance of an ERP also constitutes a consistency concurrence to the effect that the proposed activities are in compliance with the state's federally approved coastal zone management program.

References

Florida Department of Environmental Protection. 2014. Florida Outer Continental Shelf Program. Available at: http://www.dep.state.fl.us/coastal/programs/ocs.htm.

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Appendix D. Land Use Classification of Confined Disposal Areas in North Carolina

Detailed information on habitat classification can be found in Federal Geographic Data Committee (2013), which is available at https://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands/nvcs-2013

Disposal Area Name[a]	DA #[b]	General Land Use Description[c]	National Wetland Inventory Code[d]	System	Subsystem	Class	Subclass	Modifier	Special Modifier
Alligator-Pungo - Wilkerson Creek Bridge	16 17 18 19	• Freshwater pond • Freshwater emergent wetland	PUBHx PEM1Fx PEM1Fh PUBHh	Palustrine		• Unconsolidated bottom • Emergent	Persistent	• Permanently flooded • Semi-Permanently flooded	• Excavated • Diked/ Impounded
Goose Creek-Bay River - Hobucken Bridge	20 21	• Freshwater forested/Shrub wetland • Estuarine and Marine Wetland • Freshwater emergent wetland	E2EM5Pd PFO4Sd PSS4Sd PEM1Cd PEM1/SS4Cd	Estuarine Palustrine	Intertidal	• Emergent • Forested • Scrub/Shrub	• Needle-leaved evergreen • Persistent • *Phragmites australis*	• Irregularly flooded • Temporarily flooded-tidal • Seasonally flooded	Partly drained/ Ditched
Adams-Core Creek - Core Creek Cut	22 26	• Freshwater emergent wetland • Freshwater forested/shrub wetland • Freshwater pond	PSS1Ad PEM1Ad PUBHh	Palustrine		• Scrub/shrub • Emergent • Unconsolidated bottom	Broad-leaved deciduous	• Temporarily flooded • Permanently flooded	• Partly drained/ Ditched • Diked/ Impounded
Morehead City Harbor - Calico Creek	34	Estuarine and Marine Wetland	E2EM1P E2SS4P						
Bogue Inlet	61	Upland[f]							
White Oak River	64	Upland							
Queen Creek	88	Upland							

Saunders Creek (122)	94	• Estuarine and Marine Deepwater • Upland	E1ABL	Estuarine	Subtidal	Aquatic Bed		Subtidal	
Browns Inlet (123, 124, 125)	98	Estuarine and Marine wetland	E2SS1P E2SS3P E2USP E2EM1P E2SS1/4P	Estuarine	Intertidal	• Scrub/shrub • Unconsolidated shore • Emergent	• Broad-leaved deciduous • Broad-leaved evergreen • Persistent	Irregularly flooded	
Browns Inlet (126)	108	Estuarine and Marine wetland	E2SS3/1Ps E2EM1Ps E2SS1/4Ps E2SS1P E2SS4Ps	Estuarine	Intertidal	• Scrub/shrub • Emergent	• Persistent • Broad-leaved deciduous • Needle-leaved evergreen	Irregularly flooded	Spoil
Browns Inlet (129)	117	Estuarine and Marine wetland	E2SS1/4Ps E2EM1Ps E2SS1Ps E2SS1P E2SS4Ps E2SS4P	Estuarine	Intertidal	• Scrub/shrub • Emergent	• Persistent • Broad-leaved deciduous • Needle-leaved evergreen	Irregularly flooded	Spoil
Wards Channel	131	Estuarine and Marine wetland	E2SS1/4P	Estuarine	Intertidal	Scrub/shrub	• Needle-leaved evergreen • Broad-leaved deciduous	Irregularly flooded	
Howard Bay	140	Estuarine and Marine wetland	E2FO4P E2SS1P E2SS4P	Estuarine	Intertidal	• Forested • Scrub/shrub	• Needle-leaved evergreen • Broad-leaved deciduous	Irregularly flooded	
New River Crossing	142 143	Upland							
Chadwick Bay	144 145	Estuarine and Marine wetland	E2SS1P E2FO4/1P E2FO4P	Estuarine	Intertidal	• Scrub/shrub • Forested	• Broad-leaved deciduous • Needle-leaved evergreen	Irregularly flooded	
Alligator Bay (147)	150	Estuarine and Marine wetland	E2FO3/4Pd E2SS3Pd E2EM1Pd	Estuarine	Intertidal	• Forested • Scrub/shrub • Emergent	• Broad-leaved evergreen • Persistent	• Irregularly flooded • Irregularly exposed	• Partly drained/ Ditched

