APPENDIX - I
FEDERAL SPECIES

I-64 Hampton Roads Bridge-Tunnel Expansion Project

Hampton Roads Connector Partners
240 Corporate Blvd. 4th floor
Norfolk, VA 23502

Hampton-Norfolk, Virginia
August 30, 2019

Design Joint Venture

ATTACHMENTS

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I. FEDERAL SPECIES

I.1 INTRODUCTION

This appendix assesses the potential impacts of the Hampton Roads Bridge and Tunnel Expansion Project on species protected under the Endangered Species Act (ESA). The ESA directs all Federal agencies to work to conserve endangered and threatened species and to use their authorities to further the purposes of the Act. Section 7 of the Act, called "Interagency Cooperation," is the mechanism by which Federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species. Marine species are under the jurisdiction of the National Marine Fisheries Service (NMFS) and terrestrial/inland species are under the jurisdiction of the United States Fish and Wildlife Service (USFWS). Additionally, the USFWS also manages The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c) of 1940. Neither eagle species are federally listed as threatened or endangered but are protected under this Act

I.2 CONSULTATION HISTORY

I.2.1 CONSULTATION HISTORY

In cooperation with Federal Highway Administration (FHWA), Virginia Department of Transportation (VDOT) has coordinated with local, state, regional, and federal agencies (U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS) throughout the duration of the Hampton Roads Crossing Study (HRCS). Coordination with local, state, regional, and federal agencies began in 1999 regarding the HRCS and the following coordination has occurred through the National Environmental Policy Act (NEPA).

In 2015, Pursuant to 40 CFR 1501.7, FHWA published a Notice of Intent (NOI) to prepare a Supplemental EIS in the Federal Register on 23 June 2015. Since the June 2015 NOI, the following coordination has occurred:

- On 27 July 2015, National Oceanic and Atmospheric Administration (NOAA) Fisheries was copied on a memorandum from the Commonwealth of Virginia to VDOT. This memorandum lists impacts to ESA-listed species within three alternative segments as well as their biodiversity significance rating. Impacted species under NMFS jurisdiction included Atlantic sturgeon, loggerhead sea turtle, and Kemp’s ridley sea turtle.

- On 6 August 2015, NOAA Fisheries sent a letter to VDOT to provide preliminary comments as VDOT and FHWA work to develop a SEIS for the HRCS. In this letter, NOAA Fisheries states that the HRCS project area might overlap with areas known to support several ESA-listed species, including four species of sea turtles including leatherback sea turtle, green sea turtle, Kemp’s ridley sea turtle, and the Northwest Atlantic Ocean Distinct Population Segment (DPS) of loggerhead sea turtle, as well as five DPSs of Atlantic sturgeon. NOAA Fisheries encouraged VDOT to consider the effects of the alternatives on ESA-listed species and reminds them that any discretionary federal action that may affect a listed species must undergo consultation pursuant to Section 7 of the ESA. As the federal lead agency for the HRCS project, FHWA would be responsible for determining whether the proposed action is likely to affect the listed species.

- On 4 November 2015, VDOT sent a letter to NOAA Fisheries requesting their approval of the species list (including Atlantic sturgeon, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, green sea turtle, and hawksbill sea turtle) as those which will be addressed in the SEIS, approval of the proposed review actions noted in the attached table and body of text, as well as approval of the qualified biologists proposed as responsible surveyors in charge of the habitat assessments for the purposes of providing input to the SEIS.

- On 12 November 2015, the Virginia Department of Conservation and Recreation's (DCR) sent a letter to Stantec Consulting Services, Inc. regarding the DCR search in their Biotics Data System for occurrences of natural heritage resources from the area outlined on the figure provided. At the time of this letter, the natural heritage resources of concern at the Project were the following species: gull-billed tern, black skimmer, royal tern, sandwich tern, Atlantic sturgeon, least tern, loggerhead sea turtle, Kemp's ridley sea turtle, canebrake rattlesnake, and Northern long-eared bat.

- In their 19 September 2016 comments on the Draft SEIS, NOAA Fisheries acknowledged that the information and level of detail needed to assess the potential for project impacts to aquatic resources, including listed species under their jurisdiction, is not normally available during the NEPA process and isn't developed until after a Record of Decision (ROD) is issued. This includes specific information on the means, methods, materials, timing and duration of various construction elements. NOAA Fisheries encouraged VDOT and FHWA to assess the effects of the proposed alternatives on ESA-listed species before selecting a Preferred Alternative. Finally, NOAA Fisheries indicated, "When specific project plans are being developed, FHWA should submit their determination of effects, along with justification for the determination of effects, and a request of concurrence to NOAA Fisheries Service ... " FHWA and VDOT will ensure that this determination and supporting information is submitted as soon as practicable.

