US Army Corps
of Engineers
Baltimore District

DRAFT ENVIRONMENTAL ASSESSMENT

WOLF TRAP ALTERNATE OPEN WATER PLACEMENT SITE NORTHERN EXTENSION

VIRGINIA WATERS OF THE CHESAPEAKE BAY

July 2019

Prepared by: **U.S. Army Corps of Engineers, Baltimore District**
2 Hopkins Plaza
Baltimore, Maryland 21201

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1.0 PROJECT BACKGROUND

The U.S. Army Corps of Engineers (USACE), Baltimore District (NAB), is responsible for maintaining the Baltimore Harbor and Channels 50-Foot Project (50-Foot Project) to allow large, deep-draft commercial shipping vessels to safely navigate the Chesapeake Bay to and from Baltimore Harbor. The 50-Foot Project was authorized in Section 101 of the River and Harbor Act of 1970 and provides for a 50-foot-deep main shipping channel that extends from the Virginia Capes to Fort McHenry in Baltimore Harbor, Maryland, and a series of branch channels that provide access to various public and private terminals serving the Port of Baltimore. The Maryland Port Administration (MPA) is the non-federal sponsor for the 50-Foot Project. For a comprehensive overview of the Baltimore Harbor and Channels Project, please refer to the 2017 Baltimore Harbor and Channels Dredged Material Management Plan Update (DMMP) (CENAB, 2017).

The York Spit Channel is part of the 50-Foot Project's Chesapeake Bay Approach Channels in Virginia. This channel is located near the center of the Bay, east of the York River Entrance Channel and north of the Chesapeake Bay Bridge Tunnel (Figure 1). The York Spit Channel is approximately 18.4 nautical miles (nm) long and maintained at 800 feet (ft) wide and 50 ft mean lower low water (MLLW). The channel is designed to accommodate vessels in the Ultra-Post Panamax class that routinely call on the Port of Baltimore. This vessel class has a maximum length overall of 1,220 ft, a beam of 161 ft, and a loaded draft of 49 ft. The York Spit Channel undergoes periodic maintenance dredging (typically every 4 years) and each maintenance cycle generates an average of 1.5 million cubic yards (mcy) of material. The channel was last dredged in 2015. To minimize adverse impacts to sea turtles, dredging in the York Spit Channel does not occur from September 1 through November 14 in accordance with the National Marine Fisheries Service (NMFS) 2018 Biological Opinion (F/NER/2018/14816) (NOAA, 2018a).

The authorized placement site for material dredged from the York Spit Channel is the Wolf Trap Alternate Open Water Placement Site (WTAPS)[1]. Environmental effects from placement of dredged material in WTAPS were evaluated in the 1987 Supplemental Information Report #2 to the 1981 General Design Memorandum (GDM) and Environmental Impact Statement (EIS), and in the 2005 Baltimore Harbor and Channels (Maryland and Virginia) DMMP and Final Tiered EIS. WTAPS covers approximately 2,300 acres and is located approximately 5 miles east of New Point Comfort and south of Wolf Trap Light, east of Mathews County, Virginia between the Piankatank River and Mobjack Bay. NAB has been placing dredged material from the York Spit Channel into WTAPS since the late 1980s. USACE, Norfolk District (NAO) has also placed dredged material from the York River Entrance Channel and the Wormley Creek Federal

[1] As a point of clarification, the *existing* dredged material placement site is termed "alternate" because it superseded a historical placement site further to the east, closer to the main channel within the Bay. That original site is shown on the National Oceanic and Atmospheric Administration (NOAA) navigation charts, but has been inactive for decades and is not relevant to the proposed action.

Navigation Project into WTAPS (Figure 1). The most recent placement event in WTAPS occurred in 2017 for placement of approximately 59,000 cubic yards (cy) of dredged material from the Wormley Creek Federal Navigation Project (Table 1). At this time, there are no future plans to place dredged material from the York River Entrance Channel or the Wormley Creek Federal Navigation Project into WTAPS. The remaining capacity of WTAPS is approximately 40 mcy, which assumes placement of dredged material within the site boundaries up to an approximate depth of -30 ft MLLW.

Table 1. Placement history in the Wolf Trap Alternate Open Water Placement Site from 1998 to 2017.

Year	Source Channel	Quantity (cubic yards)	USACE District
1998	York Spit	371K	NAB
1998/1999	York River Entrance	1.224M	NAO
2000	Wormley Creek	21K	NAO
2002	York Spit	1.3M	NAB
2003/2004	York River Entrance	380K	NAO
2004	York Spit	327K	NAB
2007	York Spit	500K	NAB
2009	York Spit	375K	NAB
2015	York Spit	1.5M	NAB
2017	Wormley Creek	59K	NAO

2.0 PROPOSED ACTION

The proposed action would establish an extension of WTAPS to the north, increasing the size of the placement site by approximately 3,900 acres, and is herein referred to as the "WTAPS Northern Extension" (WTAPSNE) (Figures 2-4). WTAPSNE would serve as an open water placement site for dredged material primarily from the York Spit Channel, but may also be used as a placement site for other dredging projects in the lower Chesapeake Bay pending evaluation. At this time, there are no plans to place dredged material from the York River Entrance Channel or the Wormley Creek Federal Navigation Project into WTAPSNE.

WTAPSNE has been recommended by agencies of the Commonwealth of Virginia as an alternative to the currently-used WTAPS due to the potential for a high abundance of female blue crabs to overwinter in the southern portion of WTAPS. Blue crab winter dredge survey data collected by the Virginia Institute of Marine Science (VIMS) between 2009 and 2016 indicate that WTAPSNE provides less suitable habitat for overwintering female blue crabs than WTAPS (Lipcius & Knick, 2016 (Appendix F)). Placement of dredged material into WTAPS while female crabs are not overwintering (generally from early April to mid-November) is not feasible due to higher costs to dredge in the summer and potential adverse impacts to sea turtles.

No new or altered dredging activities are proposed as part of this project. The proposed action does not include any changes to or consideration of the ongoing maintenance dredging activities or any other actions beyond the establishment of the placement site extension itself. Impacts from maintenance dredging activities were evaluated in the EIS for the 2005 Baltimore Harbor and

Channels (Maryland and Virginia) DMMP and other previous National Environmental Policy Act (NEPA) documents.

The capacity of WTAPSNE is over 30 mcy, which assumes placement of dredged material within the site boundaries up to an approximate depth of -30 ft MLLW. Approximately 2.6 mcy of dredged material from operation and maintenance (O&M) of the York Spit Channel would be placed into quadrant 1 of cell NE-6 in WTAPSNE (Figure 4) during the initial placement event that is expected to begin in late fall of 2019. After initial placement into WTAPSNE, it is anticipated that approximately 1.5 mcy of dredged material from the York Spit Channel would be placed into the site approximately every 4 years, or until another alternate placement site or method is identified, approved, and implemented. Each dredging cycle and the associated placement activities (mobilization to demobilization of the dredging operation) lasts for approximately 4½ months. Open water placement activities would occur 24 hours per day and seven days a week during any maintenance dredging period. Placement into WTAPSNE would not occur during the dredge closure period for sea turtles, from September 1 through November 14.

Dredged material would be placed into WTAPSNE using a hopper dredge because they are better suited than other types of dredge vessels for maintaining the York Spit Channel. The volume and frequency of dredged material placement events during maintenance dredging is a function of the rate of dredging production, the number of hopper vessels in use, and their size, speed and capacity. Based on previous maintenance dredging actions for the York Spit Channel, it is expected that dredging would generate roughly 15,000 cy of material per day. Hopper dredge capacity is expected to range from 3,600 to 8,600 cy depending on the dredging contractor used. Depending on the size and types of vessels used, this would require the placement of 2 to 5 loads of dredged material at WTAPSNE per day during maintenance dredging periods. Depending on the amount of material dredged from the York Spit Channel during one maintenance dredging cycle, the thickness of the material that would be deposited in one cycle would range from 2 inches to 2 ft thick.

In FY 2020, NAB plans to begin a comprehensive evaluation of alternatives to WTAPS through a DMMP for the portion of the Baltimore Harbor and Channels Project located in Virginia (Virginia DMMP).

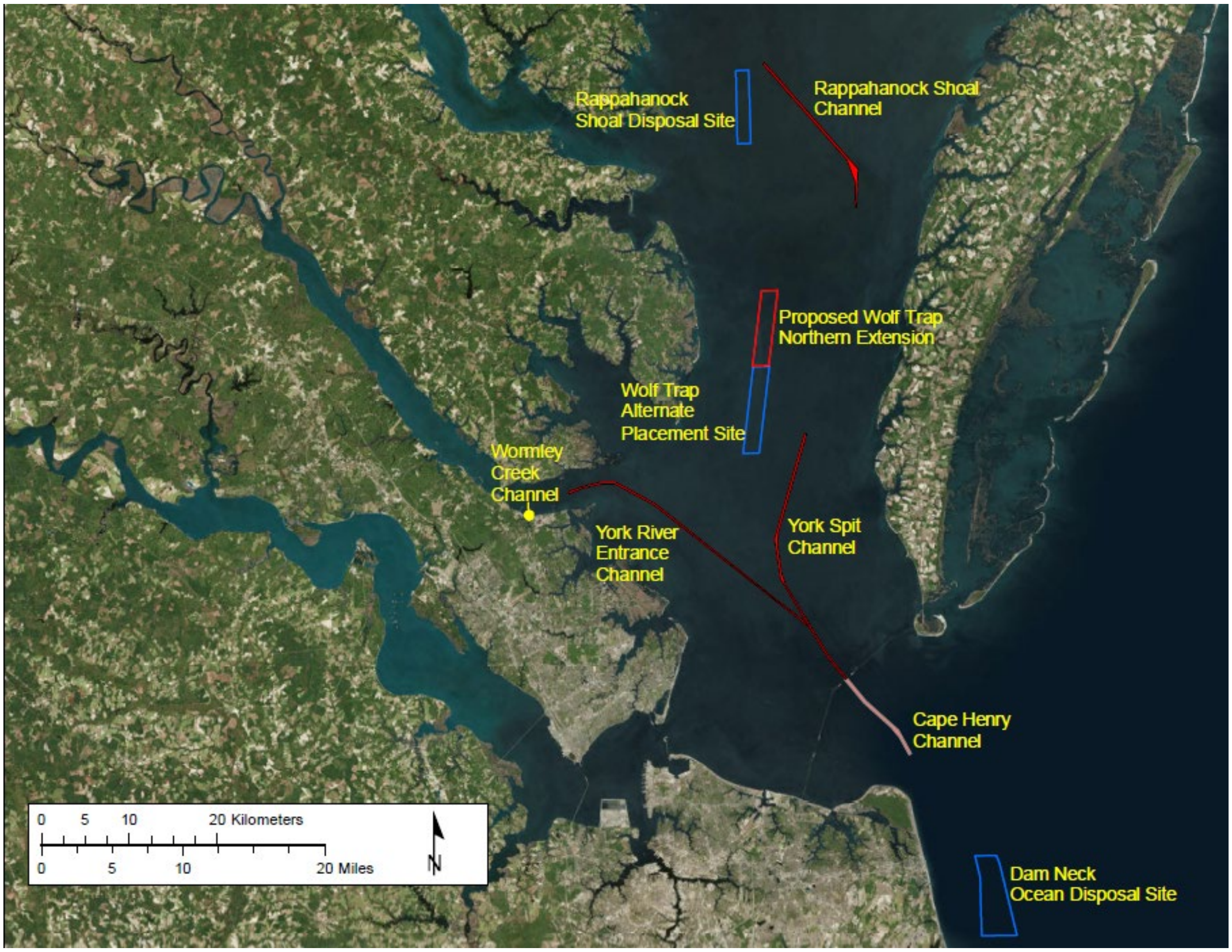


Figure 1. Map of the Baltimore Harbor and Channels Project Lower Bay Channels and Open Water Placement Sites and the York River Entrance Channel and the Wormley Creek Federal Navigation Projects.

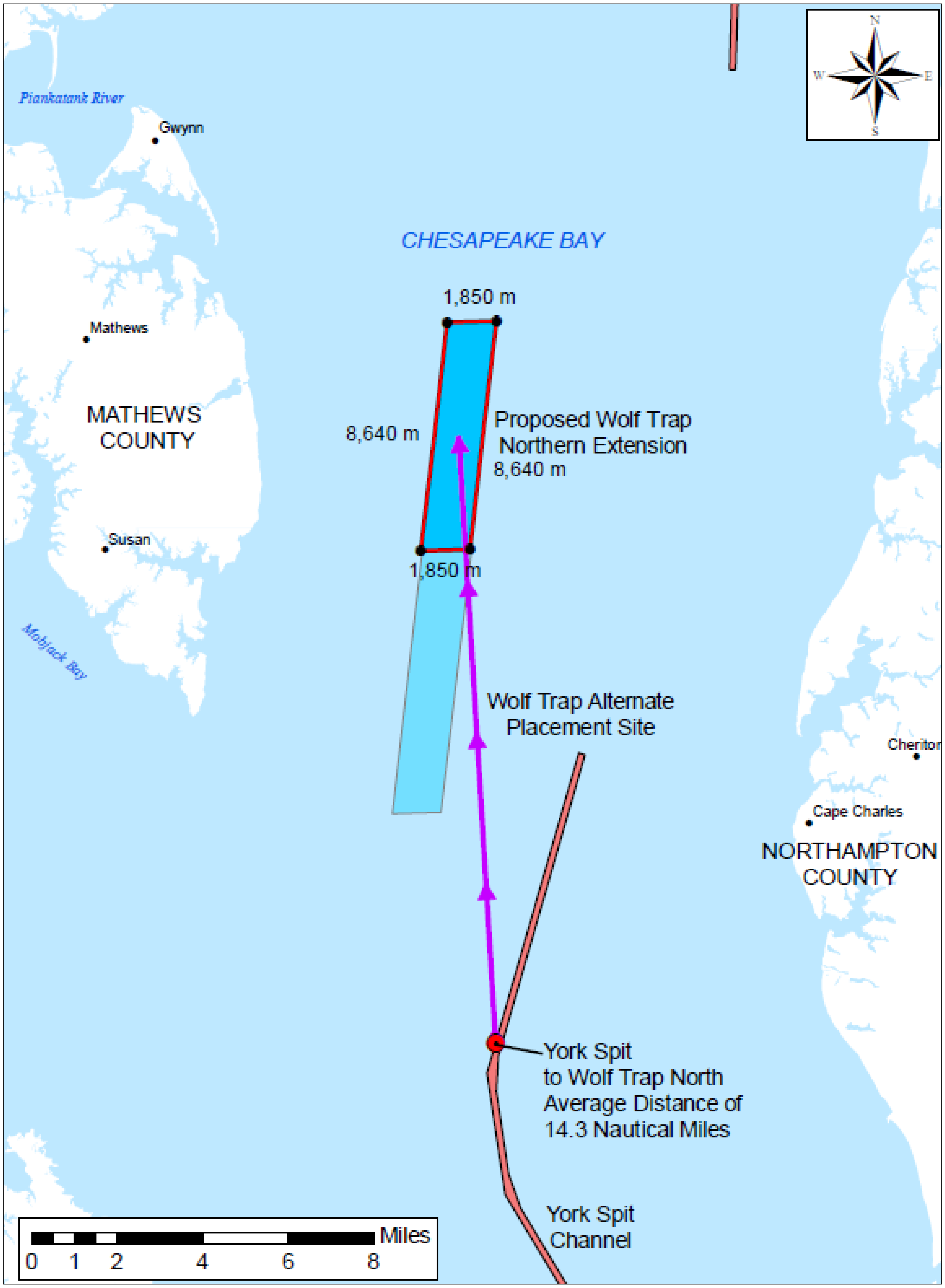


Figure 2. Dimensions of the Proposed Wolf Trap Alternate Open Water Placement Site Northern Extension.