			E2SS3/4Pd E2EM5Ph E2USMh E2USNh			• Unconsolidated shore	• *Phragmites australis*	• Regularly flooded	• Diked/ Impounded
Alligator Bay (148)	153	Estuarine and Marine wetland	E2EM1Pd E2SS3/4Pd	Estuarine	Intertidal	• Emergent • Scrub/shrub	• Persistent • Broad-leaved evergreen • Needle-leaved evergreen	Irregularly flooded	Partly drained/ Ditched
Goose Bay (468)	155 159	Estuarine and Marine wetland	E2EM1Pd E2SS1/4Ps E2SS1/3Ps E2USM E2EM1Nd	Estuarine	Intertidal	• Emergent • Scrub/shrub • Unconsolidated shore	• Persistent • Broad-leaved deciduous • Needle-leaved evergreen	Irregularly flooded	• Partly drained/ Ditched • Spoil
West Onslow Beach (472)	170	Estuarine and Marine wetland	E2FO1Ps E2SS1Ps E2SS4Ps E2SS1/4Ps	Estuarine	Intertidal	• Forested • Scrub/shrub	• Broad-leaved deciduous • Needle-leaved evergreen	Irregularly flooded	Spoil
West Onslow Beach (151)	176	Estuarine and Marine wetland	E2SS4P E2EM1P	Estuarine	Intertidal	• Scrub/shrub • Emergent	• Needle-leaved evergreen • Persistent	Irregularly flooded	
Topsail beach (153-155)	189	Estuarine and Marine wetland	E2EM1N E2EM1Ps E2SS4Ps	Estuarine	Intertidal	• Emergent • Scrub/shrub	• Needle-leaved evergreen • Persistent	• Regularly flooded • Irregularly flooded	Spoil
Topsail beach (157)	201	Estuarine and Marine wetland	E2EM1Ps E2USPs	Estuarine	Intertidal	• Emergent • Unconsolidated shore	Persistent	Irregularly flooded	Spoil
Howard Channel (159-160)	205	Estuarine and Marine wetland	E2EM1Ps	Estuarine	Intertidal	Emergent	Persistent	Irregularly flooded	Spoil
Cedar Snag Creek	214	Estuarine and Marine wetland	E2EM1Ps E2USPs	Estuarine	Intertidal	• Emergent • Unconsolidated shore	Persistent	Irregularly flooded	Spoil
Middle sound	237	• Estuarine and Marine wetland • Freshwater emergent	E2SS1P PSS1R PEM1Rd PUBVh	Estuarine Palustrine	Intertidal	• Scrub/shrub • Emergent • Unconsolidated bottom	• Broad-leaved deciduous • Persistent • Needle-leaved	• Irregularly flooded • Seasonally flooded tidal • Permanently	• Partly drained/ Ditched • Diked/

		wetland • Freshwater forested/shrub wetland • Freshwater pond	E2FO4/1Ps E2US2P E2FO1P E2FO4P			• Forested • Unconsolidated shore	evergreen • Sand	flooded tidal	Impounded • Spoil
Mason Inlet	241	• Estuarine and Marine wetland • Estuarine and Marine deepwater	E1UBLx E2FO1P E2FO4/1P E2US2P E2FO4P	Estuarine	Subtidal Intertidal	• Unconsolidated bottom • Forested • Unconsolidated shore	• Broad-leaved deciduous • Needle-leaved evergreen • Sand	• Subtidal • Irregularly flooded	Excavated
Shell Island Channel (178-179)	242	Estuarine and Marine wetland	E2EM1Ps E2EM5Ps E2US2Ps E2USM	Estuarine	Intertidal	• Emergent • Unconsolidated shore	Persistent *Phragmites australis*	Irregularly flooded	Spoil
Lees Cut	244	Estuarine and Marine wetland	E2EM1Ps E2EM1Nd	Estuarine	Intertidal	Emergent	Persistent	• Irregularly flooded • Regularly flooded	• Spoil • Partly drained/ Ditched
Mott Creek	247	Upland							
Bradley Creek (182)	248	Upland							
Shinn Creek (184-185)	251	Upland							
Masonboro Channel (186)	253	Estuarine and Marine wetland	E2EM1Ps	Estuarine	Intertidal	Emergent	Persistent	Irregularly flooded	Spoil
Masonboro Channel (187)	254 256	Estuarine and Marine wetland	E2EM1Ps E2EM1N E2US2Ps	Estuarine	Intertidal	• Emergent • Unconsolidated shore	Persistent	• Irregularly flooded • Regularly flooded	Spoil
Myrtle Grove Sound (189)	259	Estuarine and Marine wetland	E2USM E2EM1N E2EM1Ps	Estuarine	Intertidal	• Emergent • Unconsolidated shore	Persistent	• Irregularly flooded • Regularly flooded	Spoil
Carolina Beach Inlet (475)	267	Estuarine and Marine wetland	E2SS3/4Ps	Estuarine	Intertidal	Scrub/shrub	• Broad-leaved evergreen • Needle-leaved evergreen	Irregularly flooded	Spoil