- On 16 November 2016, the cooperating agencies for the HRCS met to concur on a preferred alternative to be recommended to the Commonwealth Transportation Board (CTB). During the meeting, cooperating agencies concurred that Alternative A, as described in the Draft SEIS, should be recommended to the CTB as the preferred alternative because it represented the LEDPA that meets the purpose and need of the project.

I.3 NMFS JURISDICTION SPECIES

A Biological Assessment (BA) was prepared to discuss the potential presence of and impacts to NMFS jurisdiction ESA species and is provided in Attachment 1 of this appendix. A summary of the NMFS jurisdiction ESA species with the potential to occur in the action area, their status, and the determination reached in the BA are provided in Table I-1 below.

Table I-1: Jurisdiction Species with the Potential to Occur in the Action Area

Common Name	Scientific Name	Federal Status	Determination
Fin whale	*Balaenoptera physalus*	E	**No Effect**
North Atlantic right whale	*Eubalaena glacialis*	E	**No Effect**
Hawksbill sea turtle	*Eretmochelys imbricata*	E	**No Effect**
Loggerhead sea turtle, Northwest Atlantic DPS	*Caretta caretta*	T	**Not Likely to Adversely Effect**
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	**Not Likely to Adversely Effect**
Green sea turtle, North Atlantic DPS	*Chelonia mydas*	T	**Not Likely to Adversely Effect**
Leatherback sea turtle	*Dermochelys coriacea*	E	**Not Likely to Adversely Effect**
Atlantic sturgeon, New York Bight DPS, Chesapeake Bay DPS, South Atlantic and Carolina DPS, Gulf of Maine DPS; Critical habitat	*Acipenser oxyrinchus oxyrinchus*	E	**Not Likely to Adversely Effect**
Shortnose sturgeon	*Acipenser brevirostrum*	E	**No Effect**

Key: DPS = Distinct Population Segment, E = Endangered, T = Threatened

I.4 ACTION AREA

The action area is defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. In Figure I-1 the area includes the project footprint where the work to construct the new bridge and tunnel as well as the removal of existing bridges will take place. This action area includes the areas where increased underwater noise levels, potential water quality impacts, onsite project vessel operations, as well as the transit routes in the James and Elizabeth Rivers vessels will take when transporting dredge and tunnel boring spoils from the project site to facilities located at Port Tobacco at Weaneck or Chesapeake VA for upland disposal (Figure I-2 below). The action area also includes the transit routes of vessels carrying bridge demolition debris to the same upland disposal facilities and potentially to four artificial reef locations located in the immediate vicinity of the Hampton Roads project area and mouth of the Elizabeth River.