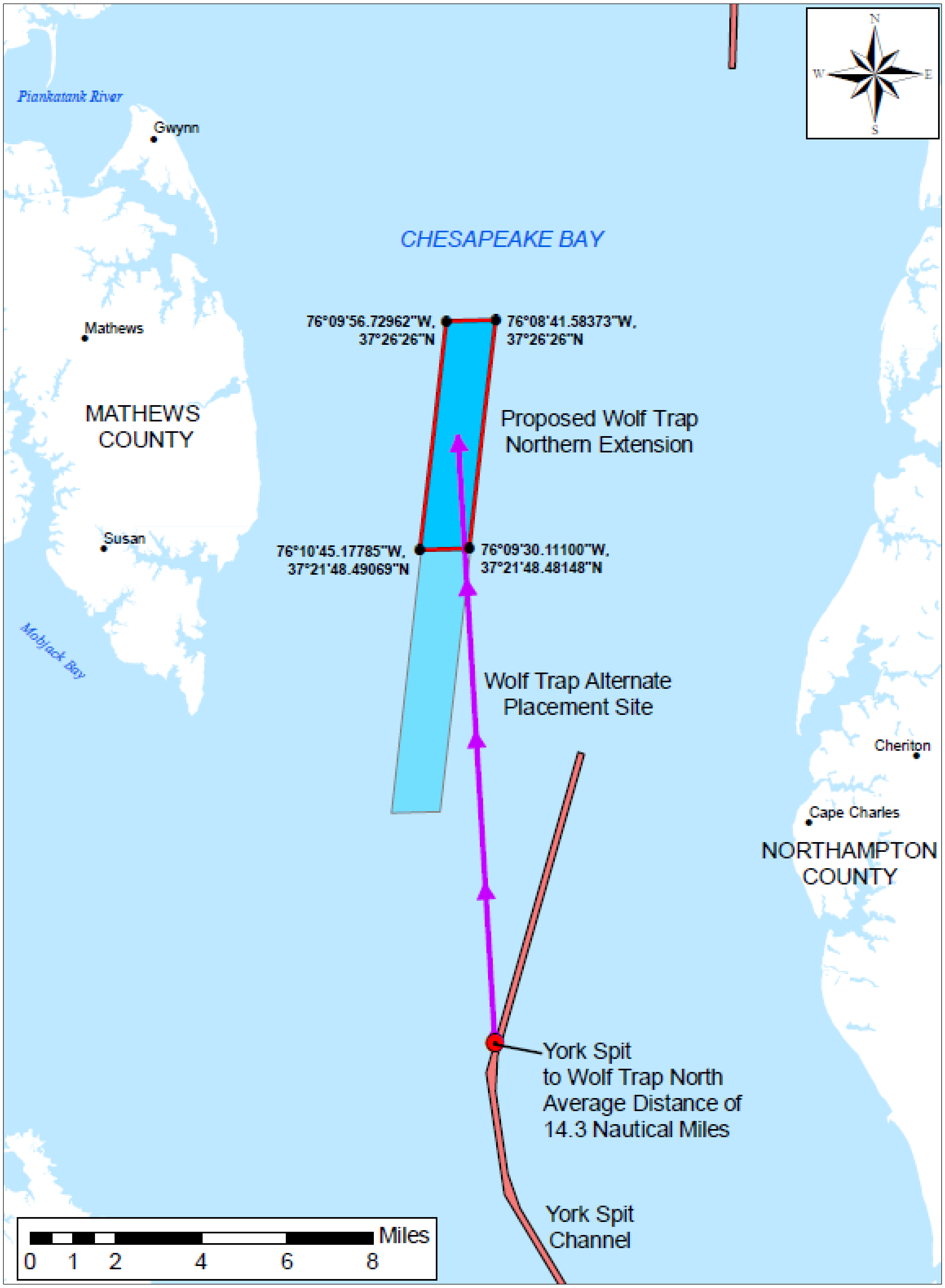
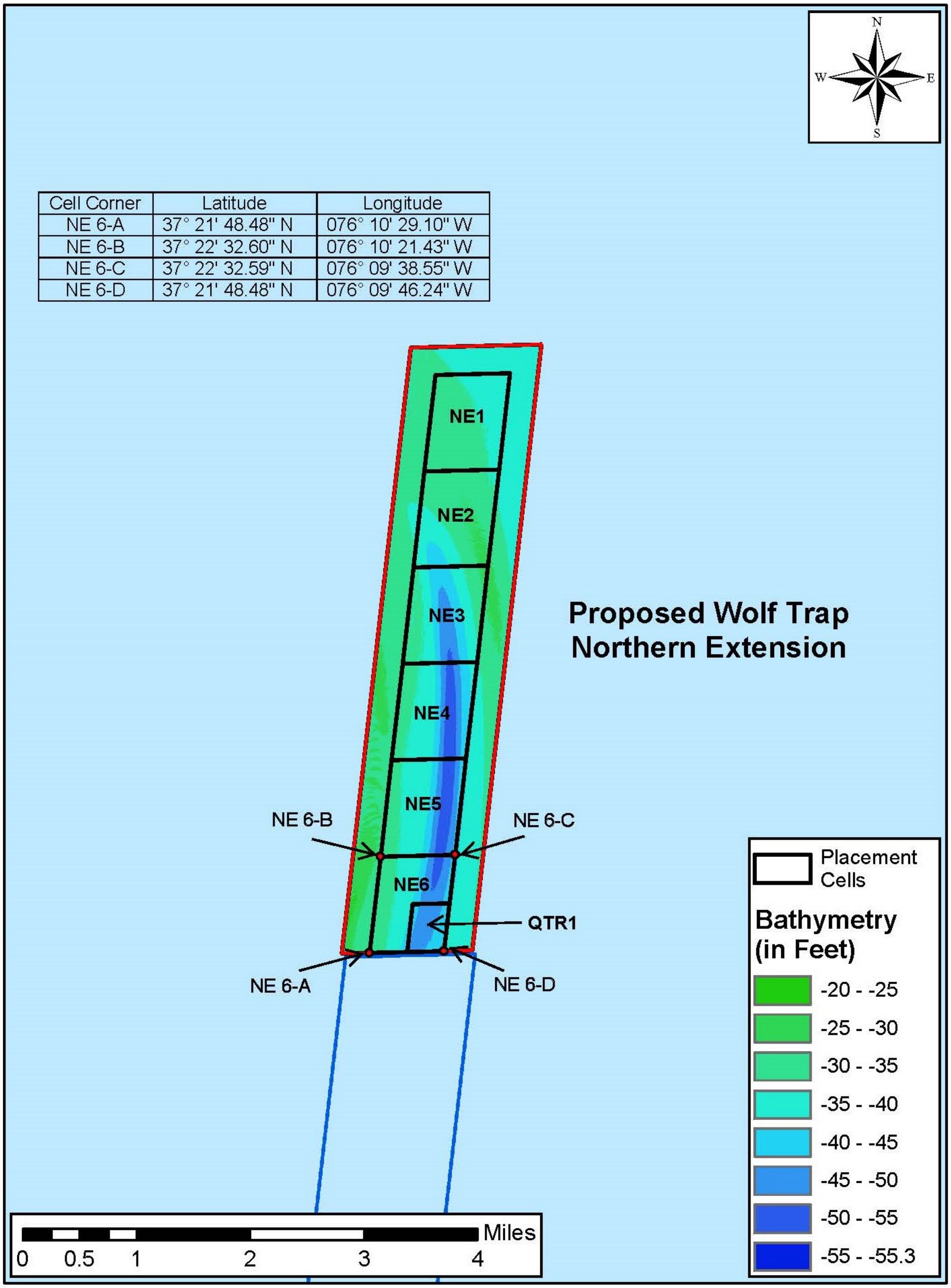


Figure 3. Coordinates of the proposed Wolf Trap Alternate Open Water Placement Site Northern Extension



Cell Corner	Latitude	Longitude
NE 6-A	37° 21' 48.48" N	076° 10' 29.10" W
NE 6-B	37° 22' 32.60" N	076° 10' 21.43" W
NE 6-C	37° 22' 32.59" N	076° 09' 38.55" W
NE 6-D	37° 21' 48.48" N	076° 09' 46.24" W

Figure 4. Placement Cells of the Proposed Wolf Trap Alternate Open Water Placement Site Northern Extension.

3.0 PURPOSE AND NEED

The purpose of the proposed action is to provide a cost-effective, environmentally-acceptable placement site for dredged material in response to a recommendation by agencies of the Commonwealth of Virginia, to minimize adverse impacts to overwintering female blue crabs. The proposed action is needed to provide safe, reliable, and efficient channels to maintain waterborne commerce and national defense.

4.0 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

The purpose of this Environmental Assessment (EA) is to determine the significance of effects from the proposed action on the human environment. The human environment includes the natural and physical environment and the relationship of people with that environment. This EA was prepared in accordance with provisions of NEPA of 1969, as amended, and the regulations for implementing NEPA promulgated by the Council on Environmental Quality (CEQ) (40 CFR 1500-1508) and USACE (33 CFR 230). A Section 404(b)(1) Analysis has been prepared due to the proposed placement of dredged material into waters of the United States (Appendix D).

5.0 AGENCY AND TRIBAL COORDINATION AND PUBLIC INVOLVEMENT

In February and April of 2019, USACE sent coordination letters to the following agencies soliciting comments on the proposed action: U.S. Environmental Protection Agency (USEPA); U.S. Fish and Wildlife Service (USFWS); NOAA NMFS; Virginia Department of Environmental Quality (VADEQ); Virginia Marine Resources Commission (VMRC); Virginia Department of Conservation and Recreation (VADCR), Virginia Department of Game and Inland Fisheries (VADGIF); VIMS; Virginia Department of Historic Resources (VADHR), Pamunkey Indian Tribe, and Delaware Nation. The coordination letters sent by NAB and comments received from various agencies and tribal nations are located in Appendix A.

Consultation with NOAA NMFS and USFWS under the Endangered Species Act and the Magnuson-Stevens Act is documented in Appendix B: Endangered Species Act Coordination and Appendix C: Essential Fish Habitat Assessment.

A public notice was issued on July 19, 2019, soliciting public, agency and tribal input on the draft EA. The draft EA is available via a posting on the USACE website located at: https://www.nab.usace.army.mil/Missions/Civil-Works/Dredged-Material-Management-Plan-DMMP/

On July 19, 2019, a Federal Consistency Package was submitted to VADEQ's Office of Environmental Impact Review. The Federal Consistency Package included the draft Finding of No Significant Impact (FONSI), EA and appendices, a request for consistency with Virginia's Coastal Zone Management Program pursuant to the Coastal Zone Management Act of 1972, and a request for a Section 401 Water Quality Certification.

6.0 ALTERNATIVES CONSIDERED

Pursuant to the requirements of NEPA and the regulations for implementing NEPA promulgated by CEQ (40 CFR 1500-1508) and USACE (33 CFR 230), this section presents alternatives to the proposed action, including the No-Action Alternative (Table 2, Figure 5). Alternative placement options for dredged material from the York Spit Channel were formulated in previous USACE studies. Those previous studies were revisited and those alternatives were found to be appropriate for reconsideration in this EA. These alternatives will be revisited and other placement options will be evaluated in the Virginia DMMP.

The Federal Standard[2] for the placement of material dredged from the York Spit Channel is WTAPS. Any alternatives that increase costs above the Federal Standard would require a non-federal sponsor and cost sharing for the increment that exceeds the federal requirements for planning.

Table 2. Alternative Placement Sites Considered.

Alternative Number	Alternative Name
1	No-Action – Continued Use of the Wolf Trap Alternate Open Water Placement Site
2	Wolf Trap Alternate Open Water Placement Site Northern Extension (Preferred Alternative)
3	Upland Placement – Confined Disposal Facility
4	Ocean Placement – Norfolk Ocean Open Water Site
5	Beneficial Use – Beach Nourishment
6	Beneficial Use – Shoreline Restoration
7	Beneficial Use – Large Island Restoration
8	Beneficial Use – Artificial Island Creation
9	Defer Maintenance Dredging of York Spit Channel

[2] The Federal Standard is identified in USACE regulations under 33 CFR 335 through 338. Specifically, 33 CFR 335.7 defines the Federal Standard as follows: "Federal Standard means the dredged material disposal alternative or alternatives identified by the Corps which represent the least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process or ocean dumping criteria."

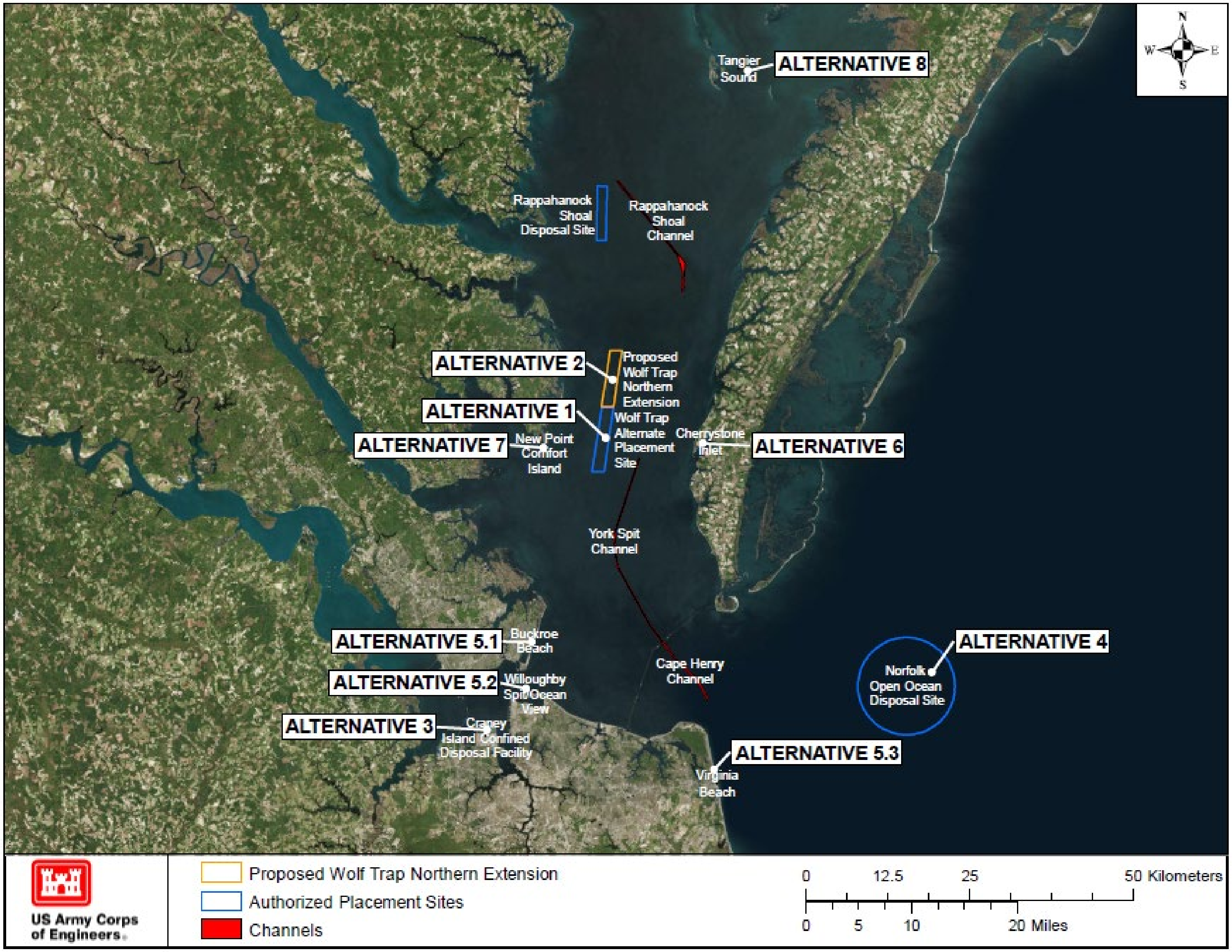


Figure 5. Map of Alternative Placement Sites.

6.1 ALTERNATIVE 1: NO ACTION

Inclusion of the No-Action Alternative is prescribed by CEQ regulations as the benchmark against which proposed federal actions are to be evaluated. The No-Action Alternative in this case is to continue placing dredged material in WTAPS. Average transport distance from the York Spit Channel to WTAPS is approximately 8.5 nm. The estimated cost (in FY 19 dollars) for this alternative is approximately $13,409,000 per dredging cycle ($7.38 per cubic yard of dredged material), or $67 million over a 20-year planning period.[3] Impacts of the No-Action Alterative are compared to the impacts of implementing the Preferred Alternative in Section 8.0 below. Adverse impacts to overwintering female blue crabs in WTAPS are of concern to agencies of the Commonwealth of Virginia, and is the purpose for preparing this EA.

6.2 ALTERNATIVE 2: WOLF TRAP ALTERNATE OPEN WATER PLACEMENT SITE NORTHERN EXTENSION

Alternative 2 would establish an extension of the existing WTAPS site to the north, increasing the size of the placement site by approximately 3,900 acres. This alternative has been recommended by agencies of the Commonwealth of Virginia to minimize adverse impacts to overwintering female blue crabs, which have the potential to be highly abundant in the southern portion of WTAPS. Aside from the increased travel distance (average distance of 14.3 nm vs. 8.5 nm), this alternative would otherwise be identical to the No-Action Alternative, and would rely upon the same methods, equipment, schedule and other factors. It would generate additional carbon emissions from project vessels, due to the increased travel distance, although the project area is in attainment for air quality standards. This alternative is not expected to have any other significantly different environmental impacts, relative to the No-Action Alternative. The estimated cost (in FY 19 dollars) for this alternative exceeds the No-Action Alternative by approximately $4.4 million per cycle ($10.30 per cubic yard of dredged material), or $21.9 million over a 20-year planning period, due to the increased travel distance and fuel consumption between the dredging and the placement site.

6.3 ALTERNATIVE 3: UPLAND PLACEMENT – CRANEY ISLAND CONFINED DISPOSAL FACILITY

A confined disposal facility (CDF) is an engineered structure for the containment of dredged material. Properly designed and operated CDFs can minimize the amount of sediment re-entering the environment, provide a permanent storage location for dredged material, and can be used as processing and/or blending areas for beneficial reuse activities. Craney Island is an existing 2,500-acre CDF located along the James River in Virginia. For this alternative, it is assumed that dredged material from the York Spit Channel would be transported to the Craney Island CDF site via hopper dredge, where it would be hydraulically placed, and allowed to dewater through controlled discharge, evaporation, or percolation.
This alternative consists of a vertical expansion of the existing Craney Island facility. The existing dikes would be raised 8 ft to generate an additional 190.4 mcy of capacity for dredged material from the Norfolk area; however, only the 20-year dredge cut volume for the York Spit Channel of 7.5 mcy is considered here.

[3] Cost estimates presented for these alternatives include the estimated cost of dredging, which is not part of the proposed action. These estimates are for comparison only.

This alternative would eliminate the environmental impacts associated with the periodic in-water placement of dredged material at the existing site, but would necessitate temporary impacts associated with modification of the existing CDF. Because of Craney Island's location, this alternative could adversely affect some sharks, sea turtles and other managed and listed species that are more common near the mouth of the Chesapeake Bay. This alternative would cost several million dollars more per dredging cycle than the No-Action Alternative, and would generate additional emissions due to the greater travel distances between the dredging and placement locations (approximately 15 to 25 nm). This alternative would also require an upfront cost of more than $5.4 million,[4] representing 4 percent of the overall construction cost, to increase the capacity of the site. Existing federal statute prohibits the use of Craney Island CDF for dredged material outside of Norfolk Harbor, and would therefore have to be amended. Due to Craney Island's proximity to Naval Station Norfolk, it is possible that this alternative might be incompatible with naval operations of the U.S. Atlantic Fleet. No other viable CDF opportunities have been identified within the project vicinity. Use of this alternative would require that the current non-federal sponsor execute agreements to modify the placement site and share in the project costs and disposal fees.

6.4 ALTERNATIVE 4: OCEAN PLACEMENT – NORFOLK OCEAN OPEN WATER SITE

For this alternative, it is assumed that dredged material from the York Spit Channel would be placed at the Norfolk Ocean Dredged Material Disposal Site (ODMDS), via barge or hopper. The Norfolk ODMDS is located in the Atlantic Ocean, approximately 15 miles southeast of Cape Charles, Virginia. The site is circular in shape, with a radius of approximately 4 nm and an area of approximately 41,500 acres. Water depths range from 43 to 85 ft with varying grade elevations of the bottom. The site has been characterized as supporting "a highly diverse benthic faunal community…typical of the mid-Atlantic inner continental shelf" (USEPA, 1992). The remaining in-place volume of the site in 1990 was estimated at 1.34 billion cubic yards (MPA, 1990). Although the site has been repeatedly used since then, it is believed that the site possesses sufficient capacity for dredged material from the York Spit Channel with a minimum allowable water depth of -65 ft MLLW.

This alternative does not appear to be environmentally preferable to the No-Action Alternative, as the Norfolk ODMDS supports viable benthic communities. Transporting material south and out of the Chesapeake Bay also presents an increased likelihood of vessel strike or other potentially-adverse effects on listed sea turtles and whales that are more common in these waters. This alternative would cost several million dollars more per dredging cycle than the No-Action Alternative, and would generate significantly greater emissions due to fuel consumption and the greater travel distances between the dredging and placement locations (roughly 20 to 30 nm).

[4] Costs represent 4 percent of the total cost to study, design and construct a 190.4 mcy increase to the capacity of the current CDF. These estimates and assumptions were derived from the 2005 Baltimore Harbor and Channels (Maryland and Virginia DMMP, and did not account for relative sea level change. Updated estimates were not considered necessary for this assessment, but would be higher.