Carolina Beach Inlet (476)	268	Estuarine and Marine wetland	E2EM1Ph E2SS3/4Ph	Estuarine	Intertidal	• Emergent • Scrub/shrub	• Persistent • Broad-leaved evergreen • Needle-leaved evergreen	Irregularly flooded	Diked/ Impounded
WH-DA9	276	• Freshwater emergent wetland • Riverine • Estuarine and Marine Deepwater • Estuarine and Marine Wetland	R1UBV PEM5R R1USS R1USR E1UBL E2EM1P E2USN E2USP	Riverine Palustrine Estuarine	Tidal Subtidal Intertidal	• Unconsolidated bottom • Emergent • Unconsolidated shore	Persistent	• Permanently flooded – tidal • Seasonally flooded-tidal • Temporarily flooded-tidal • Subtidal • Irregularly flooded • Regularly flooded	
Southport	277	• Freshwater emergent wetland • Freshwater pond • Estuarine and Marine Wetland	PUSKh E2EM1P PEM1Kh E1UBL	Palustrine Estuarine	Intertidal Subtidal	• Unconsolidated shore • Emergent • Unconsolidated bottom	Persistent	• Artificially flooded • Irregularly flooded • Subtidal	Diked/ Impounded
Yellow Banks (193)	280	• Freshwater • Forested/Shrub Wetland	PSS1Cx	Palustrine		Scrub/shrub	Broad-leaved deciduous	Seasonally flooded	Excavated
Yellow Banks (194)	281	Lake	L1UBHx	Lacustrine	Limetic	Unconsolidated bottom		Permanently flooded	Excavated
Yellow Banks (195)	282	• Freshwater • Forested/Shrub Wetland	PSS1Cd	Palustrine		Scrub/shrub	Broad-leaved deciduous	Seasonally flooded	Partly drained/ Ditched
Long Beach (196)	282	Estuarine and Marine wetland	E2FO3/4Pd E2US2Ps E2USN	Estuarine	Intertidal	• Forested • Unconsolidated shore	• Broad-leaved evergreen • Needle-leaved evergreen	• Irregularly flooded • Regularly flooded	• Partly drained/ Ditched • Spoil
Long Beach (197)	285	Upland							
Sheep Island	286	• Estuarine and Marine wetland • Freshwater	E2FO5P E2SS5P	Estuarine	Intertidal	Forested Scrub/shrub	*Phragmites australis*	Irregularly flooded	

		pond							
Holden Beach (200)	289	Freshwater emergent wetland	PEM1Rd	Palustrine		Emergent	Broad-leaved deciduous	Seasonally flooded-tidal	Partly drained/ Ditched
Holden Beach 201	290	Upland							
Holden Beach (202)	291	• Estuarine and Marine wetland • Freshwater emergent wetland	E2SS3Pd E2SS1Pd PEM1T	Estuarine Palustrine	Intertidal	Scrub/shrub Emergent	Broad-leaved evergreen	• Irregularly flooded • Semi-permanently flooded-tidal	Partly drained/ Ditched
Holden Beach (203)	292	Estuarine and Marine wetland	E2SS1Ph E2EM1Ph	Estuarine	Intertidal	Scrub/shrub Emergent	• Broad-leaved deciduous • Persistent	Irregularly flooded	Diked/ Impounded
Holden Beach (204)	293	Upland							
Shallottee River (208)	298	Estuarine and Marine wetland	E2SS3/4Ps E2EM1Pd	Estuarine	Intertidal	Scrub/shrub Emergent	• Broad-leaved evergreen • Needle-leaved evergreen • Persistent	Irregularly flooded	• Spoil • Partly drained/ Ditched
Monks Island	300	Upland							
East Ocean Isle (211)	302	Estuarine and Marine wetland	E2EM1N E2SS3/4P E2SS1/ E2EM1N E2US2N E2EM1P E2EM1/SS1N	Estuarine	Intertidal	• Scrub/shrub • Emergent • Emergent/ Scrub/shrub • Unconsolidated shore	• Persistent • Broad-leaved evergreen • Needle-leaved evergreen • Broad-leaved deciduous • Sand	• Regularly flooded • Irregularly flooded	
East Ocean Isle (212)	303	Estuarine and Marine wetland	E2US2P E2US2N E2EM1Pd E2SS1Pd E2EM1Nd E1UBL	Estuarine	Intertidal	• Unconsolidated shore • Emergent • Scrub/shrub • Unconsolidated bottom	• Sand • Persistent • Broad-leaved deciduous	• Regularly flooded • Irregularly flooded • Subtidal	Partly drained/ Ditched

Gause Landing (214)	306	Estuarine and Marine wetland	E2SS3/4P E2USP E1UBL	Estuarine	Intertidal Subtidal	• Scrub/shrub • Unconsolidated shore • Unconsolidated bottom	• Broad-leaved evergreen • Needle-leaved evergreen	• Irregularly flooded • Subtidal	
Tubbs Inlet (215)	307	Estuarine and Marine wetland	E2SS4P E2SS1P	Estuarine	Intertidal	Scrub/shrub	• Needle-leaved evergreen • Broad-leaved deciduous	Irregularly flooded	
Tubbs Inlet (216)	308	Estuarine and Marine wetland	E2EM1P E2SS1P E2US2P E1UBL	Estuarine	Intertidal Subtidal	• Emergent • Scrub/shrub • Unconsolidated shore • Unconsolidated bottom	• Persistent • Broad-leaved deciduous • Sand	Irregularly flooded Subtidal	
Sunset Beach (217)	309	Estuarine and Marine wetland	E2EM1Nd E2SS3P E2FO4P	Estuarine	Intertidal	• Emergent • Scrub/shrub • Forested	• Persistent • Broad-leaved evergreen • Needle-leaved evergreen	Regularly flooded Irregularly flooded	Partly drained/ Ditched
Sunset Beach (218)	310	Estuarine and Marine wetland	E2SS1P E2EM1P E2SS1/4P	Estuarine	Intertidal	Scrub/shrub Emergent	• Broad-leaved deciduous • Persistent • Needle-leaved evergreen	Irregularly flooded	
Mad Inlet	312	Estuarine and Marine wetland	E2EM1Ps	Estuarine	Intertidal	Emergent	Persistent	Irregularly flooded	Spoil
Bonaparte Creek	313	Estuarine and Marine wetland	E2US2M E2US2N	Estuarine	Intertidal	Unconsolidated shore	Sand	• Irregularly Exposed • Regularly Flooded	
Goat Island on state line	314	Estuarine and Marine wetland	E2EM1Ps E2SS3P E2EM1P	Estuarine	Intertidal	Emergent Scrub/shrub	• Persistent • Broad-leaved evergreen		

a = Information from Marine Cadastre (BOEM, NOAA) http://coast.noaa.gov/nationalviewer/

b = Information from Adams et al. (2011) (Appendix E. USACE District Overview Maps)

c = Information from the National Wetlands Inventory (last updated 6/12/2015) (FWS) http://www.fws.gov/wetlands/Data/Mapper.html

d = Information from *Classification of Wetlands and Deepwater Habitats of the United States* (2013) FGDC–STD-004-2013; https://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands/nvcs-2013

e = Key to classification scheme on page 69.

f = "Upland" is the default classification for regions of the map that are not classified as wetlands or other aquatic habitats. *Wetlands Mapping Standards* (2009) FGDC-STD-015-2009; http://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands-mapping/2009-08%20FGDC%20Wetlands%20Mapping%20Standard_final.pdf

Appendix E. Land Use Classification of Confined Disposal Areas in South Carolina

Detailed information on habitat classification can be found in Federal Geographic Data Committee (2013), which is available at https://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands/nvcs-2013

Disposal Facility Name[a]	DA #[b]	General Land Use Description[c]	National Wetland Inventory Code[d,e]	System	Subsystem	Class	Subclass	Modifier	Special Modifier
Goat Island	55 L-B	• Freshwater pond • Palustrine, emergent, persistent	PUBHx PEM1C	Palustrine		• Unconsolidated bottom • Emergent	Persistent	• Permanently flooded • Seasonally flooded	Excavated
Odell/LaDane Williamson	64 L-B	• Freshwater pond • Freshwater emergent wetland • Freshwater forested/Shrub wetland	PFO4B PEM1F PUBHx PUSAx	Palustrine		• Forested • Emergent • Unconsolidated bottom • Unconsolidated shore	• Needle-leaved evergreen • Persistent	• Saturated • Semi- Permanently flooded • Permanently flooded • Temporarily flooded	Excavated
Tilghman Point	110 L-B	• Estuarine and Marine wetland • Freshwater Forested/Shrub wetland	E2EM1 E2SS4P PFO4B	Estuarine Palustrine	Intertidal	Emergent Scrub/shrub Forested	• Persistent • Needle-leaved evergreen	Irregularly flooded Saturated	
Tidewater Golf	179 L-B	Palustrine, emergent, persistent	PEM1B PEM1C	Palustrine		Emergent	Persistent	Saturated Seasonally flooded	
Nixons Crossroads Bridge	214 L-B	Freshwater emergent wetland	PEM1Bx	Palustrine		Emergent	Persistent	Saturated	Excavated
Vereen's Marina	320 L-B	Freshwater emergent wetland	PEM1B	Palustrine		Emergent	Persistent	Saturated	
Waterway	389	Freshwater	PEM1A	Palustrine		Emergent	Persistent	Temporarily flooded	