6.5 ALTERNATIVE 5: BENEFICIAL USE – BEACH NOURISHMENT

Beach nourishment is the placement of beach-quality sand to widen an existing recreational beach. Generally, beach nourishment is performed along beaches with moderate and persistent erosion. Dredged material used for beach nourishment generally must closely match the sediment composition of the beach material. For this alternative, it is assumed that material dredged from the York Spit Channel would be used to periodically nourish several public beaches in Virginia, including Virginia Beach on the Atlantic Ocean, and Willoughby Spit/Ocean View and Buckroe Beach on the Chesapeake Bay. A hopper dredge would moor offshore from the beach nourishment site, and material would be pumped from the dredge through 8,000 to 10,000 ft of pipeline onto the beach, using booster pumps as required. On the beach, heavy equipment would be used to distribute the material and establish the design beach profile.

Sediments from the southern portion of York Spit Channel contain approximately 82 percent sand and may be viable material for beach nourishment. Sediments from the northern portion of the York Spit Channel generally contain too much silt and clay to be beach-compatible (EA, 2014). Placement of fine-grained materials from the northern portion of the York Spit Channel on beaches subject to nearshore wave action would likely result in ongoing turbidity and sedimentation within shallow, nearshore waters. This would be a concern on Willoughby Spit/Ocean View and Buckroe Beach on the Chesapeake Bay that could potentially support submerged aquatic vegetation (SAV). This alternative may require preparation of an EIS. Transporting material south and out of the Chesapeake Bay to Virginia Beach also presents an increased likelihood of vessel strike or other potentially-adverse effects on listed sea turtles and whales that are more common in these waters. This alternative would cost several million dollars more per dredging cycle than the No-Action Alternative, and would generate additional emissions due to the greater travel distances between the dredging and placement locations (approximately 10 to 20 nm), as well as the operation of construction equipment on the beach. This alternative would also require an initial cost of more than $58 million to study, design and construct the placement sites over a 20-year planning period.[5] Use of this alternative would require a willing non-federal sponsor to develop the placement sites and share in the project costs.

6.6 ALTERNATIVE 6: BENEFICIAL USE – SHORELINE RESTORATION

Shoreline restoration, in the context of this assessment, is the restoration of an eroded natural shoreline, tidal wetland or similar area, in a manner that enhances habitat and ecosystem functions. Generally, shoreline restoration is appropriate along shorelines with low-to-moderate wave energies, and where tidal marshes or other natural habitats were present, but have been lost due to erosion. For this alternative, shoreline restoration of a peninsula near Cherrystone Inlet on Chesapeake Bay, north of Cape Charles, Virginia is considered, as it is representative of typical, relatively large "living shoreline" restoration projects within the vicinity. This would involve constructing a 6,200 ft exterior dike, then infilling approximately 110 acres behind it with dredged material to create low- and high-marsh habitats, to restore the eroded peninsula. It is assumed dredged material would be placed over a 2-year period, and that the material would require 4 years

[5] These estimates and assumptions were derived from the 2005 Baltimore Harbor and Channels (Maryland and Virginia) DMMP, and did not account for relative sea level change. Updated estimates were not considered necessary for this assessment, but would be higher.

of settlement prior to final grading and establishment of hydraulic controls. The capacity of the site would be roughly 0.7 mcy,[6] which is less than half that needed for even a single, typical York Spit Channel maintenance dredging cycle.

Even if additional shoreline restoration areas could be identified, it is doubtful that sufficient capacity could be cost effectively provided. Material dredged from northern portion of the York Spit Channel would generally be unsuitable for use for unconfined natural beach shoreline restoration, as it would contain excessive amounts of fine-grained sediments. Although it would require the infilling of shallow, open-water habitat, it may be environmentally preferable to the No-Action Alternative, as it would restore a large area of tidal marsh habitat, which provides valuable ecosystem functions that have declined in the Chesapeake Bay from historical levels. Projects for this alternative at the scale of the total placement need for the 20-year planning horizon would most likely require preparation of an EIS. This alternative would have similar travel distances and transportation costs to the No-Action Alternative, but would require an initial cost of more than $21 million to study, design and construct the placement site. Costs to develop placement capacity via shoreline restoration sufficient to accommodate all York Spit Channel dredged material over a 20-year planning period would likely be well in excess of $100 million.[7] Use of this alternative would require a willing non-federal sponsor to develop the placement site and share in the project costs.

6.7 ALTERNATIVE 7: BENEFICIAL USE – ISLAND RESTORATION

Island Restoration, in the context of this assessment, is the restoration of a historic island footprint greater than 200 acres in size via the placement of dredged material, where that island has suffered land loss due to erosion, sea-level rise, or subsidence. For this alternative, the restoration of New Point Comfort Island, at the mouth of Mobjack Bay and the southernmost end of Mathews County, Virginia, is considered. The proposed site is approximately 4,000 ft by 2,600 ft, which would restore the island to its historically-surveyed size of roughly 240 acres. The restored island would be roughly half upland and half wetland. Perimeter dikes would be constructed to enclose the placement area, then dredged material would be deposited hydraulically within the dike. Interior dikes would be built to separate the island into six 40-acre interior cells, to facilitate management and dewatering of the dredged material, and allow the creation of distinct habitats. Material would be placed into wetland cells at a low elevation to allow tidal inundation, while upland cells may be filled to an elevation close to that of the perimeter dike.

The site capacity (cut volume) would be equal to 4.7 mcy.[8] This alternative has sufficient capacity for roughly 2 dredging cycles, or less than half the estimated capacity necessary to accommodate

[6] Based on an average water depth of roughly 4 ft, per NOAA charts of the Old Town Neck, Virginia vicinity.

[7] The $21M figure is based on the 2005 Baltimore Harbor and Channels (Maryland and Virginia) DMMP for a typical, large shoreline restoration site, albeit one that provides less than 1/10th the necessary dredged material capacity over the 20-year planning period. That DMMP did not account for relative sea level change. Updated estimates were not considered necessary for this assessment, but would be higher. The $100M figure is speculative, but presumes that providing more than 10 times the capacity would require at least five times the cost. This may be conservative as shoreline restoration projects have capacities that are limited by elevation, channelward distance and shallow waters, and therefore benefit less from "economy of scale" than other alternatives like island restoration or creation.

[8] The in-place volume for the alternative would be 2.5 mcy in the upland portion (up to +9 ft MLLW) and 0.8 mcy in the wetland portion (up to +0 ft MLLW), assuming an average water depth of 4 ft, per NOAA maps. The site capacity (cut volume) is equal to the in-place volume divided by a consolidation factor of 0.7 mcy.

dredged material from the York Spit Channel over a 20-year planning period. Although it would require the infilling of shallow, open-water habitat, it may be environmentally preferable to the No-Action Alternative, as it would restore a large area of lost coastal island and tidal marsh habitat, which provides valuable ecosystem functions that have declined in the Chesapeake Bay from historic levels. This alternative would require preparation of an EIS. This alternative would cost several million dollars more per dredging cycle than the No-Action Alternative, and would generate additional emissions due to the greater travel distances between the dredging and placement locations, as well as the long-term operation of heavy equipment at the site. It would also require an initial cost of more than $48 million to study, design and construct the placement site. These costs to provide adequate placement capacity over the 20-year planning period, assuming suitable sites could be identified, would be far greater.[9] Use of this alternative would require a willing non-federal sponsor to develop the placement site and share in the project costs.

6.8 ALTERNATIVE 8: BENEFICIAL USE – ARTIFICIAL ISLAND CREATION

Artificial island creation in the context of this assessment, is island formation via the placement of dredged material within a constructed perimeter dike in a location where an island did not previously exist. For this alternative, the proposed site is in Tangier Sound, Virginia north of Watts Island and to the east/leeward side of Tangier Island. The proposed site is approximately 8,000 ft by 5,500 ft, with an area of roughly 1,000 acres.[10] The created island would be natural in character and consist of roughly half upland and half wetland. Perimeter dikes would be constructed to enclose the placement area, then dredged material would be deposited hydraulically within dike. Interior dikes would be built to separate the island into six smaller interior cells, to facilitate management and dewatering of the dredged material, and allow the creation of distinct habitats. The site capacity would be approximately 34.6 mcy.[11]

This alternative would have adequate capacity necessary to accommodate dredged material from the York Spit Channel over a 20-year planning period and beyond. This alternative would cost over $10 million more per dredging cycle than the No-Action Alternative, and would generate significantly greater emissions due to the greater travel distances between the dredging and placement locations (approximately 37 nm), as well as the long-term operation of heavy equipment at the site. This alternative would also cost more than $230 million to study, design and construct the placement site.[12] This alternative would require extensive planning, design, approval and

[9] These figures are based on the 2005 Baltimore Harbor and Channels (Maryland and Virginia) DMMP, and did not account for relative sea level change. A realistic estimate of the costs to develop placement capacity via island restoration sufficient to accommodate all York Spit Channel dredged material over a 20-year planning period, would probably be significantly higher than these values.

[10] Design assumptions for the Alternative 8 are based on Alignment 1 of the James Island Habitat Restoration Project, Dredging and Site Engineering Reconnaissance Study (GBA, 2003). The exterior dike would have a length of 32,000 ft and an elevation of +20 ft MLLW. The interior dike heights would be +2 ft MLLW and +14 ft MLLW for the wetland and upland cells, respectively. Final grade elevation would be determined during the design development phase.

[11] The in-place volume for the alternative would be 24.2 mcy assuming an average water depth of 6 ft, per NOAA maps. The site capacity (cut volume) is equal to the in-place volume divided by a consolidation factor of 0.7 mcy.

[12] These figures are based on the 2005 Baltimore Harbor and Channels (Maryland and Virginia) DMMP, which considered a hypothetical, 1000-acre artificial island creation site capable of holding 24 mcy of dredged material, which is more than three times the estimated capacity to accommodate all York Spit Channel dredged material over a 20-year planning period. However, such projects are generally less cost-efficient at a smaller scale; therefore, a smaller facility sized to only accommodate the 7.5 mcy expected to be generated from York Spit Channel during that period likely would still have construction costs in excess of $100 million.

construction to convert open water habitat to an artificial island. It therefore has a high degree of associated risk and uncertainty. This alternative would require preparation of an EIS. Use of this alternative would require a willing non-federal sponsor to develop the placement site and share in the project costs.

6.9 ALTERNATIVE 9: DEFER MAINTENANCE DREDGING OF YORK SPIT CHANNEL

Under this alternative, maintenance dredging of the York Spit Channel would be deferred indefinitely. No maintenance dredging would occur within the York Spit Chanel to remove shoaled sediments and thus, no placement of dredged material would be required. Shoaling of sediment typically requires maintenance dredging every 4 years to remove about 1.5 mcy. Deferral of maintenance dredging would result in accumulation of sediment and reduction of the effective depth of the navigation channel. The York Spit Channel would become draft limiting for vessels transiting to and from Baltimore, which with regular channel maintenance can accommodate vessels with a loaded draft of 49 ft. A reduction in draft results in decreased shipping efficiency and ultimately a reduction in regional economic benefits. This alternative would forego potential regional and national economic benefits accruing from improvements in Port of Baltimore berth capacity.

6.10 ALTERNATIVES RETAINED FOR ASSESSMENT

Table 3 provides a summary comparison between the alternatives.

Alternative 1 (No Action) is the current Federal Standard for placement of dredged material from the York Spit Channel and has a non-federal sponsor. As such, it represents the least costly alternative consistent with sound engineering practices, and meets the environmental standards established by the 404(b)(1) evaluation process. The estimated cost (in FY 19 dollars) for this alternative is approximately $13,409,000 per dredging cycle ($7.38 per cubic yard of dredged material), or $67 million over a 20-year planning period. Impacts of the No-Action Alterative are compared to the impacts of implementing the Preferred Alternative in Section 8.0 below.

Alternative 2 is feasible, as it would rely on typical equipment and methods, and would be supported by the current non-federal sponsor (MPA). It would be environmentally preferable compared to the No-Action Alternative, as it would reduce the likelihood of adverse impacts to blue crabs by making additional placement areas available, including the deeper, muddy channel, which are usually avoided as an overwintering habitat by blue crabs (Lipcius and Knick, 2016). It would cost approximately $4.3 million (33 percent) more per dredging cycle, due to the increased average travel distance between the dredging location and the proposed placement site. Over a 20-year planning period, this Alternative would cost approximately $22 million more ($77.3 million vs. $55.4 million) than the No-Action Alternative.

Alternative 3 (placement at a confined disposal facility) is currently infeasible, as use of the Craney Island CDF is statutorily restricted to dredged material from Norfolk Harbor. It would rely on typical equipment and methods, and may not require a new non-federal sponsor, although a cost-share agreement may be necessary. It would be environmentally preferable to the No-Action

Alternative, as it would eliminate the need for periodic in-water placement of dredged material from the York Spit Channel. It would require extensive planning, design, approval and construction to increase the site capacity, and would cost significantly more than the No-Action Alternative. It is uncertain whether use of Craney Island for this purpose would conflict with U.S. Atlantic Fleet operations. Due to the legal prohibition, high uncertainty and risk, and cost, this alternative is not retained for further assessment.

Alternative 4 (ocean open-water placement) is feasible, as it would rely on typical equipment and methods. A non-federal sponsor would be required to cover the costs of disposal. It is not environmentally preferable to the No-Action Alternative as it would still constitute in-water placement of dredged material in a different location without any clear environmental benefit. Transporting material south and out of the Chesapeake Bay presents an increased likelihood of vessel strike and other potentially-adverse effects on managed species such as sharks and other pelagic fishes, as well as listed species including sea turtles and whales. It would cost significantly more than the No-Action Alternative and would have greater fuel consumption and emissions, due to the greater transport distance. Due to the lack of a non-federal sponsor to cover the costs of disposal, the lack of a clear environmental benefit, risk of adverse effects to managed and listed species, uncertainty regarding approvability, and the excessive cost, this alternative is not retained for further assessment.

Alternative 5 (beach nourishment) may be feasible for only a portion of the dredged material from the York Spit Channel. Dredged material from the southern portion of the channel may be able to be used for beach nourishment; however, sediments from the northern portion of the channel generally contain too great a proportion of fines to be beach-compatible. An alternate placement site would be needed for material from the northern portion of the channel. It is potentially environmentally preferable to the No-Action Alternative if sandy sediments from the southern portion of York Spit were used for beach nourishment. It would cost significantly more than the No-Action Alternative, due to the need to study, design, construct and monitor the beach placement sites. This alternative currently lacks a willing non-federal sponsor. Due to the lack of a non-federal sponsor, uncertainty regarding approvability, and the excessive cost, this alternative is not retained for further assessment.

Alternative 6 (shoreline restoration) is not feasible, because while it involves typical equipment and methods, there are probably not sufficient areas suitable for cost-effective shoreline restoration projects. It might be environmentally preferable, provided suitable restoration sites with adequate total capacity could be found within the vicinity of the project, and provided that the dredged material is found to be suitable for shoreline restoration use. The potential success of this alternative is subject to a high degree of risk. Typical shoreline restoration sites within the region lack sufficient capacity to accommodate the volume of material from even a single, typical dredging cycle. Therefore, it would cost significantly more than the No-Action Alternative, due to the need to study, design, construct and monitor multiple placement sites. This alternative could be used in conjunction with Alternative 5, but that would add to the already excessive cost. This alternative currently lacks a willing, non-federal sponsor. Due to the lack of a non-federal sponsor, uncertainty regarding approvability or availability of potential sites, and the excessive cost, this alternative is not retained for further assessment.

Alternative 7 (island restoration) is feasible, and involves typical equipment and methods. It might be environmentally preferable, provided suitable restoration sites with adequate total capacity could be found within the vicinity of the project. The potential success of this alternative is subject to a high degree of risk. Because this project would involve filling of a large area of shallow, open-water habitat, it is possible that it would be found to involve unacceptable adverse impacts to aquatic resources. Suitable candidate sites with acceptable environmental impacts are limited, and may lack sufficient capacity to accommodate the volume of dredged material expected to be generated during a 20-year planning period. It would cost substantially more than the No-Action Alternative, due to the need to study, design, construct and monitor the placement sites. This alternative currently lacks a willing, non-federal sponsor. Due to the lack of a non-federal sponsor, high degree of risk and uncertainty regarding approvability, and the excessive cost, this alternative is not retained for further assessment.

Alternative 8 (artificial island creation) is feasible, and involves typical equipment and methods; however, it is not environmentally preferable due to the conversion of open water habitat to an artificial island. The potential success of this alternative is subject to a very high degree of risk. Because this project would involve filling of a large area of shallow, open-water habitat, it is possible, even likely, that it would be found to involve unacceptable adverse impacts to aquatic resources. It would cost substantially more than the No-Action Alternative, due to the need to study, design, construct and monitor the placement site. This alternative currently lacks a willing, non-federal sponsor. Due to the lack of a non-federal sponsor, potential for unacceptable adverse environmental impacts, a high degree of risk and uncertainty regarding approvability, and the excessive cost, this alternative is not retained for further assessment.

Alternative 9 (defer maintenance dredging) is unacceptable because this alternative will result in draft restrictions for vessel traffic. Draft restrictions will reduce vessel efficiency and negatively impact regional and national economic development. This alternative would result in no direct environmental impacts from maintenance dredging or the placement of dredged material. Due to the large economic consequence of this alternative it is not retained for further assessment.

In conclusion, Alternative 2 is the only alternative that is feasible, environmentally preferable to the No-Action Alternative, likely to be successfully implemented in the foreseeable future, and relatively cost-competitive. Alternative 2 is therefore the preferred alternative carried forward for further assessment. These findings are summarized in Table 3.

Table 3. Evaluation of Alternatives Relative to the No-Action Alternative.

Alternative	Evaluation Criteria (Relative to the No-Action Alternative)			
	Environmental[13]	Feasibility[14]	Risk[15]	Cost[16]
1 – No Action	n/a	n/a	n/a	$55M
2 – Northern Extension of Existing WTAPS	Preferable; reduces the likelihood of adverse impacts to blue crabs; minor increase in emissions, other factors similar	Feasible	Minimal; uses established equipment and methods	$77M
3 – Use of Craney Island CDF	Preferable; would eliminate in-water placement; minor increase in vessel emissions	Currently infeasible; Craney Is. cannot legally accept material from outside Norfolk Harbor; feasible if law changed	Excessive; legislative authorization highly uncertain, use of the facility may not be permissible given USN fleet operations	$104M
4 – Norfolk Ocean Open-Water Placement	Not preferable; no clear environmental benefit; significantly greater fuel consumption and emissions; greater risk to managed and listed species.	Feasible	Minimal	$121M
5 – Beach Nourishment	Potentially-Preferable for dredged material from the southern portion of the York Spit Channel. Not preferable for dredged material from the northern portion of the York Spit Channel because silty dredged material would cause adverse turbidity and sedimentation if placed on beaches subject to wave action. Greater fuel consumption and emissions and potentially greater risk to managed and listed species.	Feasible, if non-federal sponsor(s) found	High; dredged material from the northern portion of the York Spit Channel would not be beach-compatible; multiple sites needed for adequate capacity	$135M
6 – Shoreline Restoration	Potentially-preferable; assuming suitable sites can be found where living shorelines would be viable and would not adversely affect other resources.	Feasible, if non-federal sponsor(s) found	Excessive; unlikely to reliably provide adequate capacity over the planning period; doubtful that enough viable sites could be found to meet need	$76M (partial)
7 – Island Restoration	Potentially-preferable; assuming island restoration and associated habitat conversion is supported, and would not adversely affect other resources.	Feasible, if non-federal sponsor(s) found	High; planning, design, approval and construction would be lengthy and the outcome uncertain; uncertain as to whether sufficient areas could be found.	$125M (partial)

[13] "Environmental" refers to an aggregate consideration of all relevant federal environmental laws and policies.