Landing Apts	L-B	emergent wetland							
Watford Basin in "Palmetto Harbor"	444 L-B	Freshwater emergent wetland	PEM1C	Palustrine		Emergent	Persistent	Seasonally flooded	
Horry County Airport	487 L-B	Freshwater emergent wetland	PEM1C	Palustrine		Emergent	Persistent	Seasonally flooded	
Barefoot Landing (1911)	536 L-B	Upland[f]							
Barefoot Landing (1888)	892 L-B	Freshwater pond	PUBHx	Palustrine		Unconsolidated bottom		Permanently flooded	Excavated
Grande Dunes Development (1865)	1046 L-B	• Freshwater • Forested/Shrub wetland	PEM1C	Palustrine		Emergent	Persistent	Seasonally flooded	
The Battery (1913)	1103 L-B	Upland							
Grissom Park (1876)	1152 L-B	Upland							
Floyd emergency (1867)	1206 L-B	Upland							
Tommy Socha slope protection project (1910)	1255 L-B	Freshwater pond	PUBHh	Palustrine		Unconsolidated bottom		Permanently flooded	Diked/ Impounded
AIWW Boat Ramp Excavation (1866)	1302 L-B	• Freshwater • Forested/Shrub wetland	PEM1B PEM1C	Palustrine		Emergent	Persistent	Saturated Seasonally flooded	
Fantasy Harbor/Gatlin Bros. Theater (1872)	1390 L-B	• Freshwater • Forested/Shrub wetland	PSS1Hx PUBHx PFO1R	Palustrine		• Scrub/shrub • Unconsolidated bottom • Forested	Broad-leaved deciduous	• Permanently flooded • Seasonally flooded-tidal	Excavated
AIWW Disposal Island 1430 L-B (1836)	1430 L-B	Freshwater pond	PUBHx	Palustrine		Unconsolidated bottom		Permanently flooded	Excavated
Swimmin' Hole off Burcale Road (1906)	1480 L-B	Freshwater pond	PUBHx	Palustrine		Unconsolidated bottom		Permanently flooded	Excavated

Socastee Bridge	1610 L-B	• Freshwater • Forested/Shrub wetland • Freshwater emergent wetland	PFO1R PFO1C PFO1B PEM1C	Palustrine		Forested Emergent	• Broad-leaved deciduous • Persistent	• Seasonally flooded-tidal • Seasonally flooded • Saturated	
AIWW Disposal Island 1750 L-B (1881)	1750 L-B	• Freshwater • Forested/Shrub wetland	PFO1/4R	Palustrine		Forested	• Broad-leaved deciduous • Needle-leaved evergreen	Seasonally flooded-tidal	
Cat Island (1879)	1511 NW-C	Freshwater emergent wetland	PEM1R	Palustrine		Emergent	Persistent	Seasonally flooded-tidal	
AIWW Disposal Island 1505N W-C (1878)	1505 NW-C	• Freshwater Forested/Shrub wetland • Freshwater emergent wetland	PEM1Nd PEM1R	Palustrine		Emergent	Persistent	• Regularly flooded • Seasonally flooded-tidal	Partially drained/ ditched
AIWW Disposal Island 1450N W-C (1880)	1450 NW-C	• Freshwater • Forested/Shrub wetland • Freshwater emergent wetland	PEM1N PFO1/4As PEM1As	Palustrine		Emergent Forested	• Persistent • Broad-leaved deciduous • Broad-leaved evergreen	Regularly flooded Temporarily flooded	Spoil
AIWW Disposal Island 1421N W-C (1869)	1421 NW-C	Upland							
Estherville Minim Creek Canal (1868)	1370 NW-C	• Freshwater • Forested/Shrub wetland • Freshwater emergent wetland	PEM1Ch PEM1Ah PSS1Fh	Palustrine		Emergent Scrub/shrub	• Persistent • Broad-leaved deciduous	• Seasonally flooded • Temporarily flooded • Semi-permanently flooded	Diked/ Impounded
Duck Creek (1892)	1299 NW-C	• Other • Estuarine and Marine Wetland	PUSRh E2EM1N E2EM1P	Palustrine Estuarine	Intertidal	• Unconsolidated shore • Emergent	Persistent	• Seasonally flooded-tidal • Regularly flooded	Diked/ Impounded

								• Irregularly flooded	
Little Crow Island/Big Duck Creek (1864)	1190 NW-C	• Other • Estuarine and Marine Wetland • Lake	PUSRh E2USP E2EM1N E2EM1P L2USRh	Palustrine Estuarine Lacustrine	Intertidal Littoral	• Unconsolidated shore • Emergent	Persistent	• Seasonally flooded-tidal • Regularly flooded • Irregularly flooded	Diked/ Impounded
Kinloch Island (1860)	1156 NW-C	• Other • Estuarine and Marine Wetland	PUSRh E2EM1N E2USP	Palustrine Estuarine	Intertidal	• Unconsolidated shore • Emergent	Persistent	• Seasonally flooded-tidal • Regularly flooded • Irregularly flooded	Diked/ Impounded
Santee Swamp (1857)	1103 NW-C	Freshwater emergent wetland	PEM1Ch	Palustrine		Emergent	Persistent	Seasonally flooded	Diked/ Impounded
S. Santee River 1058N W-C (1900)	1058 NW-C	Upland							
S. Santee River 1027N W-C (1920)	1027 NW-C	Upland							
Ormand Hall Crk. /Alligator Creek (1908)	775 NW-C	• Freshwater • Forested/Shrub wetland • Freshwater emergent wetland	PSS3/EM1R PEM1Th	Palustrine		Scrub/shrub Emergent	• Broad-leaved evergreen • Persistent	• Seasonally flooded-tidal • Semi-permanently flooded-tidal	Diked/ Impounded
AIWW Disposal Island 716N W-C (1858)	716 NW-C	Freshwater emergent wetland	PEM1Fh	Palustrine		Emergent	Persistent	Semi-permanently flooded	Diked/ Impounded
Dupree Creek (1875)	697 NW-C	Estuarine and Marine Wetland	E2USP	Estuarine	Intertidal	Unconsolidated shore		Irregularly flooded	
AIWW Disposal Island 562N W-C (1861)	562 NW-C	Freshwater Forested/Shrub wetland	PEM1Rh	Palustrine		Emergent	Persistent	Seasonally flooded-tidal	Diked/ Impounded
Ballam Tract (1874)	488/ 450 NW-C	Freshwater emergent wetland	PEM1Fh	Palustrine		Emergent	Persistent	Semi-permanently flooded	Diked/ Impounded
AIWW Disposal	402	Freshwater	PEM1Rh	Palustrine		Emergent	Persistent	Seasonally flooded-	Diked/

Island 402N W-C (1894)	NW-C	Forested/Shrub wetland						tidal	Impounded
AIWW Disposal Island 364N W-C (1924)	364 NW-C	Estuarine and Marine Wetland	E2SS1/3P	Estuarine	Intertidal	Scrub/shrub	• Broad-leaved deciduous • Broad-leaved evergreen	Irregularly flooded	
Harbor River & Long Creek (1855)	341 NW-C	Estuarine and Marine Wetland	E2SS1/3P	Estuarine	Intertidal	Scrub/shrub	• Broad-leaved deciduous • Broad-leaved evergreen		
Harbor River (1904)	310 NW-C	Estuarine and Marine Wetland	E2SS1/3P	Estuarine	Intertidal	Scrub/shrub	• Broad-leaved deciduous • Broad-leaved evergreen	Irregularly flooded	
Tract # 11-C (1919)	225 NW-C	• Estuarine and Marine Wetland • Estuarine and Marine Deepwater	E1UBL E2SS1/3P	Estuarine	Tidal Intertidal	• Unconsolidated bottom • Scrub/shrub	• Broad-leaved deciduous • Broad-leaved evergreen	Subtidal Irregularly flooded	
AIWW Disposal Island 204N W-C (1899)	204 NW-C	Estuarine and Marine Wetland	E2SS1/3P	Estuarine	Intertidal	Scrub/shrub	• Broad-leaved deciduous • Broad-leaved evergreen	Irregularly flooded	
Tract# 11-E	106 NW-C	• Freshwater Forested/Shrub wetland • Freshwater emergent wetland • Estuarine and Marine Wetland	PSS3/1R PEM1R E2SS1/3P	Estuarine	Intertidal	Scrub/shrub Emergent	• Broad-leaved deciduous • Broad-leaved evergreen • Persistent	• Seasonally flooded-tidal • Irregularly flooded	
Tract# 11-F (1901)	78 NW-C	• Freshwater Forested/Shrub wetland • Freshwater emergent wetland	PSS3/EM1R PEM1Rs E2SS3P	Palustrine Estuarine	Intertidal	Scrub/shrub Emergent	• Broad-leaved deciduous • Broad-leaved evergreen • Persistent	• Seasonally flooded-tidal • Irregularly flooded	Spoil

		• Estuarine and Marine Wetland							
Tract #11-F (1926)	55 NW-C	• Estuarine and Marine Wetland • Freshwater Forested/Shrub wetland	E2SS3P PSS3/EM1R	Estuarine Palustrine	Intertidal	Scrub/shrub Emergent	• Broad-leaved evergreen • Persistent	• Irregularly flooded • Seasonally flooded-tidal	
Graham Creek (1925)	39 NW-C	Freshwater Forested/Shrub wetland	PSS3/1R	Palustrine		Scrub/shrub	• Broad-leaved evergreen • Broad-leaved deciduous	Seasonally flooded-tidal	
Salt Pond & Graham Creek (1893)	19 NW-C	• Freshwater Forested/Shrub wetland • Freshwater emergent wetland	PSS3R PEM1/SS3R	Palustrine		Scrub/shrub Emergent	• Broad-leaved evergreen • Persistent	Seasonally flooded-tidal	
Salt Pond Creek (1856)	13 41 SW-C	Estuarine and Marine Wetland	E2EM1/SS3P	Estuarine	Intertidal	Emergent Scrub/shrub	• Persistent • Broad-leaved evergreen	Irregularly flooded	
Whiteside Creek/Capers Creek (1891)	612 SW-C	• Freshwater Forested/Shrub wetland • Freshwater emergent wetland	PSS1Ah PEM1Fh	Palustrine		Scrub/shrub Emergent	• Broad-leaved deciduous • Persistent	• Temporarily flooded • Semi-permanently flooded	Diked/ Impounded
Whiteside Creek/Capers Creek (1884)	645 690 SW-C	Other	PUSCh	Palustrine		Unconsolidated shore		Seasonally flooded	Diked/ Impounded
Hamlin Creek/Goat Island (1859)	970 SW-C	Estuarine and Marine Wetland	E2EM1Ps	Estuarine	Intertidal	Emergent	Persistent	Irregularly flooded	Spoil
IOP Connector - Hamlin Creek (1883)	1006 SW-C	• Freshwater pond • Freshwater Forested/Shrub	PUBHh PSS3Ah PEM1Ch	Palustrine		• Unconsolidated bottom • Scrub/shrub • Emergent	• Broad-leaved evergreen • Persistent	• Permanently flooded • Seasonally flooded • Temporarily	Diked/ Impounded