[14] "Feasibility" refers to whether the alternative is reasonably expected to be possible, given existing materials and methods, available resources, existing legal authorities, etc.

[15] "Risk" refers to expected likelihood of alternative being successfully implemented, and includes consideration of factors such as regulatory approvals, funding, public and political support, as well as logistical risk, such as whether the alternative can consistently and reliably meet the demand, capacity and be available over the 20 year planning period.

[16] **These are not official government estimates, but rough estimates to be used for comparison only;** "Cost" refers to very rough estimate of total cost over 20-year planning period, including base costs of the No-Action Alternative, with added transport costs estimated in proportion to the difference between Alternatives 1 & 2, (roughly $22M per extra 5 nm), plus any construction costs from the 2005 Baltimore Harbor and Channels (Maryland and Virginia) DMMP, which underrepresent current costs for labor, fuel, services, etc.; costs marked "partial" indicate alternatives that do not provide the necessary estimated capacity for the 20 year planning period, and as such, significantly underrepresent the true cost to meet the need.

Alternative	Evaluation Criteria (Relative to the No-Action Alternative)			
	Environmental	Feasibility	Risk	Cost
8 – Artificial Island Creation	Not preferable due to the conversion of open water habitat to an artificial island; potential for unacceptable adverse impacts to aquatic resources; significantly greater fuel consumption and emissions	Feasible, if non-federal sponsor found	Excessive; planning, design, approval and construction would be very lengthy and the outcome uncertain.	$373M
9 – Defer Maintenance Dredging of York Spit Channel	Preferable; would eliminate dredging impacts and need for placement of dredged material.	Feasible, however not supported.	Excessive; large impact to regional and national economic development through draft restrictions on vessels.	$0M

7.0 AFFECTED ENVIRONMENT

This section describes the existing conditions of each environmental, cultural and social resource topic that may be affected by the proposed action. A combination of literature reviews, agency coordination and information from previous NAB and NAO projects and NEPA documents were used to focus on relevant issues and sensitive resources to be addressed in this EA. Each environmental, cultural and social resource topic was reviewed for its applicability to the project. Through this analysis, resource topics clearly not applicable to the proposed action were eliminated for further evaluation (summarized in Table 4 below). Potential impacts to these resources would be negligible, localized, and most likely immeasurable.

Table 4. Resource topics not evaluated in this Environmental Assessment.

Resource Topic	Reason for Elimination
Aesthetics	Negligible impact. Temporary presence of one hopper dredge would occur during open water placement activities. The west side of the proposed action area is located approximately 3 nm east of the nearest shoreline (Mathews County, Virginia). The vessel would be noticeable from land; however, from this distance, the hopper dredge would most likely blend in with other large vessels (tug and tow vessels, large fishing boats, and cargo ships) transiting through the area. The proposed action would not permanently obstruct the view of the Bay.
Water Use	Negligible impact. Use of the proposed action area will temporarily change during open water placement activities as navigation through the area and recreation and fishing activities would be more limited. Effects to navigation, recreation and fisheries are described in Sections 8.8, 8.9 and 8.10, respectively. The proposed action would not permanently change the use of the water in the vicinity of the proposed action area.
SAV and Oysters	Not applicable. VMRC identifies no SAV or oyster beds within the boundaries or adjacent to the proposed action area (VMRC, 2019). SAV is typically limited to depths of less than 2 m, and oysters to depths of less than 8 m in Chesapeake Bay (VIMS, 2019a).
Wild and Scenic Rivers	Not applicable. The proposed action area is located in the mainstem of the Chesapeake Bay and there are no designated wild or scenic rivers adjacent to the proposed action area.
Climate	Negligible impact. The input of carbon dioxide resulting from construction activities would not be large enough to affect the climate.
Hazard, Toxic and Radioactive Waste	Not applicable. No hazardous waste, brownfields, voluntary remediation programs, or federal Superfund sites are located in or adjacent to the proposed action area (VADEQ, 2019).

7.1 HYDROLOGY AND WATER QUALITY

7.1.1 Hydrology

Water levels in the Chesapeake Bay are dominated by a semi-diurnal tide. Due to its small depth-length ratio (bathymetry described in Section 7.2), the Bay accommodates more than one semidiurnal tidal wave at all times, which results in special tidal characteristics within the Bay. The mean tidal range decreases from 3 ft at the Bay's entrance to a minimum of 1 ft at Annapolis, Maryland, then rises to 2.3 ft at the head of the Bay. The typical tidal range in the action area is approximately 2.85 feet, although this varies significantly with time of the month (spring and neap tides) as well as storm activity, which can create significant storm surges well beyond the normal tidal range. Average tidal current amplitudes decrease from a maximum of 3.38 ft/second (s) at the mouth to a minimum of 0.43 ft/s in the middle Bay, and increase to 1.94 ft/s in the upper Bay (Xiong and Berger, 2010).

Water circulation in the Bay is primarily driven by the downstream movement of fresh water from rivers and the upstream movement of salt water from the ocean. A gradient of increasing salinity is produced proceeding oceanward. Generally, salinity in the lower Chesapeake Bay Mainstem is characterized as polyhaline (salinity between 18 and 30 parts per thousand (ppt)), salinity in the middle to upper Bay Mainstem is characterized as mesohaline (salinity between 5 and 18 ppt), and salinity in the upper Bay Mainstem is characterized as oligohaline (0.5 and 5 ppt) and tidal fresh (0 and 0.5 ppt) (Figure 6) (Center for Conservation Biology, 2010). Tides pump water into and out of the Bay. In addition to salinity differences, the earth's rotation affects Bay circulation. Inflowing ocean water hugs the eastern shore, while outflowing Bay water hugs the western shore. Wind can mix the Bay's waters and occasionally reverse the direction of the flows. Major storm and flood events cause general circulation patterns to break down (CBP, 2019a).

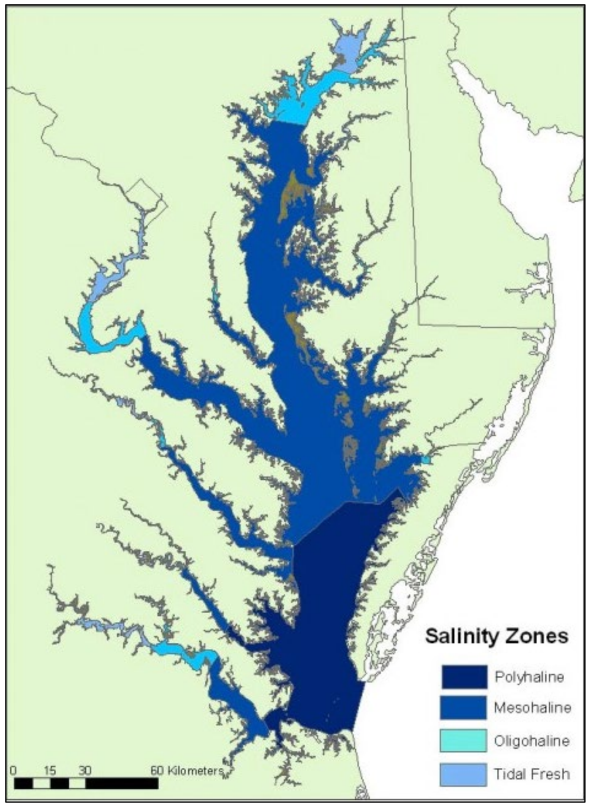


Figure 6. Salinity gradients in the Chesapeake Bay.

Less dense, fresher surface water layers are seasonally separated from saltier and denser water below by a zone of rapid vertical change in salinity known as the pycnocline. The pycnocline plays an important role in Bay water quality acting to prevent deeper water from being reoxygenated from above. Pycnocline depth varies in the Bay as a function of several factors. It shows general long-term geographic patterns, but varies over shorter time periods as a function of precipitation and winds. When substantial freshwater inflow occurs during warm weather months, it promotes stronger stratification that can last for extended periods during a year. Conversely, sustained winds in a single direction for several days can cause the pycnocline to tilt, bringing deeper water up into shallows on the margins of the Bay (CBP, 2019a).

Because of this partial seasonal separation into layers, or strata, the Bay is classified as a partially stratified estuary. Division of surface from deeper waters varies depending on the season, temperature, precipitation, and winds. In late winter and early spring, melting snow and high streamflow increase the amount of fresh water flowing into the Bay, initiating stratification for the calendar year. During spring and summer, the Bay's surface waters warm more quickly than deep waters, and a pronounced temperature difference forms between surface and bottom waters, strengthening stratification. In autumn, fresher surface waters cool faster than deeper waters and freshwater runoff is at its minimum. The cooler surface water layer sinks and the two layers mix rapidly, aided by winds. During the winter, relatively constant water temperature and salinity occurs from the surface to the bottom (CBP, 2019a).

Seasonal stratification produces vertical salinity differences in warm weather months in the middle and lower Bay. Waters below the pycnocline may be several to more than 10 ppt greater in salinity than surface waters in warm water conditions. Vertical salinity differences are greatest when substantial freshwater inflow occurs during warm weather months (Maryland BayStat, 2019).

7.1.2 Water Quality

Water quality information for the proposed action area was obtained using the Watershed Assessment, Tracking and Environmental Results System (WATERS) GeoViewer and Water Quality Assessment Report from the USEPA Office of Water. The proposed action area is located in segment "CB6PH", which is located in the northeastern half of the Virginia portion of the Chesapeake Bay between the mouths of the James and Rappahannock Rivers, hydrologic unit code (HUC) 02080101. Segment CB6PH is listed as impaired under USEPA's 303d list for reporting year 2014. The causes of impairment in this segment are dissolved oxygen and polychlorinated biphenyls (PCBs)[17] in fish tissue. A total maximum daily load (TMDL) has been developed for segment CB6PH for nutrients (nitrogen and phosphorus) resulting in decreased levels of dissolved oxygen. Probable sources contributing to the dissolved oxygen impairment include agriculture, atmospheric deposition – nitrogen, industrial point source discharge, internal nutrient recycling, loss of riparian habitat, municipal point source discharges, unspecified non-point source discharge, sources outside state jurisdiction, and wet weather discharges (point source and combination of stormwater). The source of the PCB impairment is unknown (USEPA, 2019a).

Long-term dissolved oxygen (DO) data, salinity and temperature data for the proposed action area was obtained from the Virginia Estuarine and Coastal Observing System (VECOS). Data was obtained from monitoring station "CB6.3 – Lower West Central Chesapeake Bay", which is located in the center of the proposed action area (VIMS, 2019b).

Dissolved Oxygen

DO is critical to aquatic life in the Chesapeake Bay. Aquatic creatures, other than some microbes, need oxygen to survive. DO concentrations vary depending on location and time of year, and are based on temperature, salinity, nutrient levels, and biological uptake. Many factors interact to determine the DO content of Chesapeake Bay tidal waters. Nutrient loading, water column stratification, wind and tidal mixing, and water temperatures are important factors (CBP, 2019a).

DO concentrations of 5 mg/L (milligrams per liter) or greater allow Bay aquatic life to thrive. At DO levels below 2 mg/L, the water is considered hypoxic, and when DO drops below 0.2 mg/L, it is considered anoxic. DO levels tolerable by aquatic life vary; with some organisms being more tolerant of low DO than others. Non-mobile and poorly mobile organisms, such as oysters, clams, and benthic invertebrates such as some worms, are unable to relocate when low DO conditions occur. Mobile organisms, such as fish and crabs, can avoid low DO waters. However, chronically low levels of DO in the Chesapeake Bay reduces availability of inhabitable deep-channel and deep open-water habitat on a large scale. Availability of associated forage food for demersal (bottom-dwelling) fish species is also consequently reduced substantially. Hypoxia (low

[17] PCBs are a class of man-made compounds manufactured in the 20th century until 1979 that were used for a variety of industrial applications. PCBs are suspected human carcinogens. PCBs in sediments can be resuspended into the water column. PCBs bioaccumulate and biomagnify in some aquatic organisms, with accumulations/concentrations of concern occurring in bottom-oriented fish (ICPRB, 2007).

oxygen) consequently reduces the numbers and catch of demersal fish species (Buchheister et al., 2013). Severe near-absence of oxygen conditions (anoxia) occur perennially in the deep channel (below 39 feet in depth) in the middle Bay and in certain bowl-shaped areas of the Bay's bottom (CBP, 2019a; Versar, 2017). The WTAPSNE site is closer to the middle Bay areas with chronic low DO problems than is the WTAPS site.

Data from monitoring station CB6.3 show that typical bottom DO levels in the proposed action area reach near-hypoxic levels below 4 milligrams/liter (mg/l) during the summer months while surface DO remains above hypoxic levels at 6 mg/l during the summer months. DO levels potentially reach severe lower oxygen levels in the deeper channel during the summer months. During the winter months, both the surface and the bottom DO levels remain above hypoxic levels with a typical range of 8 to 12 mg/l at the bottom and a range of 10 to 12 mg/l at the surface (VIMS, 2019). Figure 7 shows the average surface and bottom DO levels in the proposed action area from 1984 to 2018 (CBP, 2019a).

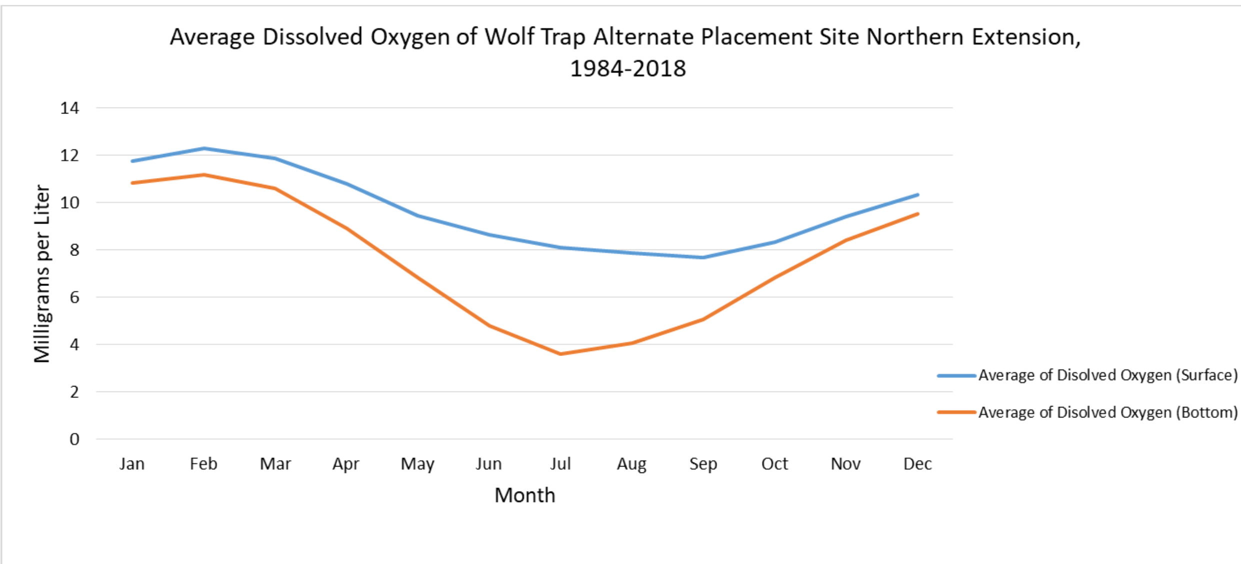


Figure 7. Average surface and bottom dissolved oxygen levels in the proposed Wolf Trap Alternate Open Water Placement Site Northern Extension from 1984 to 2018.

Water Temperature
Water temperatures in the Chesapeake Bay fluctuate widely throughout the year, ranging from 1° Celsius (C) in the winter to 29°C in the summer. Changes in water temperature influence when fish and crabs feed, reproduce and migrate (CBP, 2019a). Figure 8 shows the average surface and bottom temperatures in the proposed action area from 1984 to 2018 (CBP, 2019a).

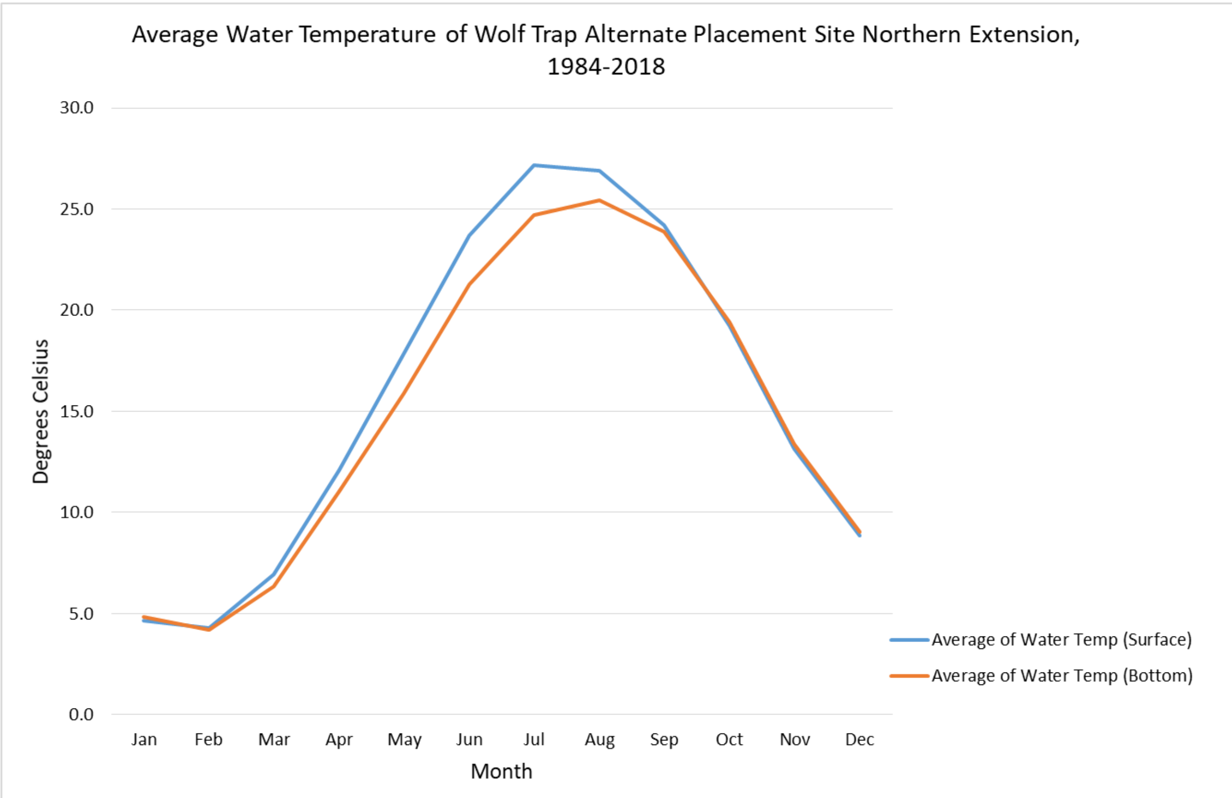


Figure 8. Average surface and bottom water temperatures in the proposed Wolf Trap Alternate Open Water Placement Site Northern Extension from 1984 to 2018.