		wetland • Freshwater emergent wetland						flooded	
Swinton Creek 1056S W-C (1898)	1056 SW-C	Freshwater emergent wetland	PEM1Cx	Palustrine		Emergent	Persistent	Seasonally flooded	Excavated
Swinton Creek 1088S W-C (1923)	1088 SW-C	Freshwater pond	PUBHx	Palustrine		Unconsolidated bottom		Permanently flooded	Excavated
Inlet Creek (1922)	1011 SW-C	No wetlands							
Sullivans Island (1829)	1207 SW-C	Freshwater emergent wetland	PEM1Ch	Palustrine		Emergent	Persistent	Seasonally flooded	Diked/ Impounded
Charleston/ Wappoo Creek/Elliott Cut	104 395 450 540 532 580 C-P	• Estuarine and Marine Deepwater • Freshwater emergent wetland	E1UBLx PEM1/SS1R	Estuarine Palustrine	Tidal	• Unconsolidated bottom • Emergent • Scrub/shrub	• Persistent • Broad-leaved deciduous	• Subtidal • Seasonally flooded-tidal	Excavated
Stono River (1835)	1595 C-P	• Estuarine and Marine Deepwater • Estuarine and Marine Wetland	E1UBLx E2EM1P E2ABN	Estuarine	Tidal Intertidal	• Unconsolidated bottom • Emergent • Aquatic bed	Persistent	• Temporarily flooded • Irregularly flooded • Regularly flooded	Excavated
Dawho River Bridge (1832)	1668 C-P	Freshwater Forested/Shrub wetland	PSS1Ch PSS3Ch	Palustrine		Scrub/shrub`	• Broad-leaved deciduous • Broad-leaved evergreen	Seasonally flooded	Diked/ Impounded
North Creek 1717 C-P (1916)	1717 C-P	• Freshwater emergent wetland • Other	PEM1Fh PUSCh	Palustrine		• Emergent • Unconsolidated shore	Persistent	• Semi-permentantly flooded • Seasonally flooded	Diked/ Impounded
North Creek 1743 C-P (1844)	1743 C-P	• Lake • Freshwater emergent	L2USCh PEM1Ss	Lacustrine Palustrine	Littoral	• Unconsolidated shore • Emergent		• Seasonally flooded • Temporarily flooded-tidal	Diked/ Impounded Spoil

		wetland							
North Creek 1764 C-P (1845)	1764 C-P	• Freshwater emergent wetland • Freshwater Forested/Shrub wetland	PEM1Ss PEM1Fh PEM1Rs PFO1Cs PFO1Bs PSS1Cs PFO4/1As	Palustrine		Emergent Forested Scrub/shrub	• Persistent • Broad-leaved deciduous • Needle-leaved evergreen	• Temporarily flooded-tidal • Semi-permentantly flooded • Seasonally flooded-tidal • Seasonally flooded • Saturated • Temporarily flooded	• Spoil • Diked/ Impounded
North Creek 1789 C-P (1843)	1789 C-P	• Freshwater emergent wetland • Freshwater Forested/Shrub wetland	PSS1Sh PEM1Sh	Palustrine		Scrub/shrub Emergent	• Broad-leaved deciduous • Persistent	Temporarily flooded-tidal	Diked/ Impounded
Watts Cut 1820 C-P (1918)	1820 C-P	• Freshwater emergent wetland • Freshwater pond	PUBFs PUSCs PEM1Cs	Palustrine		• Unconsolidated bottom • Unconsolidated shore • Emergent	Persistent	• Semi-permentantly flooded • Seasonally flooded	Spoil
Watts Cut 1835 C-P (1917)	1835 C-P	• Lake • Freshwater emergent wetland	L2USAs L2USCs PEM1As	Palustrine Lacustrine	Littoral	• Unconsolidated shore • Emergent	Persistent	• Seasonally flooded • Temporarily flooded	Spoil
S. Edisto River 2160 C-P (1834)	2160 C-P	Estuarine and Marine Wetland	E2SS5/EM1P E2SS1/3Ph E2SS5 E2EM1Ph E2US2Ph E2SS3/EM1Ph	Estuarine	Intertidal	• Scrub/shrub • Emergent • Unconsolidated shore	• Dead • Persistent • Broad-leaved deciduous • Sand • Broad-leaved evergreen	Irregularly flooded	Diked/ Impounded
Fenwick Cut (1831)	2237 C-P	Estuarine and Marine Wetland	E2EM1Ph E2US2Ph	Estuarine	Intertidal	• Emergent • Unconsolidated shore	• Persistent • Sand	Irregularly flooded	Diked/ Impounded
Rock Creek	2461	• Lake	L2USCs	Lacustrine	Littoral	• Unconsolidated	• Persistent	• Seasonally flooded	Spoil

(1830)	C-P	• Freshwater emergent wetland • Freshwater Forested/Shrub wetland	L2USAs PEM1As PEM1Fs PSS1As	Palustrine		shore • Emergent • Scrub/shrub	• Broad-leaved deciduous	• Temporarily flooded • Semi-permentantly flooded	
Ashe Island 2508 C-P (1846)	2508 C-P	• Lake • Freshwater emergent wetland	L2USAs L2UBFh PEM1As	Lacustrine Palustrine	Littoral	• Unconsolidated shore • Unconsolidated bottom • Emergent	Persistent	• Temporarily flooded • Semi-permentantly flooded	• Spoil • Diked/ Impounded
Ashe Island 2536 C-P (1915)	2536 C-P	Freshwater pond	PUSAs	Palustrine		Unconsolidated shore		Temporarily flooded	Spoil
Ashe Island 2564 C-P (1882)	2564 C-P	• Freshwater emergent wetland • Freshwater Forested/Shrub wetland	PSS3As PEM1Cs PEM1Fs	Palustrine		Scrub/shrub Emergent	• Broad-leaved evergreen • Persistent • Broad-leaved deciduous	• Seasonally flooded • Temporarily flooded • Semi-permentantly flooded	Spoil

a = Information from Marine Cadastre (BOEM, NOAA) http://coast.noaa.gov/nationalviewer/

b = Information from Adams et al. (2011) (Appendix E. USACE District Overview Maps)

c = Information from the National Wetlands Inventory (last updated 6/12/2015) (FWS) http://www.fws.gov/wetlands/Data/Mapper.html

d = Information from *Classification of Wetlands and Deepwater Habitats of the United States* (2013) FGDC–STD-004-2013; https://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands/nvcs-2013

e = Key to classification scheme on page 69.

f = "Upland" is the default classification for regions of the map that are not classified as wetlands or other aquatic habitats. *Wetlands Mapping Standards* (2009) FGDC-STD-015-2009; http://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands-mapping/2009-08%20FGDC%20Wetlands%20Mapping%20Standard_final.pdf

Appendix F. Land Use Classification of Confined Disposal Areas in Northeast Florida

Detailed information on habitat classification can be found in Federal Geographic Data Committee (2013), which is available at https://www.fgdc.gov/standards/projects/FGDC-standards-projects/wetlands/nvcs-2013

Disposal Facility Name[a]	DA #[b]	General Land Use Description[c]	National Wetland Inventory Code[d,e]	System	Subsystem	Class	Subclass	Modifier	Special Modifier
D/A-D1 (2011)	DU-2	Upland[f]							
N/A	DU-20	Other	PUS2Cx	Palustrine		Unconsolidated Shore	Sand	Seasonally flooded	Excavated
N/A	DU-384	• Freshwater • Forested/Shrub wetland	PFO1C	Palustrine		Forested	Broad-leaved deciduous	Seasonally flooded	
Fanning Island	DU-6A	• Freshwater emergent wetland • Freshwater • Forested/Shrub wetland	PEM1Fx PFO1/4C	Palustrine		Emergent	• Persistent • Broad-leaved deciduous • Needle-leaved evergreen	• Semi-permanently flooded • Seasonally flooded	Excavated
DA/8	N/A	Upland							
Sj-14 (946)	N/A	Upland							
Sj-1 (752)	N/A	Upland							
V-29 (762)	N/A	Freshwater emergent wetland	PEM1C	Palustrine		Emergent	Persistent	Seasonally flooded	
BV-2C (751)	N/A	• Freshwater pond • Freshwater emergent wetland	PEM1Fh PUBHh PEM1Ch	Palustrine		• Emergent • Unconsolidated bottom	Persistent	• Semi-permanently flooded • Permanently flooded • Seasonally flooded	Diked/Impounded
V-26 (952)	N/A	• Freshwater pond • Freshwater emergent wetland	PEM1Cd PUSCx	Palustrine		Emergent	• Persistent • Unconsolidated shore	Seasonally flooded	• Partly drained/ditched • Excavated
BV-52 (756)	N/A	• Freshwater	PEM1Fx	Palustrine		Emergent	• Persistent	• Semi-permanently	Excavated

		pond • Freshwater emergent wetland	PUSCx				• Unconsolidated shore	flooded • Seasonally flooded	

a = Information from Marine Cadastre (BOEM, NOAA) http://coast.noaa.gov/nationalviewer/

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