Salinity

Salinity in the Chesapeake Bay varies from season to season and year to year depending largely on the amount of freshwater flowing into the Bay. Generally, salinity in the lower Chesapeake Bay is characterized as polyhaline (between 18 and 30 ppt) (The Center for Conservation Biology, 2010). Normal surface salinities in the proposed action area vary from 10 to 24 ppt, with an average of 17.9 ppt. Normal bottom salinities vary from 14 to 28 ppt, with an average of 22.2 ppt. Figure 9 shows the average surface and bottom in the proposed action area from 1984 to 2018 (CBP, 2019a).

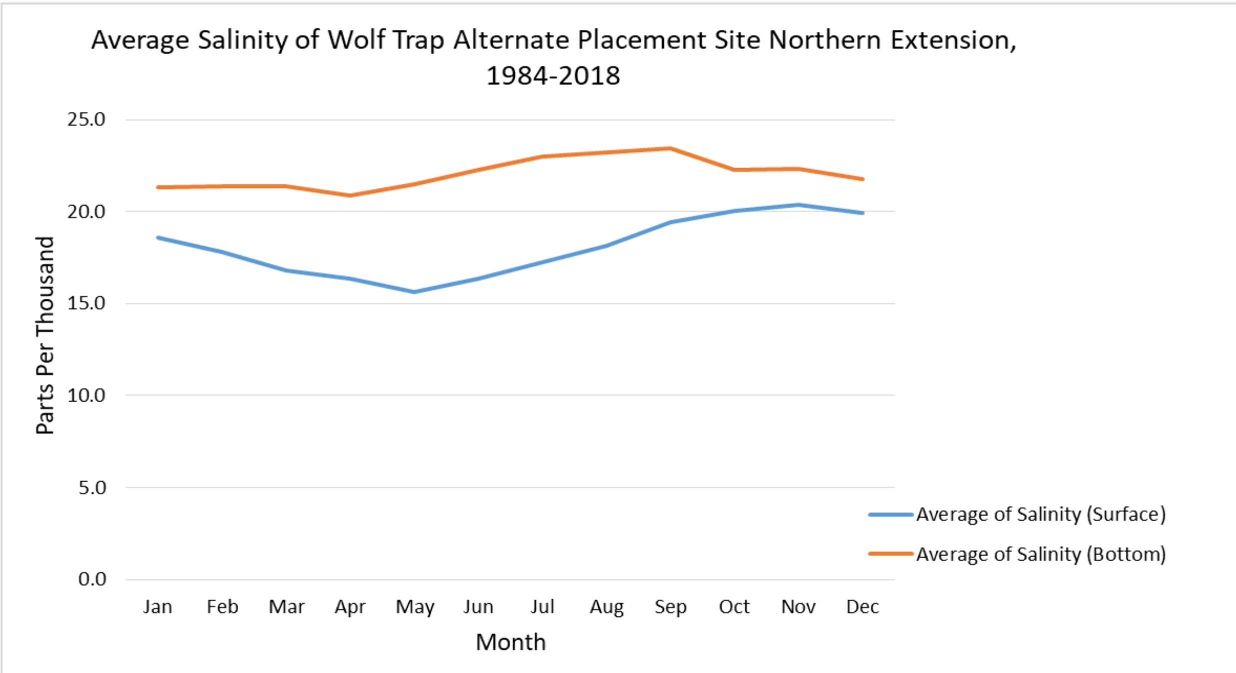


Figure 9. Average surface and bottom salinities in the proposed Wolf Trap Alternate Open Water Placement Site Northern Extension from 1984 to 2018.

7.2 BATHYMETRY AND PHYSIOGRAPHY

The Chesapeake Bay is located in the middle Atlantic Coastal Plain Province and is a large drowned river valley. Water depths in the Bay are relatively shallow; approximately 50 percent of the Bay is less than 20 ft deep, 35 percent has depths greater than 30 ft, 18 percent greater than 40 ft, and only 8 percent greater than 60 ft (Xiong and Berger, 2010).

The bottom of the proposed action area is characterized as a flat, relatively featureless plain (termed bay-stem plains by Wright et al. 1987) with a deep channel running lengthwise through the site (termed bay-stem channel by Wright et al. 1987) (Figure 10). Based on bathymetric surveys conducted by NAB in April, July and August of 2017, water depths in the proposed action area range from 23 ft to 55 ft MLLW, with an average depth of 36 ft MLLW (Figure 11).

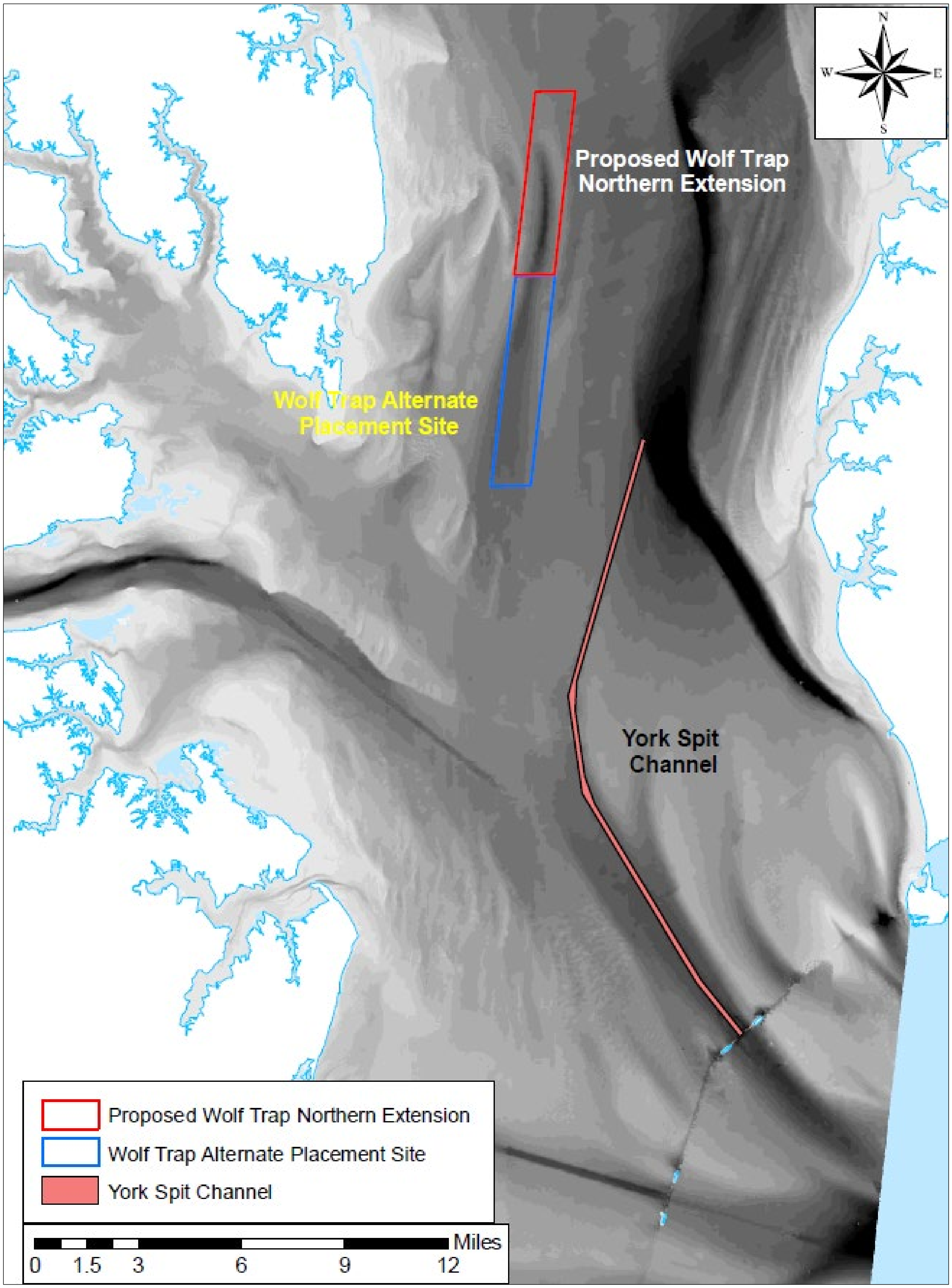


Figure 10. Bottom contours in the proposed Wolf Trap Alternate Open Water Placement Site Northern Extension. Background bathymetry data published by NOAA in 1998.

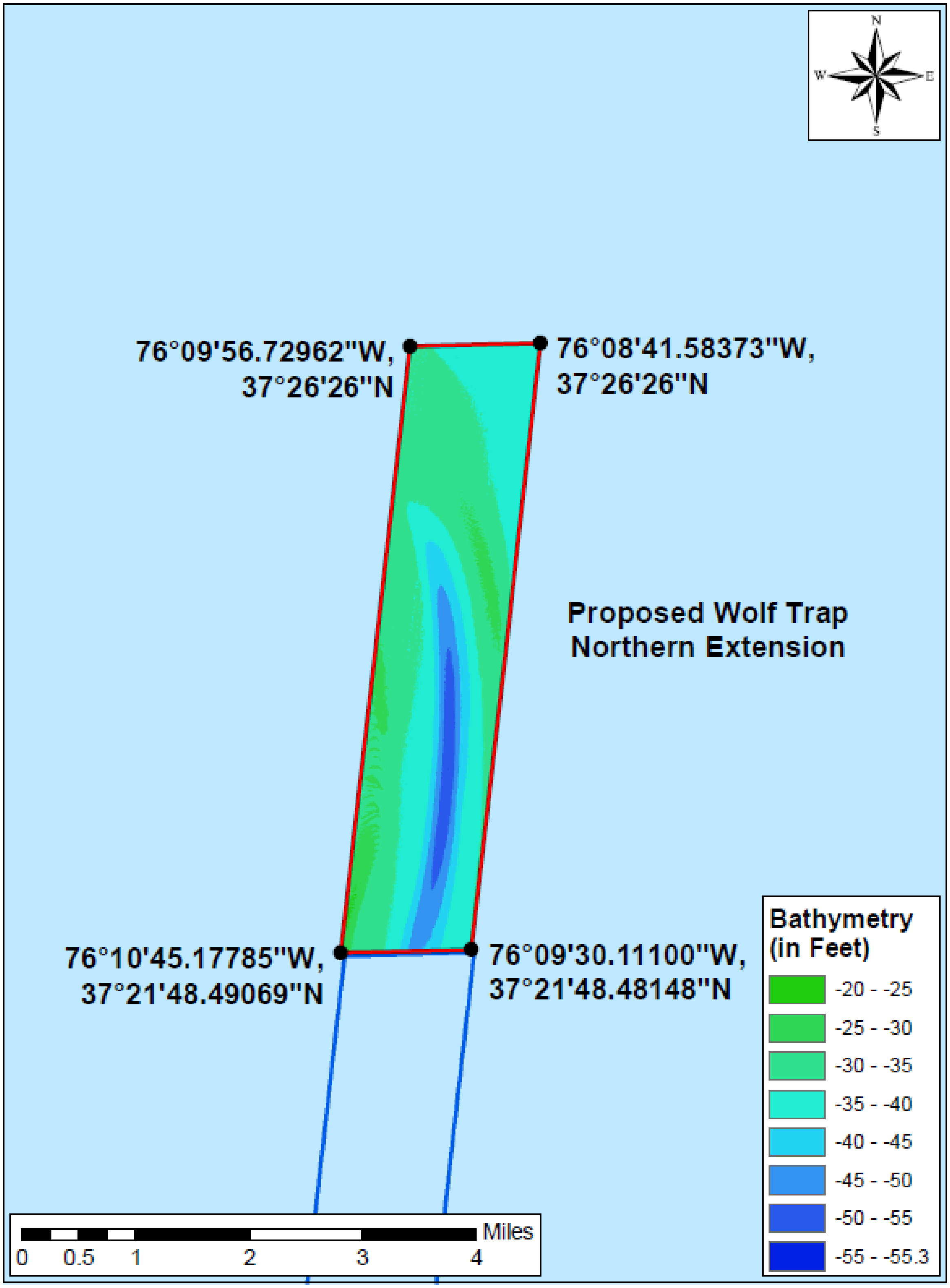


Figure 11. Bathymetry (in feet) in the proposed Wolf Trap Alternate Open Water Placement Site Northern Extension. Data collected by USACE in 2017.

7.3 GEOLOGY

The two bottom types found in the proposed action area, bay-stem plains and bay-stem channels, are typically composed of mud or fine sand with silt and clay filling interstices (Wright et al., 1987). No sediment testing has been conducted by USACE in the proposed action area. However, sediments in WTAPS are composed of very fine/fine sand and silts consistently throughout the entire site. In the west boundary of WTAPS, grain sizes were smaller with lower percentages of medium sand than in the east boundary (CENAB, 2016).

USACE conducted physical and chemical sampling of the York Spit Channel O&M material in June 2013 using methods outlined in the Inland Testing Manual, which is national guidance developed by the USEPA and USACE. Sediments from the northern part of York Spit Channel were predominantly comprised of silt and clays (79.5 percent) and were most similar to the sediments at WTAPS (78.4 percent silt/clay). Sediments from the southern part of the York Spit Channel were predominately comprised of sand (81.9 percent) (EA, 2014).

Concentrations of detected analytes[18] in sediment samples from the York Spit Channel were compared to sediment quality guidelines (SQGs) for marine sediments to assess the sediment quality of the material proposed for dredging. SQGs were used to identify potential adverse biological effects associated with contaminated sediments. Threshold effects levels (TELs) typically represent concentrations below which adverse biological effects are rarely observed, while probable effects levels (PELs) typically represent concentrations in the middle of the effects range and above which effects are more frequently observed (EA, 2014).

Of the 18 tested metals[19], 9 of them – arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc – have TEL and PEL values. All of the tested metals were detected in each sediment sample from the York Spit Channel; however, none of the concentrations exceeded TEL or PEL concentrations. In addition to comparing sediment results to sediment quality guidelines, the acid volatile sulfide (AVS) / Simultaneously Extracted Metals (SEM) ratio was calculated to assess the bioavailability of the five simultaneously extracted metals included in the analysis (cadmium, copper, lead, nickel, and zinc). The AVS/SEM ratios for sediments from the York Spit Channel indicated that these metals would most likely be bound to organic matter[20] and would not be expected to be bioavailable to aquatic organisms in these locations. None of the tested polycyclic aromatic hydrocarbons (PAHs)[21] were detected in site water, receiving water, or in the standard elutriates samples taken from the York Spit Channel. This indicates that PAHs are tightly bound to sediments and are not likely to be released into the water column during open water placement. Total PCB concentrations in the York Spit Channel sediments did not exceed TEL values (EA, 2014).

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[18] A substance whose chemical constituents are identified and measured.

[19] Rationale for testing these metals is derived from: USEPA/USACE. 1998. (EPA-823-B-98-004). Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual.

[20] Matter composed of organic compounds that have come from the remains of organisms such as plants and animals and their waste products in the environment.

[21] PAHs form when gas, coal and oil are burned. PAHs are detected at varying concentrations across the watershed, with the highest reported in or near Baltimore Harbor and the Anacostia and Elizabeth rivers (CBP, 2019a).

7.4 AIR QUALITY

The Clean Air Act of 1970 requires the USEPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants including ground-level ozone, particulate matter, carbon monoxide, lead, sulfur dioxide, and nitrogen dioxide. USEPA calls these “criteria air pollutants” because their levels in outdoor air need to be limited based on health criteria. These pollutants are found all over the United States and may cause health problems, harm the environment, and cause property damage (USDOE, 2000). Mathews County, Virginia (the closest county to the proposed action area) and neighboring Virginia counties including Gloucester, York and Northampton Counties are all currently in attainment (as of April 30, 2019) with the NAAQS (40 CFR Part 50) for the six principal pollutants. Attainment means that an area is meeting or is below a given safe standard set by the USEPA for the particular criteria pollutant (USEPA, 2019b).

7.5 FISH AND WILDLIFE

7.5.1 Threatened and Endangered Species

Federally-listed Species

Table 5 lists the federally-listed threatened and endangered species under the purview of NMFS as having the potential to occur in the proposed action area. No listed species critical habitat is located within the proposed action area. This species list was verified by NMFS Protected Resource Division Staff (B. Hopper, pers. comm. April 4, 2019). More details on the species listed in the table below can be found in Appendix B: Endangered Species Act Coordination.

Table 5. Federally-listed threatened and endangered species under the purview of NMFS that have the potential to be affected by the proposed Wolf Trap Alternate Open Water Placement Site Northern Extension.

Species	Distinct Population Segment (DPS)	Federal Status
Loggerhead Sea Turtle (*Caretta caretta*)	Northwest Atlantic	threatened
Green Sea Turtle (*Chelonia mydas*)	North Atlantic	threatened
Leatherback Sea Turtle (*Dermochelys coriacea*)	n/a	endangered
Kemp’s Ridley Sea Turtle (*Lepidochelys kempii*)	n/a	endangered
Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)	Gulf of Maine Carolina New York Bight Chesapeake Bay South Atlantic	Gulf of Maine – threatened; all other DPSs are endangered
Shortnose Sturgeon (*Acipenser brevirostrum*)	n/a	endangered

The USFWS Environmental Conservation Online System Information for Planning and Consultation (ECOS-IPaC) Website (USFWS, 2019) was used to identify any species under USFWS purview that has the potential to occur in the proposed action area. ECOS-IPaC identified the northern long-eared bat (*Myotis septentrionalis*) as having the potential to occur in the proposed action area.

State-listed Species

Table 6 identifies the state-listed threatened and endangered species that have the potential to occur in the proposed action area (VADGIF, 2019). More details on the species listed in the table below can be found in Appendix B: Endangered Species Act Coordination.

Table 6. State-listed threatened and endangered species that have the potential to be affected by the proposed Wolf Trap Alternate Open Water Placement Site Northern Extension.

Species	State Status
Loggerhead Sea Turtle (*Caretta caretta*)	threatened
Green Sea Turtle (*Chelonia mydas*)	threatened
Leatherback Sea Turtle (*Dermochelys coriacea*)	endangered
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	endangered
Hawksbill Sea Turtle (*(Eretmochelys imbricate)*	endangered
Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)	endangered
West Indian Manatee (*Trichechus manatus*)	endangered

7.5.2 Finfish

Fish species occurring along the length of the Bay differ as a function of salinity and other factors. The middle and lower regions of the Bay have a greater biomass of fish species that spawn on the Continental Shelf, as well as sharks and rays, as compared to the upper Bay. The upper Bay contains a greater biomass of anadromous species that spawn in low salinity waters. Generally, the lower and middle Bay regions have more diverse and changing fish assemblages than the upper Bay throughout the year, primarily because of migration of many species. However, the upper Bay typically has more fish species occurring at any one place throughout the year because there is less turnover of species (Buccheister et al., 2013).

Low DO levels limit distribution and abundance of fish because fish avoid waters where DO drops below 4 mg/L. Demersal (bottom-oriented) fish of the Bay have had a substantial seasonal reduction in habitat availability with onset of vast anthropogenic hypoxia or anoxia. Forage for demersal fish in the middle Bay is reduced due to hypoxia and eutrophication stress, likely detrimentally affecting Atlantic croaker, white perch, and spot (Buccheister et al., 2013).

The Chesapeake Bay supports 348 species of finfish, 32 of which are year-round residents of the Bay (CENAB, 2005; CBP, 2015). Many species enter the Bay either from freshwater streams or the Atlantic Ocean to feed, reproduce, and find shelter. Highly abundant species such as the Bay anchovy (*Anchoa mitchilli*) form a critical link in the food web, serving as the dietary basis for other species, including a variety of birds and mammals. The sport fish most commonly caught in the Chesapeake Bay in 2015 included white perch, striped bass, Atlantic croaker, freshwater catfish, spot, herring, summer flounder, and kingfishes (NMFS, 2015).

In November 2014, a total of 33,546 finfish were collected during bottom trawl sampling in WTAPS. Fish assemblages were dominated by bay anchovies, Atlantic croaker, northern kingfish, smallmouth flounder, and weakfish, which collectively accounted for 99 percent of all finfish collected. Bay anchovy alone accounted for 95 percent of the total number of fish collected. In June 2015, total finfish abundance was lower (2,307), and fish assemblages were dominated by bay anchovies, northern sea robins, weakfish, spotted hake, and Atlantic croaker, which collectively accounted for 84 percent of all fish collected. Total fish abundance in November 2015 (895) was lower than November 2014, primarily because of low bay anchovy abundances in November 2015 (CENAO, 2016).

7.5.3 Essential Fish Habitat

As shown in Table 7 below, 14 species have been identified as having Essential Fish Habitat (EFH) in the proposed action area, including the sandbar shark, which has Habitat Areas of Particular Concern[22] (HAPC) in the proposed action area. The sand tiger and dusky sharks *do not* have EFH within the proposed action area, but are Species of Concern with potential EFH in the lower Chesapeake Bay, in the vicinity of the proposed action area. These designations are based on the NOAA Estuarine Living Marine Resource (ELMR) program, the EFH habitat mapper tool, and NOAA EFH source documents. Based on salinity information presented in Section 7.1.2, the proposed action area is generally in the mixed/brackish ("M") zone, but occasionally rises past the 25 ppt threshold into seawater ("S") salinity zone (NOAA, 2018a; NOAA, 2019a; NOAA, 2019b). Please refer to Appendix C: Essential Fish Habitat Assessment for detailed descriptions of the species identified in Table 7 and their EFH.

[22] EFH that is judged to be particularly important to the long-term productivity of populations of one or more managed species, or to be particularly vulnerable to degradation may also be identified by Fisheries Management Councils and NOAA Fisheries as HAPC. Areas of EFH considered HAPC must be proven to be important to the ecological function provided by the habitat for the managed species. The extent to which the habitat is sensitive to human-induced environmental degradation, including development activities that stress the habitat and the rarity of the habitat are considered.

Table 7. Summary of federally-managed species with Essential Fish Habitat in the proposed Wolf Trap Alternate Open Water Placement Site Northern Extension.

Species	Life Stage			
	Eggs	Larvae	Juveniles	Adults
Red hake (*Urophycis chuss*)			S	S
Windowpane flounder (*Scopthalmus aquosus*)			M,S	M,S
Summer flounder (*Paralicthys dentatus*)		M,S	M,S	M,S
Bluefish (*Pomatomus saltatrix*)			M,S	M,S
Atlantic butterfish (*Peprilus triacanthus*)	M,S	M,S	M,S	M,S
Scup (*Stenotomus chrysops*)			S	S
Black sea bass (*Centropristus striata*)			M,S	M,S
King mackerel (*Scomberomorus cavalla*)	X	X	X	X
Spanish mackerel (*Scomberomorus maculatus*)	X	X	X	X
Atlantic sea herring *(Clupea harengus)*				S
Sand tiger shark *(Carcharias taurus*)*			S	S
Sandbar shark *(Carcharhimus plumbeus*)			S	S
Dusky shark *(Carcharhinus obscurus)**				S
Clearnose skate (*Raja eglanteria*)			M,S	M,S
Little skate (*Leucoraja erinacea*)			M,S	M,S
Winter skate (*Leucoraja ocellata*)			M,S	M,S

S = Includes the seawater salinity zone (salinity ≥ 25.0‰).
M = Includes the mixing water/brackish salinity zone (0.5‰ < salinity < 25.0‰).
X = EFH has been designated for a given species and life stage.

***** The project area is not mapped as potential EFH for the sand tiger or dusky sharks; however, both species are included in Appendix C: Essential Fish Habitat Assessment because they are NOAA Species of Concern, and have potential EFH mapped in the lower Chesapeake Bay, a few miles south of the project location.

7.5.4 Benthic Community

Benthos is the community of organisms that live in or on the bottom sediment of water bodies. Benthos includes mobile and immobile organisms. Benthic invertebrates are animals without a backbone that live on top of or within bottom sediments in aquatic ecosystems. They are often used as indicators of water quality and ecological health due to their abundance, known pollution tolerances, and limited mobility. A typical healthy benthic community includes species characteristic of unstressed communities. In a polluted environment, these species would be replaced by species more tolerant of pollution. Most degraded communities would also tend to have fewer species, fewer large organisms deep in the sediment, and a lower total mass of organisms (Versar, 2013).

The benthic environment in the lower Chesapeake Bay is generally considered to be a more stable environment than what is observed in the middle and upper Bay. Lower Bay temperature and salinity are relatively stable compared to conditions in the upper Bay. Therefore, the biomass of benthic species is greater in the lower Bay (Nilson et al., 1982). The Benthic Index of Biotic Integrity (IBI) measures the condition of the benthic community living in or on the soft bottom areas of the Bay (UMCES, 2013). The Benthic IBI average annual score for the sampling station located in the proposed action area and in the existing WTAPS is considered good (CBP, 2015).

Bay-stem plains (the primary bottom type in the proposed action area) are colonized by high densities of tube dwellers including the annelid, *Euclymene zonalis*, the anemone, *Ceriantheopsis sp.*, and the amphipod crustacean, *Ampelisca abdita*. Sediment reworking by *Euclymene zonalis*, a "conveyor-belt" species, produces a hummocky bed surface (Wright et al, 1987). The benthic community in the bay-stem channel that runs lengthwise through the proposed action area may differ from the benthic community in the bay-stem plains due to limited near-bottom water exchange and greater seasonal oxygen stress.

In November 2014, samples were collected of the benthic macrofaunal assemblages in WTAPS. It is expected that this area has benthos similar to that of WTAPSNE. The WTAPS study showed the area was numerically dominated by Spionid polychaetes worms, which accounted for 42.5 percent of all individuals collected. Other common taxa included arthropods of the amphipod crustacean families Ischyroceridae and Caprellidae. Benthic biomass was dominated by mollusks in the northeast area of WTAPS. Mollusks were not a major component of the southern area of WTAPS, which had a large number of Chaetopterus annelid worms. The bivalves *Anaitides mucosa* and *Nucula proxima* were common in the northern half of WTAPS. Sampling of WTAPS in June 2015 found benthic macrofaunal assemblages were numerically dominated by Spionid polychaetes, which accounted for 31.9 percent of all individuals collected within WTAPS, followed by Capitellid polychaetes (17.4 percent) and Ampelisca amphipods (15.8 percent). Benthic biomass was fairly even across all of areas of WTAPS, with no peaks caused by relatively large-bodied bivalves (CENAO, 2016). Furthermore, sampling in November 2015 found that Spionid polychaetes were again the numerically dominant taxon, accounting for 51.7 percent of all individuals collected. Ampeliscid (9 percent) and Ischyrocerid (6.7 percent) amphipods were the next two most abundant taxa (CENAO, 2016).

The benthic community in WTAPSNE is not likely to be fundamentally different than the benthic community in WTAPS (except for the abundance of blue crabs). However, the benthic community in WTAPSNE is likely to be colonized by species that are more tolerant of greater seasonal oxygen stress, silty conditions and deeper water depths.

7.5.5 Blue Crab

Blue crabs are not federally-managed or listed, but they are a NOAA trust resource species[23] because of their ecological and economic significance. They are the most valuable commercial fishery in the Chesapeake Bay, and are important prey for many finfish species that have EFH in the project area. Cobia and red drum prey on adult and larger juvenile blue crabs while summer flounder and sandbar shark prey on young juvenile blue crabs (Maryland Sea Grant, 2011).
Blue crab habitat includes shallow and brackish waters, eelgrass beds, and muddy bottoms. In the Chesapeake Bay, mating occurs within shallow tributaries between May and October. After mating, female blue crabs migrate from sub-estuaries to spawning areas in the lower Chesapeake Bay. When water temperatures fall below 10°C (typically December through March), blue crab activity ceases (e.g., movement and foraging) and the crabs burrow into the sediment and begin a period of overwintering dormancy. In the Chesapeake Bay, most females go through an overwintering stage and produce broods of eggs the following spring (USACE, 2017). In the tidal waters of Virginia, commercial harvest of crabs by crab pot is not allowed from December 1 through March 16 (beginning in 2018), and the commercial harvest of crabs using commercial gear is prohibited from November 1 through March 30 (VMRC, 2017). Juvenile blue crabs utilize grass beds for nursery areas, and throughout the life stages of blue crabs, grass beds are utilized for foraging.

VMRC has previously raised concerns regarding potential effects to overwintering female blue crabs due to usage of the WTAPS, which is located to the south of the proposed action area. Lipcius and Knick (2016) analyzed data from the blue crab winter dredge survey conducted from 2009 to 2016 in WTAPS and the Rappahannock Shoal Placement Site. Lipcius and Knick (2016) reported a high abundance of overwintering female blue crabs in the southern portion of WTAPS, moderate abundance in the north portion of the site, and low abundance in the middle of the site (Figure 12, note that actual densities are exaggerated by factor of 1,000 for visual clarity). They also reported considerable annual variability in female blue crab density at WTAPS, with low densities in 2012 and 2014 and high densities in 2013 and 2016 (Lipcius and Knick, 2016).

[23] NOAA trust resources are living marine resources that include: Commercial and recreational fishery resources (marine fish and shellfish and their habitats); Anadromous species (fish, such as salmon and striped bass, that spawn in freshwater and then migrate to the sea); Endangered and threatened marine species and their habitats; Marine mammals, turtles, and their habitats; Marshes, mangroves, seagrass beds, coral reefs, and other coastal habitats; and Resources associated with National Marine Sanctuaries and National Estuarine Research Reserves.

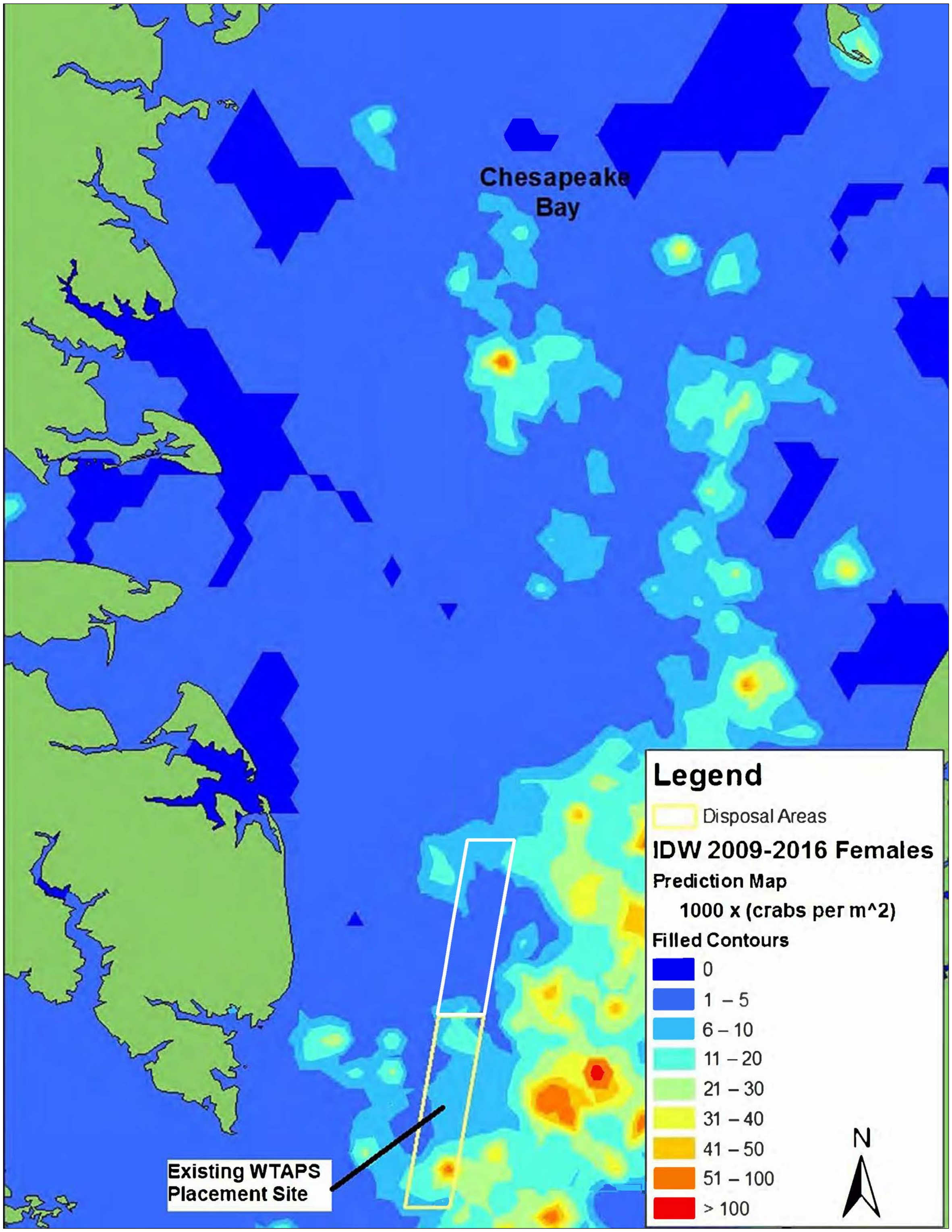

Figure 12. Relative density of overwintering female blue crabs from 2009 to 2016. Density multiplied by a factor of 1,000 for clarity (modified from Lipcius and Knick, 2016).

7.6 CULTURAL RESOURCES

Cultural resources are locations of human activity, use, or occupation. They can be defined by expressions of human culture in this physical environment, such as prehistoric or historic archaeological sites, buildings, structures, objects, districts, or sacred sites among others. Cultural resources may also include natural features, plants, and animals that are deemed important or significant to a cultural group or community.

It is important to note that historic properties, as defined by 36 CFR 800, and the implementing regulations of Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, are cultural resources that are eligible for inclusion in the National Register of Historic Places (NRHP). Historic properties may include districts, sites, buildings, structures, artifacts, ruins, objects, works of art, properties of traditional religious and cultural importance, or natural features important in human history at the national, state, or local level.

Section 106 of the NHPA requires consultation with the State Historic Preservation Office (SHPO) for proposed actions that may affect historic properties. The Virginia Department of Historic Resources (VDHR) is designated as the SHPO for Virginia. Consultation with the VDHR and federally-recognized Native American tribes is currently ongoing to identify cultural resources that may be impacted by the proposed action.

As part of Section 106 coordination, an area of potential effect (APE) was defined to evaluate any potential cultural resources that could be affected by the proposed action. The APE includes those areas where direct impacts are proposed, as well as areas within which the undertaking may directly or indirectly cause alterations in the character or use of historic properties, including visual effects. For this project, the APE includes the boundaries of the proposed action area.

The Virginia Cultural Resources Information System (V-CRIS) was utilized to identify previously mapped cultural resources within one mile of the project area (V-CRIS, 2019). According to the VCRIS, no cultural resources have been previously mapped within this radius; however, three Phase I and two Phase II archaeological surveys were conducted by Underwater Archaeological Joint Ventures in the 1980s within one mile of the project area. These were all in association with WTAPS. The Phase II investigations identified two sites, 44MT0035 and 44MT0036; the former is associated with a 20th century railroad tank car and the latter a 19th or 20th century ship or barge. Neither of these sites are affected by the placement activities at WTAPS.

Additionally, NOAA's Automated Wreck and Obstruction Information System (AWOIS) was utilized to identify any previously identified submerged wrecks or obstructions within the proposed action area. Neither of these were observed within the proposed action area, although an abandoned lighthouse is noted approximately one mile west of the site.

Given the history of the area and that previous archaeological surveys have observed multiple targets, a Phase I archaeological survey was recommended for the proposed action area. In June 2019, USACE contracted SEARCH to survey the proposed action area. The survey was conducted in accordance with the most recent version of the *Guidelines for Conducting Historic Resource*

Surveys in Virginia (VDHR, 2017). It was also performed by a professional archaeologist meeting the Secretary of Interior's Professional Qualifications Standards for Archaeology, as stated in 36 CFR 61.

During the survey, SEARCH identified 358 magnetic anomalies, 15 acoustic contacts, and 22 acoustic reflectors. SEARCH also identified one distinct anomaly located in the west central portion of the proposed action area. This was identified as the steam yacht Polynia, which was constructed in 1880 and later converted into the coal barge Tillie. In 1917, the barge sank while under tow to Baltimore, approximately 1.5 miles southeast of Wolf Trap Light.

The final Phase I archaeological survey report, with final results and National Register eligibility recommendations, is expected to be completed by July 31, 2019.

7.7 NOISE

The proposed action area is located in open water of the mainstem of the Chesapeake Bay. Daily noise levels are expected to be typical of an open water bay setting (i.e., recreational boating and commercial fishing activities). Large vessel traffic in the navigation channel located east of the proposed action area provides occasional noise as vessels pass through. The west boundary of the proposed action area is located approximately 3 nm from the nearest shoreline and any noise from the area is dissipated by wind, waves, and distance before it reaches land.

7.8 NAVIGATION

There are no marked navigation channels in or adjacent to the proposed action area (NOAA, 2018). Cargo vessel traffic follows a naturally-deep area of the Bay that is located approximately 4 nm east of the east side of the proposed action area. The proposed action area is used by fishing and recreational boaters, as well as a high density of tug and towing vessels that transit through the area (NOAA, 2019c). There are no navigational obstructions in the proposed action area (NOAA, 2018c). Water depths in the proposed action area range from 23 ft to 55 ft MLLW, with an average depth of 36 ft MLLW, providing adequate water depth for recreational and fishing vessels as well as tug and tow vessels.

7.9 RECREATION

Recreational activities in the proposed action area include boating and fishing. Sport fish commonly caught in the Chesapeake Bay include striped bass, Atlantic croaker, spot, herring, summer flounder, and kingfishes (NMFS, 2015). Striped bass, also referred to as rockfish, are the top recreational sportfish in the Chesapeake Bay (NOAA, 2019). No oyster sites or artificial reef dive sites are located in the proposed action area.

7.10 FISHERIES

Chesapeake Bay fisheries play a critical role in the culture, economy, and ecology of the region. These species are ecologically and economically important for the Chesapeake Bay and may potentially be fished for in the proposed action area: blue crab (discussed in Section 7.5.5), menhaden, striped bass, and river herrings (including American shad, hickory shad, blueback herring, and alewife).

Menhaden

In the past century, all but one Atlantic Coast state gradually banned the large scale fishing of menhaden. Today, Virginia is the only state that allows "reduction" (industrial) menhaden fishing, which takes about 80 percent of the catch coastwide. This reduction fishery removes approximately 80,000 tons of menhaden from the Virginia part of the Bay each year (CBF, 2019a).

In 2006, the Atlantic States Marine Fisheries Commission (ASMFC) capped the annual industrial catch in the Chesapeake based on concerns about malnutrition in striped bass and the need to protect the Bay ecosystem from localized depletion. This included a cap on the reduction harvest. In November 2011, the ASMFC decided to set new standards for menhaden management. In November 2017, the ASMFC approved Amendment 3 which included a management action to decrease the reduction fishery harvest cap in the Chesapeake Bay by 41.5 percent, to 51,000 metric tons, protecting important nursery habitat (CBF, 2019a).

Striped Bass

The striped bass is one of the most sought-after commercial and recreational fish in the Chesapeake Bay. A number of environmental challenges in the Chesapeake Bay threaten striped bass, including habitat loss, lack of prey, pollution, hypoxia and disease. Climate-driven changes in temperature and rain patterns may further impact striped bass' ability to bounce back from declines. Striped bass experienced a severe decline in the 1970s and 1980s that scientists attributed to overfishing, which may have made striped bass more susceptible to pollution and other stresses. In response to this downturn, Congress passed the Atlantic Striped Bass Conservation Act in 1984. Maryland and Delaware imposed a fishing moratoria on striped bass from 1985 through 1989, and Virginia imposed a one-year moratorium in 1989. The Chesapeake fishery reopened in 1990 (CBP, 2019b). In order to reduce fish mortality and restore a thriving striped bass population, the ASMFC recently voted to begin developing changes to the Interstate Fishery Management Plan for the striped bass harvest coastwide (CBF, 2019b).

River Herrings

Alosines are anadromous—they migrate from the ocean waters into fresh waters to spawn. Commercial landings for all these species have declined dramatically from historic highs. Currently, there is a moratorium on the harvest of American shad from Virginia's waters that has been in place since 1994. American shad stock does not appear to be recovering and are at record lows. A harvest moratorium for river herring in Virginia has been in place since 2012 (NOAA, 2016).

8.0 ENVIRONMENTAL EFFECTS

This section presents the effects from the No-Action Alternative (Alternative 1) and the Preferred Alternative (Alternative 2) on each resource topic discussed in Section 7.0 above. For this analysis, the No-Action Alternative would mean the proposed action would not take place and dredged material would continue to be placed in the WTAPS. The resulting environmental effects from continued placement in the WTAPS would be compared with the effects anticipated from the proposed action (Alternative 2). The environmental effects of the No-Action Alternative are expected to be similar to the environmental effects of Alternative 2, with the exception of effects on overwintering female blue crabs.

Table 8 provides a summary of the potential effects of implementing the No-Action Alternative (Alternative 1) and the Preferred Alternative (Alternative 2).

Table 8. Summary of potential effects from Alternative 1 (No-Action) and Alternative 2 (Preferred Alternative).

Resource Topic	Alternative 1 – No Action	Alternative 2 – Preferred Alternative
Hydrology and Water Quality	Overall water circulation is expected to be unimpacted. Minor, short-term turbidity impacts. Suspended particles are expected to settle out within a short time, with no long-term measurable effects on water quality	Overall water circulation is expected to be unimpacted. Minor, short-term turbidity impacts. Suspended particles are expected to settle out within a short time, with no long-term measurable effects on water quality.
Bathymetry and Physiography	Over the life of the project, the depth of the site could change from an average depth of -35 ft MLLW to -30 ft MLLW. No changes to physiography.	Over the life of the project (until 2100), the depth of the site could change from an average depth of -36 ft MLLW to -30 ft MLLW. Infilling the trough with dredged material would change this area from a bay-stem channel to a bay-stem plain.
Geology	No geologic changes are expected.	No geologic changes are expected.
Air Quality	Minor, short-term, localized impacts associated with the transport of dredged material to the placement site. No long term effects anticipated. Adjacent counties are in attainment with the Clean Air Act.	Minor, short-term, localized impacts associated with the transport of dredged material to the placement site. No long term effects anticipated. Adjacent counties are in attainment with the Clean Air Act.
Federally-Listed Threatened and Endangered Species	Species under NMFS purview - may adversely affect, but is not likely to jeopardize the continued existence of any DPS of Atlantic sturgeon, Kemp's ridley or green sea turtles, or the Northwest Atlantic DPS of loggerhead sea turtles. Not likely to adversely affect leatherback sea turtles or shortnose sturgeon. Species under USFWS purview – No effect on the Northern long-eared bat.	Species under NMFS purview - may adversely affect, but is not likely to jeopardize the continued existence of any DPS of Atlantic sturgeon, Kemp's ridley or green sea turtles, or the Northwest Atlantic DPS of loggerhead sea turtles. Not likely to adversely affect leatherback sea turtle or shortnose sturgeon. Species under USFWS purview – No effect on the Northern long-eared bat.
State-Listed Threatened and Endangered Species	May adversely affect, but is not likely to jeopardize the continued existence of Atlantic sturgeon, Kemp's ridley or loggerhead sea turtles. Not likely to adversely affect leatherback sea turtles. No effect on the hawksbill sea turtle or the West Indian Manatee.	May adversely affect, but is not likely to jeopardize the continued existence of Atlantic sturgeon, Kemp's ridley or loggerhead sea turtles. Not likely to adversely affect leatherback sea turtles. No effect on the hawksbill sea turtle or the West Indian Manatee.

Resource Topic	Alternative 1 – No Action	Alternative 2 – Preferred Alternative
Finfish	Some slow-moving benthic individuals, as well as eggs and larvae would be buried by sediment. Adverse impacts to the bottom feeder finfish population are expected to be negligible. Turbidity may cause temporarily disorientation for some finfish. Most finfish are expected to be able to avoid being directly impacted by placement activities, and would be temporarily displaced during placement operation. No significant impacts to finfish expected.	Some slow-moving benthic individuals, as well as eggs and larvae would be buried by sediment. Adverse impacts to the bottom feeder finfish population are expected to be negligible. Turbidity may cause temporarily disorientation for some finfish. Most finfish are expected to be able to avoid being directly impacted by placement activities, and would be temporarily displaced during placement operation. No significant impacts to finfish expected.
Essential Fish Habitat	Habitats for managed species and their prey would be temporarily effected during placement activities.	Habitats for managed species and their prey would be temporarily effected during placement activities.
Benthic Community	It is expected that the benthic community will recolonize within 1.5 years and that the community will have an opportunity to fully recover following each dredged material placement event and prior to the subsequent such event.	It is expected that the benthic community will recolonize within 1.5 years and that the community will have an opportunity to fully recover following each dredged material placement event and prior to the subsequent such event.
Blue Crab	Potential adverse effects depending on the density of crabs in the area during placement activities. Direct mortality, by burial or asphyxiation, of overwintering female crabs, when these crabs are present within the dredged material placement area, especially in overburden thicknesses greater than 30 cm.	Minor to negligible adverse effects. WTAPSNE is believed to support significantly fewer overwintering female crabs than WTAPS, and thus the project would constitute, overall, a net reduction of the effect to blue crabs.
Cultural Resources	Phase II investigations identified two sites, 44MT0035 and 44MT0036; the former is associated with a 20th century railroad tank car and the latter a 19th or 20th century ship or barge. Neither of these sites are affected by placement activities at WTAPS.	Effects to cultural resources will be assessed when the draft Phase I archeological survey report is completed in early July. To avoid any adverse effects to historic properties, USACE is developing a Programmatic Agreement in consultation with the VADHR.
Noise	Short-term and restricted to the immediate vicinity of the activity.	Short-term and restricted to the immediate vicinity of the activity.

Resource Topic	Alternative 1 – No Action	Alternative 2 – Preferred Alternative
Navigation	The hopper dredge will not impede navigation in a marked navigation channel. To minimize the risk of collision, USACE would require the contractor to comply with USCG regulations.	The hopper dredge will not impede navigation in a marked navigation channel. To minimize the risk of collision, USACE would require the contractor to comply with USCG regulations.
Recreation	Temporary impacts to recreation during placement activities. The public will be able to access the area shortly after placement activities occur.	Temporary impacts to recreation during placement activities. The public will be able to access the area shortly after placement activities occur.
Fisheries	Fishing would be shifted elsewhere during placement activities. The proposed action would be expected to have a negligible or minor impact on fisheries.	Fishing would be shifted elsewhere during placement activities. The proposed action would be expected to have a negligible or minor impact on fisheries.
Environmental Justice	No disproportionally high and adverse human health or environmental effects on minority populations and low-income populations in the United States.	No disproportionally high and adverse human health or environmental effects on minority populations and low-income populations in the United States.

8.1 HYDROLOGY AND WATER QUALITY

Upon placement, dredged material will partition into a main cloud, which will descend vertically. The main cloud would descend to the bottom at a high velocity, leaving behind a turbidity cloud (CENAB, 2005).

Open water placement activities are expected to create some degree of turbidity in excess of ambient conditions up to 6,500 ft from the discharge location. During placement activities, suspended sediment levels can be as high as 500 mg/l within 250 feet of the discharge location, decreasing to background levels (i.e., 15 to 100 mg/l depending on location and sea conditions) within 1,000 to 6,500 feet of the discharge location. Total suspended solids (TSS) concentrations near the center of the plume created by the placement of dredged material have been observed to reach near background levels in 35 to 45 minutes (NOAA, 2017). Furthermore, the high flushing rate (due to the water exchange and tidal fluctuations) of the Chesapeake Bay is anticipated to minimize potential turbidity plumes and cause them to be more quickly dispersed, with no long-term measurable impacts to water quality.

The proposed action area is susceptible to wave-induced velocities that may cause sediments to become resuspended in the water column. The site is relatively shallow, with an average depth of 36 ft, and the area can experience wind speeds of 35 miles per hour or greater. The combination of water depth and high wind speeds may cause wave-induced velocities that could resuspend deposited materials. This generally occurs less than 48 hours per year. Material eroded out of this placement site would be expected to move northward in the Bay or locally to deeper parts of the Bay floor (CENAB, 1981).

Based on the sampling results, the placement of dredged material from the York Spit Channel into WTAPSNE would not be toxic to marine life. Metals of concern and PAHs occur at low levels, and would likely settle out onto the bottom remaining adsorbed to sediment and not be released into the water column.

Overall water circulation is expected to be unimpacted. No measurable changes in temperature, salinity, oxygen content or other chemical characteristics are expected. It is possible that infilling the trough with dredged material could reduce hypoxic conditions in the proposed action area. Water quality impacts during open water placement activities are expected to be temporary, minimal and similar to conditions of past placement events in WTAPS. Suspended particles are expected to settle out within a short time, with no long-term measurable effects on water quality. Thus, the proposed action would not result in any significant adverse impacts to water quality.

8.2 BATHYMETRY AND PHYSIOGRAPHY

Placement of dredged material into the proposed action area will change the bathymetry of the site. Depending on the amount of material dredged from the York Spit Channel during one maintenance dredging cycle, the thickness of the material that would be deposited in one cycle would range from 2 inches to 2 ft thick. It is expected that over time, some of the material will erode out of the placement site. The capacity of WTAPSNE is over 30 mcy, which assumes placement of dredged material within the site boundaries up to an approximate depth of -30 ft MLLW. Over the life of the project (until 2100), the depth of the site could change from an average depth of -36 ft MLLW to -30 ft MLLW.

A deep trough with a maximum depth of -55 ft MLLW termed “bay-stem channel” runs lengthwise through the site. If this channel was filled with dredged material, this area would change from a bay-stem channel to a bay-stem plain. As stated in Section 8.1 above, it is possible that infilling the trough with dredged material could reduce hypoxic conditions in the proposed action area.

8.3 GEOLOGY

Quality and texture of sediments dredged from the York Spit Channel is expected to be similar to the existing sediments in WTAPSNE. Therefore, no changes in geology in the proposed action area are expected.

8.4 AIR QUALITY

Minor, short-term, localized direct impacts to air quality would occur as a result of dredging activities that generate exhaust emissions every four years. Emissions will cease once construction stops. No long-term impacts to air quality would occur. Emissions would not pose a significant risk to the environment or the health of workers or the public because they will be minor in quantity and short-term in nature. Because the proposed action area is in attainment and no new stationary emissions sources will be created as part of the proposed action, no air quality conformity analysis is required.

8.5 FISH AND WILDLIFE

8.5.1 Threatened and Endangered Species

Federally-listed species

Effects from the No-Action Alternative (continued placement in the WTAPS) on NMFS-trust threatened and endangered species was assessed in the 2018 NMFS Biological Opinion (BO) (F/NER/2018/14816) (NOAA, 2018b). Activities covered under this BO included the construction and maintenance of the Baltimore Harbor and Channels Project Virginia Approach Channels and use of the associated dredged material placement sites. In the BO, NMFS concluded that that these activities may adversely affect, but are not likely to jeopardize the continued existence of any DPS of Atlantic sturgeon, Kemp’s ridley or green sea turtles or the Northwest Atlantic DPS of loggerhead sea turtles and is not likely to adversely affect leatherback sea turtles, hawksbill sea turtles, shortnose sturgeon, fin whales, sei whales, blue whale, sperm whales, and North Atlantic right whales. The BO allowed for a certain number of incidental take of listed species, primarily from dredging and not from placement, over the life of the project (50 years). The BO also included reasonable and prudent measures designed to minimize and monitor the impact of incidental take that might otherwise result from the activities including a time-of-year (TOY) restriction for dredging.

There are two peak windows for turtle activity in the lower Chesapeake Bay; in the spring (March to May) and in the fall (September to November). Restrictions on dredging during both windows was deemed by NAB to be too restrictive to dredging. Additionally, at least 6 contiguous months is required for dredging contracts. Therefore, in consultation with NMFS, dredging is only restricted during the fall window (from September 1 through November 14) because more turtles have historically been taken during hopper dredge activities in the fall than during the spring.

USACE, in coordination the NMFS, determined that the effects on listed species from the proposed action are similar to the effects considered in the 2018 NMFS Biological Opinion (F/NER/2018/14816) (NOAA, 2018b) for the lower Bay channels and placement areas. In an email dated May 6, 2019, NMFS concurred with the USACE determination that re-initiation is not warranted. Please refer to Appendix B: Endangered Species Act Coordination, for a detailed analysis on the effects of the proposed action on listed species and the rationale for the "no re-initiation" determination.

USACE determined that there will be no effect to listed species under the purview of USFWS. An effects analysis for the northern long-eared bat can be found in the USFWS Project Review Package located in Appendix B: Endangered Species Act Coordination. Through the online project review process, USFWS concurred with USACE's "no effect" determination in a letter dated February 14, 2019.

State-listed species

The Kemp's ridley, leatherback and loggerhead sea turtles and the Atlantic sturgeon are also federally-listed. An effects analysis for each of these species is included in the Request for Concurrence from NMFS of a No Re-Initiation Determination for WTAPSNE that is located in Appendix B: Endangered Species Act Coordination.

The hawksbill sea turtle is listed as endangered by the Commonwealth of Virginia (VADGIF, 2019). Hawksbill sea turtles are extremely rare in the Chesapeake Bay; only two have been reported since 1979. These turtles prefer tropical and subtropical waters (VIMS, 2019). Since it would be extremely rare for a hawksbill sea turtle to occur in the Chesapeake Bay, the proposed action will have no effect on the hawksbill sea turtle.

The West Indian manatee is listed as endangered by the Commonwealth of Virginia (VADGIF, 2019). The West Indian manatee is rarely seen in the Chesapeake Bay; its northernmost range is the Georgia coast. The West Indian manatee is found along the coast of Florida and in the Caribbean (USFWS, 2008). The last local live sighting was in November 2017 at the VIMS boat basin (Daily Press, 2017). Since it would be extremely rare for a West Indian manatee to occur in the Chesapeake Bay, the proposed action will have no effect on the West Indian manatee.

8.5.2 Finfish

Available literature regarding specific effects to fish behavior from dredged material placement activities is generally confined to turbidity, with little information available on effects from other aspects of dredging and placement.

It is anticipated that some slow-moving benthic individuals (bottom feeder finfish including windowpane, summer and winter flounder, scup, hogchoker, northern sea robin, northern stargazer (CBP, 2019a)), as well as larvae and eggs suspended in the water column, would be buried by 2 inches to 2 ft thick of sediment as a result of placement activities. Benthic individuals would be particularly vulnerable during months of coldest bottom water when fish could be lethargic.

It is expected that individuals would be permanently lost; however, impacts to the bottom feeder finfish population are expected to be negligible. Turbidity may cause temporary disorientation for some finfish. Because of their high mobility, most finfish are expected to be able to avoid being directly impacted by placement activities and would be temporarily displaced during placement operation. The existing community is also probably exposed to episodic oxygen stress and hypoxia, at least during some summers. Therefore, it is highly unlikely that finfish will suffer significant impacts as a result of placement activities.

8.5.3 Essential Fish Habitat

Please see Appendix C: Essential Fish Habitat Assessment for a comprehensive effects analysis for each species with EFH in the proposed action area. In summary, potential adverse effects to EFH of the 14 species described in this assessment would be periodic and concurrent with maintenance dredging of the York Spit Channel roughly every four years. Potential adverse effects due to turbidity and sedimentation would be temporary. The proposed dredged material placement would potentially disturb motile life stages of managed fish species, at least temporarily, which may cause them to seek alternative habitats elsewhere. This avoidance would occur only when dredged material placement activities are underway. The proposed placement sites comprise a small proportion of the suitable area within the lower Bay. There would be plentiful habitat available throughout the Bay, to include adjacent waters, from which fishes can forage during project activities. In-water work would occur over several months, and once completed, the local habitats would again be available to all managed fish species and their prey.

8.5.4 Benthic Community

This community is characterized by opportunistic and equilibrium species that are adapted to and tolerant of bottom-disturbing events such as major storms and flows. The existing community is also probably exposed to episodic oxygen stress and hypoxia, at least during some summers. Bottom-dump placement of dredged material typically produces mounded deposits on the Bay bottom, and the thickness of such mounds and the force of impacting sediment will be lethal to benthic organisms within the footprint of the deposit.

Impacts of dredged material placement on benthic habitats are varied and difficult to predict. Although many projects have been monitored and substantial literature exists on the subject, few generalizations can be made about typical recovery[24] rates because biological responses are influenced by numerous factors, including site-specific bathymetry, hydrodynamics, thickness of sediments, spatial scale of the disturbance, sediment type and the timing and frequency of

[24] Recovery is defined as a return of benthic resources to a baseline (pre-impact) condition.

disturbance. In general, recovery of the benthic community in deep, stable habitats is measured in years (Wilber and Clarke, 2007).

A two-year study by VIMS showed that benthic communities in WTAPS recovered fairly quickly, particularly when the depth of sediment deposited at the disposal site was relatively shallow. Sites buried by 6 inches or less of dredged material were minimally affected, with many of the organisms able to burrow back up to the surface. These organisms likely evolved this ability in response to frequent burial by tides and storms in the lower Chesapeake Bay. With deeper burial, beneath more than 6 inches of sediment, it took 1.5 years or less for the study sites to converge with reference sites in terms of species richness, abundance, biomass, and community composition. Recolonization via immigration from nearby areas was apparently more important for re-establishing benthic communities than upward migration of animals through the new sediment layers (Schaffner, 2010).

It is expected that the dredged material placement locations would return to pre-placement conditions following the project activities, with an approximation that the benthic community would become recolonized within 1.5 years. Placement activities would occur in accordance with the anticipated York Spit Channel maintenance schedule, or as necessary as a result of shoaling from storm events and other environmental factors. The benthic community would have an opportunity to fully recover following each dredged material placement event and prior to the subsequent such event.

8.5.5 Blue Crab

The effects of dredged material placement upon blue crab survival was studied by NAO and Engineer Research and Development Center (ERDC), using a controlled mesocosm study. Burial of mature female blue crabs at depths of 5 and 10 cm increased mortality, whereas few crabs survived burial depths of 30 cm. There did not appear to be an effect of burial duration, i.e., mortality rates did not increase over time. Although water temperatures reached lows of -2°C, the high survival rates of control crabs suggest low temperatures alone did not cause mortality. In addition, because survivors were recovered at the sediment surface, it appears that an inability to ascend through the sediment overburden was the cause of death, with a burial depth of 30 cm most associated with having very few crabs recovered at the sediment surface (ERDC, 2018).

Many factors influence fluctuations in blue crab abundances, including larval success, prey availability, predator abundance, habitat degradation, and disease. Overwintering mortality is another important factor affecting the variability in population size. Overwintering studies have found that smaller blue crabs are more likely to survive intense cold winters and mature females are more susceptible to mortality. Overwintering blue crab survival is highest in warmer, saline waters (ERDC, 2018).

Short-term project effects to blue crabs would consist primarily of direct mortality, by burial or asphyxiation, of overwintering female crabs, when these crabs are present within the dredged material placement area. Turbidity would result in suspended particulates within the water column and may temporarily degrade ambient water quality for nutrients, dissolved oxygen content, and other constituents. Turbidity may also clog the gills of fishes and invertebrates within the turbidity plume. Anoxic dredged materials may also contain chemically-reduced sediments which, at least in some circumstances, produce significant chemical oxygen demand (COD) within ambient waters at the site of disposal. In practice, however, this effect is generally mitigated by the entrainment of oxygen-rich surficial waters during overboard placement and by tidal mixing. Cold temperatures reduce the crabs' locomotor ability, and would make overwintering females susceptible to mortality by burial, especially in overburden thicknesses greater than 10cm.

Placement of dredged material into WTAPS while female crabs are not overwintering (generally from early April to mid-November) is not feasible due to higher costs to dredge in the summer and potential adverse impacts to sea turtles. A hopper dredge is the preferred dredge method because it is more cost efficient and generally performs better than other dredge types in rough sea conditions. A hopper dredge removes material from the bottom of the channel in thin layers with hydraulic pressure. Sea turtles are generally present in the lower Chesapeake Bay from April through November. Sea turtles are vulnerable to entrainment in the draghead of the hopper dredge when they are likely to be feeding or resting on the bay bottom. Measures can be taken to minimize adverse impacts to sea turtles including the use of a mechanical dredge instead of a hopper dredge. Mechanical dredging entails removing material by scooping it from the channel bottom using an open bucket or clamshell and then placing it on a barge. It is unlikely that sea turtles would be captured in the mechanical dredge, presumably because they are able to avoid the dredge bucket. However, it is more cost effective to use a hopper dredge than a mechanical dredge. Therefore, because a hopper dredge is more cost effective and to minimize adverse impacts to sea turtles that may be entrained in a hopper dredge, dredging and placement is conducted in the winter months.

When assessing the significance of this effect, however, it must be remembered that the WTAPSNE site is believed to support fewer overwintering female crabs than the currently-used WTAPS site. As previously discussed, a deep muddy channel runs through the center of WTAPSNE. According to the Dredge Disposal Effects on Blue Crab Report provided by VIMS (Appendix F), crab density will almost always be low in muddy habitats. It is likely that within the deeper, muddy channel, crab density will almost always be low due to the muddy habitat, which is usually avoided as an overwintering habitat by blue crabs (Lipcius and Knick, 2016).

If, due to placement of dredged material at WTAPSNE, crab habitat becomes more suitable in the area, USACE will reevaluate the use of individual WTAPSNE cells (Figure 4). If habitat alteration occurs, it may take multiple maintenance dredging cycles to alter habitat suitability over the entire WTAPSNE site. In FY 2020, NAB plans to begin a comprehensive evaluation of alternative placement sites and methods through a DMMP for the portion of the Baltimore Harbor and Channels Project located in Virginia.

8.6 CULTURAL RESOURCES

As stated in Section 7.6 above, the final Phase I archaeological survey report, with final results and National Register eligibility recommendations, is expected to be completed by July 31, 2019.

To avoid any adverse effects to historic properties, USACE is developing a Programmatic Agreement (PA) in consultation with the VADHR. The PA will address procedures for completing the Section 106 process for the remainder of the project, and it will be implemented before the final EA is signed.

8.7 NOISE

Noise impacts from project equipment are expected to increase in the vicinity during placement operations as a result of engine noise and noise emitted from other job-related equipment. While there is little that can be done to reduce noise during operations, these impacts would be short-term and restricted to the immediate vicinity of the activity. The west boundary of the proposed action area is located approximately 3 nm from the nearest shoreline and any noise from the area is dissipated by wind, waves, and distance before it reaches land. No long-term increase in noise would occur within the proposed action area. Noise is not expected to be a significant impact.

Many fish and marine mammal species in the Bay use noise to communicate, navigate, breed, and locate sources of food. Sensitivity to noise varies among species, location, and season. Underwater noise influences fish and other marine animal behavior resulting in changes in their hearing sensitivity and behavioral patterns. Sound is crucial to marine animals when they are hunting for prey, avoiding predators, or engaging in social interaction.

It is anticipated that noise produced during placement activities would not cause any mortality to marine life. However, underwater noise from the hopper dredge may alter the behavior of fish in the vicinity of the area during placement activities. Fish may alter swim speed and direction and fish communication could be affected. Overall noise impacts to marine life are expected to be minor and temporary.

8.8 NAVIGATION

The proposed action will not encroach into and impede navigation in a marked navigation channel. However, recreational and fishing vessels, and tow and tug vessels transit through the area. To minimize the risk of collision, USACE would utilize measures such as posting a Notice to Mariners, maintaining communication with passing vessels, and conducting operations in accordance with general regulations of the Department of the Army and the USCG governing lights and day signals. Utilizing these measures, impacts to navigation are anticipated to be negligible to minor.

8.9 RECREATION

Recreational vessels would not be able to access the waters of the proposed action area during placement activities. Fish may temporarily leave the area during placement activities. However, impacts to recreation will be minor and temporary and the public would be able to access the area shortly after placement activities occur.

8.10 FISHERIES

Fishermen would avoid the area during placement activities. Fishing would be shifted elsewhere. In light of the vast area of the Chesapeake Bay available in the vicinity of the proposed action area of equivalent value as fishing grounds, the proposed action would be expected to have a negligible or minor impact on fisheries. Placement activities would generate turbidity, but turbid conditions would be temporary with no anticipated impact on commercial fishing. Fisheries impacts would be comparable to those from the use of WTAPS, just shifted further north. However, because placement would be shifted north away from higher density blue crab wintering areas, there would be a reduction in adverse impacts to the blue crab population and thus to the blue crab fishery.

9.0 CUMULATIVE EFFECTS

The principal cumulative effects concerns are to Bay Bottom. Historical use of open water placement sites within the lower Chesapeake Bay has been necessary to accommodate large volumes of dredged material from the Baltimore Harbor and Channels Project. The project vicinity has historically been used for the placement of dredged material since the early 1960s. The proposed action would impact a new area of Bay Bottom that has not been previously impacted by material placement. The volumes, frequency, and acreage impacted by placement activities during any given dredging cycle of the York Spit Channel would not change, relative to the No Action Alternative. At potential greatest extent, over multiple dredging cycles, the area of Bay Bottom impacted would be cumulative greater. However, benthic recovery to pre-project conditions is anticipated within two years, more quickly than the four year dredging cycle, and therefore the total area used would have minimal bearing on benthic health and no adverse cumulative impacts.

The allowable placement area would be expanded, enabling dredged material to be placed in the northern extension area, and thereby mitigating adverse impacts on overwintering female blue crabs that currently occurs under the No-Action Alternative. Therefore, no adverse cumulative impacts to blue crabs are anticipated as a result of the proposed action.

Improvements to the Port of Baltimore, including improvements to berthing facilities at the Seagirt Marine Terminal and development of a new terminal at Tradepoint Atlantic (Sparrows Point) will support increased vessel traffic and increased vessel size utilizing York Spit Channel. These activities will not affect the maintenance dredging cycle and therefore will not affect lower Chesapeake Bay Bottom habitat.

Other activities planned or ongoing in the Lower Chesapeake Bay affecting Bay Bottom and the water column include ongoing maintenance and deepening of navigation channels serving The Port of Virginia. Additionally, Virginia Port growth is anticipated to increase throughout the next 50 years, and a new port facility is planned. Additional development, including construction of the Third Crossing (I-64 Hampton Roads Crossing) and expansion of the Chesapeake Bay Bridge Tunnel (parallel Thimble Shoal tunnels), is planned in the future. The implementation of the Preferred Alternative is not predicted to substantially cumulatively impact Bay Bottom with the aforementioned actions (USACE, 2018).

Dissolved oxygen levels in deeper waters in the middle Bay is a major concern. There are efforts underway by many entities to improve water quality in the Chesapeake Bay through a Total Maximum Daily Load (TMDL). Positive trends in Bay water quality would not be impacted by placement activities, because nutrient releases into the water column will remain the same as the No-Action Alternative over the dredging cycle.

10.0 MITIGATION

Available data indicate that WTAPS, particularly the southern portion, provides habitat for a high density of overwintering female blue crabs. By proceeding with the proposed action, adverse effects to these overwintering female crabs would be greatly reduced, relative to the No-Action alternative. Although blue crab is not managed under the Magnuson-Stevens Act, minimizing impacts to blue crabs mitigates EFH impacts for those managed fish species evaluated in this document for which blue crab is an important prey item.

To avoid/minimize adverse effects to ESA-listed sea turtles, USACE has implemented a TOY restriction from September 1 through November 14, of any year, on the dredging of the York Spit Channel. Therefore, dredged material placement would not occur at the proposed action area during this period. Furthermore, USACE generally seeks to perform this work in the winter and early spring, subject to availability of dredging contractors. This TOY would also help to avoid and minimize effects to sandbar shark HAPC used for pupping and nursery activities (occurring from May 1 to October 30).

Bottom-dump placement of dredged material typically produces mounded deposits on the bay bottom, and the thickness of such mounds and the force of impacting sediment will be lethal to benthic organisms within the footprint of the deposit. USACE considered requiring the contractor to smooth the deposits out to a roughly uniform thickness, but reworking the sediments in this way would be extremely costly, time consuming and likely ineffective. It would extend the duration of project disturbance, increase vessel traffic and emissions, and exacerbate turbidity. Moreover, distributing the sediments after placement would merely spread adverse effects over a much larger area. While it might result in somewhat-reduced mortality within the deposit footprint, it would greatly increase mortality and sublethal stress on benthic communities over a much larger area, and would result in delayed post-disturbance recovery and greater temporal loss of functions. If deposited “mounds” are left in place, natural tidal currents will gradually redistribute sediments, but this process would occur at a rate similar to that of natural sediment movements within the area, to which native benthic communities can acclimate with minimal risk of harm. For these reasons, USACE believes that spreading deposited material is not a viable measure to reduce project impacts, and would likely increase adverse effects to the benthic community.

11.0 COMPLIANCE OF THE PROPOSED ACTION WITH ENVIRONMENTAL PROTECTION STATUTES AND OTHER ENVIRONMENTAL REQUIREMENTS

Coastal Zone Management Act of 1972. NAB certifies that the proposed action complies with and will be conducted in a manner consistent with Section 307 of the Coastal Zone Management Act of 1972 and the approved program for the State of Virginia.

Clean Water Act of 1972. On October 30, 2013, the Commonwealth of Virginia issued a Virginia Water Protection Permit (13-0593) and a Section 401 Water Quality Certification for maintenance dredging of the York Spit Channel and for placement of dredged material into WTAPS. The permit and WQC expires on October 29, 2028. A 401 WQC for WTAPSNE will be obtained from VADEQ prior to placement activities in WTAPSNE.

Coastal Barrier Resources Act (CBRA) of 1982. No coastal zones covered under CBRA will be impacted by the proposed action. The Coastal Barrier Resources System mapper, created by USFWS, was referenced to verify there are no CBRA areas within the proposed action area.

Rivers and Harbors Act of 1899. The proposed action would not obstruct navigable waters of the United States.

Executive Order 13045, Protection of Children. The proposed action complies with EO 13045, "Protection of Children from Environmental Health Risks and Safety Risks", and does not represent disproportionally high and adverse environmental health or safety risks to children in the United States. The proposed action area is located in open water of the Chesapeake Bay and uninhabited; thus, no changes in demographics, housing, or public services would occur as a result of the proposed action. With respect to the protection of children, the likelihood of disproportionate risk to children is not significant. The proposed action does not involve activities that would pose any disproportionate environmental health risk or safety risk to children.

Executive Order 12898, Environmental Justice. The proposed action complies with EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations", and does not represent disproportionally high and adverse human health or environmental effects on minority populations and low-income populations in the United States. The proposed action is not designed to create a benefit for any group or individual. A review and evaluation of the proposed modification has not disclosed the existence of identifiable minority or low-income communities that would be adversely impacted.

Table 9. Compliance of the proposed action with environmental protection statutes and other environmental requirements.

Federal Statutes	Level of Compliance[1]
Anadromous Fish Conservation Act	N/A
Archeological and Historic Preservation Act	Partial
Clean Air Act	Full
Clean Water Act	Partial
Coastal Barrier Resources Act	N/A
Coastal Zone Management Act	Partial
Comprehensive Environmental Response, Compensation and Liability Act	N/A
Endangered Species Act	Full
Estuary Protection Act	Full
Farmland Protection Policy Act	N/A
Federal Water Project Recreation Act	N/A
Fish and Wildlife Coordination Act	Full
Land and Water Conservation Fund Act	N/A
Magnuson-Stevens Act	Partial
Marine Mammal Protection Act	N/A
Marine Protection, Research and Sanctuaries Act	N/A
National Environmental Policy Act	Partial
National Historic Preservation Act	Partial
Noise Control Act	Full
Resource Conservation and Recovery Act	N/A
Rivers and Harbors Act	Full
Safe Drinking Water Act	N/A
Solid Waste Disposal Act	N/A
Toxic Substances Control Act	N/A
Water Resources Planning Act	N/A
Watershed Protection and Flood Prevention Act	N/A
Wetlands Conservation Act	N/A
Wild and Scenic Rivers Act	N/A
Executive Orders (E.O.), Memoranda, etc.	
Migratory Bird (E.O. 13186)	Full
Protection and Enhancement of Environmental Quality (E.O. 11514)	Full
Protection and Enhancement of Cultural Environment (E.O. 11593)	Partial
Floodplain Management (E.O. 11988)	N/A
Protection of Wetlands (E.O. 11990)	N/A
Environmental Justice in Minority and Low-Income Populations (E.O. 12898)	Full
Protection of Children from Health Risks and Safety Risks (E.O. 13045)	Full
Chesapeake Bay Protection and Restoration (E.O. 13508)	Full
Invasive Species (E.O. 13112)	N/A
Indian Sacred Sites (E.O. 13007)	N/A
Stewardship of the Oceans, Our Coasts and the Great Lakes (E.O. 13547)	Full
Streamlining Service Delivery and Improving Customer Service (E.O. 13571)	Full
Facilitation of Cooperative Conservation (E.O. 13352)	Full

[1]Level of Compliance:
Full Compliance (Full): Having met all requirements of the federal statute, executive order (E.O.), or other environmental requirements.
Partial Compliance (Partial): Having partially met all requirements of the federal statute, E.O., or other environmental requirements. See Section 5.0, Environmental Consequences, for an explanation of each partial level of compliance listed in the table.
Not Applicable (N/A): No requirements for the federal statute, E.O., or other environmental requirements.

12.0 CONCLUSION

USACE, Baltimore District has determined that no significant impacts on the quality of the human environment are projected to occur upon implementation of the proposed action. The District made this determination based on the following:

a. WTAPSNE would be an extension of the existing authorized WTAPS. Effects on the human environment from placement of dredged material in WTAPS were evaluated in the 1987 Supplement #2 to the 1981 General Design Memorandum and EIS, and in the 2005 Baltimore Harbor and Channels (Maryland and Virginia) DMMP and Final Tiered EIS.
b. The proposed action would not create new or additional impacts, relative to the No-Action Alternative. The volumes, frequency and acreage impacted by placement activities during any given dredging cycle of the York Spit Channel would not change. It would merely expand the allowable placement area, to enable dredged material to be placed in the northern extension area, and thereby mitigate adverse impacts on overwintering female blue crabs that currently occurs under the No-Action Alternative.
c. Aside from mitigating impacts to Chesapeake Bay blue crab population associated with the No-Action Alternative, the proposed action is not anticipated to have any other significantly different effects on the human environment.
d. The project vicinity has historically been used for the placement of dredged material since the early 1960s. The proposed action would shift impacts to a different location, but would not create new or additional impacts. Therefore, no adverse cumulative impacts are anticipated as a result of the proposed action.

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