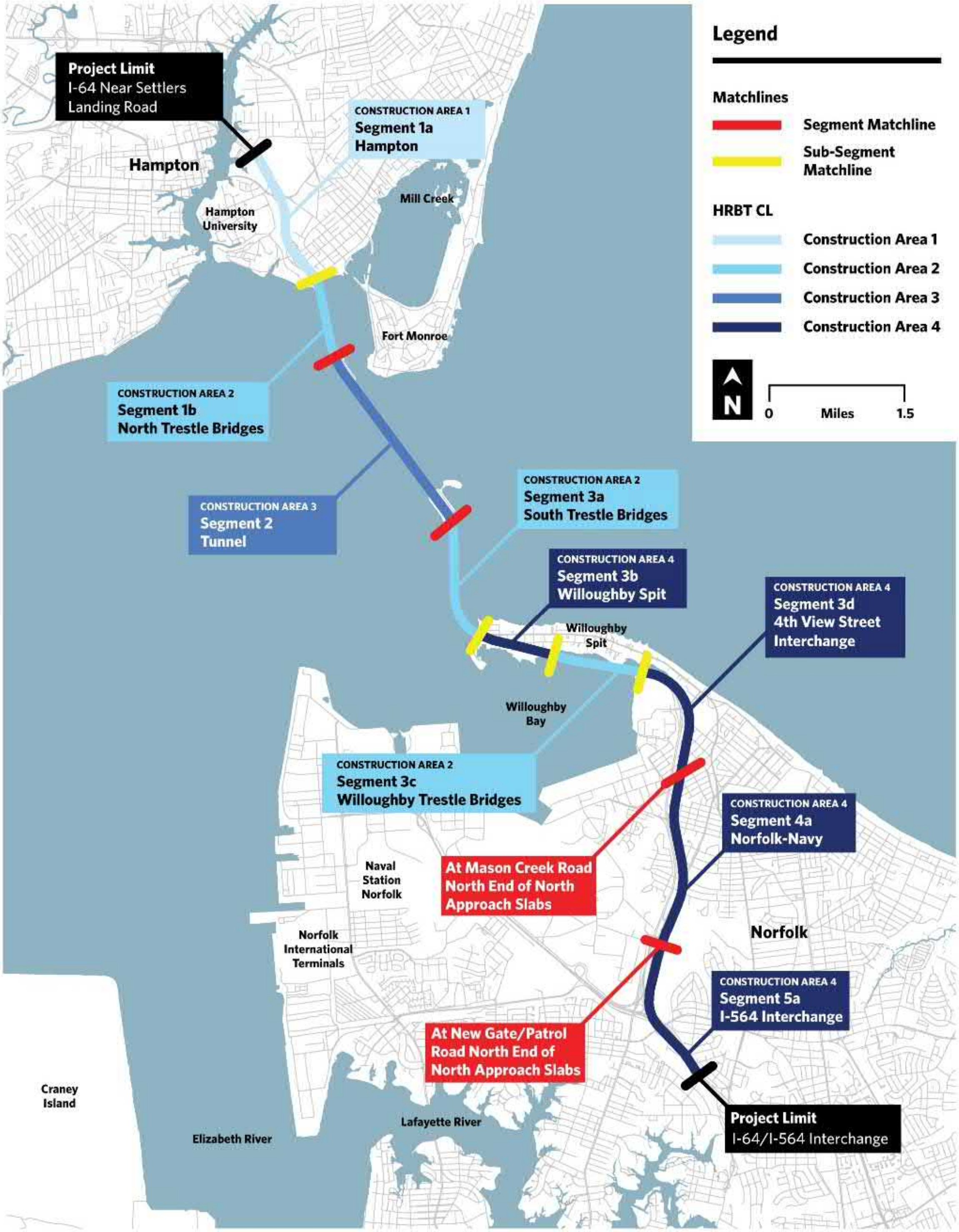

Figure I-1: HRBT Expansion Project Segment Map

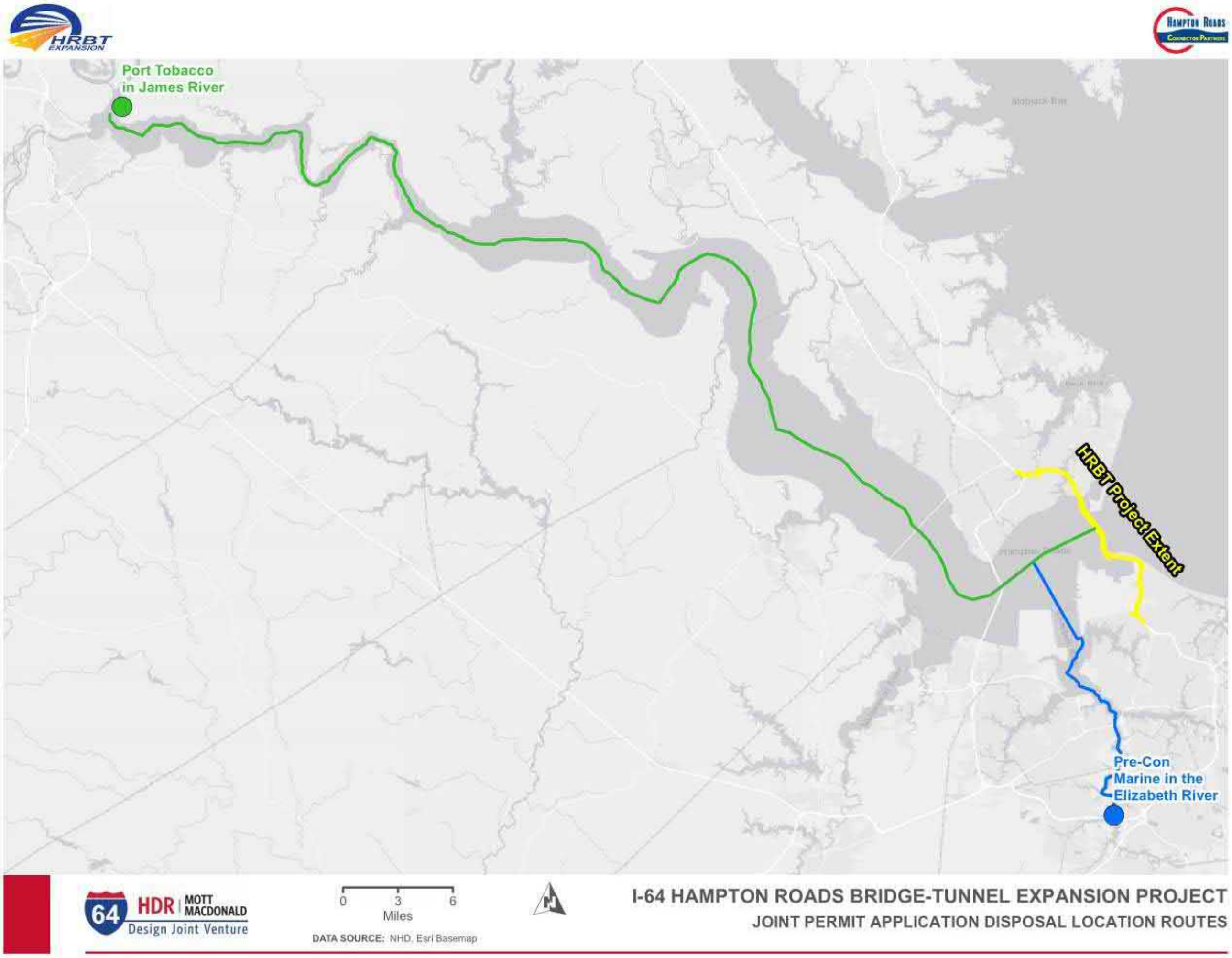

Figure I-2: Anticipated Disposal Locations and Barge Routes

I.5 USFWS JURISDICTION ESA SPECIES

An official USFWS List of Threatened and Endangered Species that may occur in our Project Area was obtained from the Information for Planning and Consultation tool (IPAC) on 11 August 2019 (Consultation Code: – 05E2VA00-2019-SLI-5741) (USFWS 2019a) (See Attachment 2 of this Appendix). Attachment 2 also contains species a species conclusion table as well as a review request letter.

The only federally listed species identified within the Project Area in the Official Species list is the piping plover *(Charadrius melodus).* However, additional listed species are potentially present based on the review of the Virginia Department of Game and Inland Fisheries (VDGIF Virginia Fish and Wildlife Information Service (VAFWIS) and of the Virginia Department of Conservation and Recreation's (DCR) Virginia Natural Heritage Data Explorer. These additional species include the Red Knot *(Calidrus* *canutus),* Northeastern Tiger Beetle *(Cincindela dorsalis),* Northern long-eared bat (*Myotis septentrionalis*) and nesting species of Sea turtles identified in Table I-1.

I.5.1 PIPING PLOVER.

In the James River and Chesapeake Bay, the piping plover historically nested on Craney Island in Norfolk and Grandview Beach in Hampton, outside of the Project area; however, no nesting has recently been documented in either location (Watts 2013; VDOT and FHWA 2016). Nesting habitats typically are laid in washover areas cut into or between dunes and often in close proximity to backside marshes, mudflats, or vegetation barriers where there is greater protection from predators. No nesting habitat occurs within the Project area. Piping plover have been observed in Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Suffolk (VDOT and FHWA 2016; DGIF 2019a; VDOT 2019). One sighting of a piping plover occurred at Fort Monroe, greater than one mile from the Project area (VDOT 2019). Project activities would not attract predators or interfere with piping plover breeding success, as no known breeding habitat occurs within the Project area. Figure I-1 depicts potential foraging areas for Piping Plovers and Red Knots as identified in the HRCS SEIS Natural Resources Technical Report (FHWA and VDOT 2016).

Figure I-3: Potential Foraging areas for Piping Plovers and Red Knots

A few areas of sandy shoreline at Willoughby Spit and marsh under the I-64 bridges in Hampton and Norfolk were identified as suboptimal foraging areas (areas appearing to have more frequent human disturbance) in Norfolk and Hampton (Figure I-3) (FHWA and VDOT 2016). A large portion of the shoreline within the Project area are hardened and/or developed and provide no habitat potential for this species. Piping plover foraging habitat consists of beaches and intertidal mud and sand flats

(FHWA and VDOT 2016). Piping plovers are highly mobile and are capable of avoiding project activities and impacts such as elevated noise levels and active construction in the unlikely event they are present in this area. Ongoing coordination will continue with Federal and State agencies.

I.5.2 RED KNOT

Red knots have the potential to occur in the Project area, starting in mid-April to May, prior to making one of the longest migrations in the world (USFWS 2019b) to breeding areas above the Arctic Circle from June to July. Red knots appear to have highly diverse routes; with some flying over open-ocean and some hugging the United States (U.S.) Atlantic coast for the duration of the migration (USFWS 2019b). These birds stop over along the Atlantic coast for feeding (USFWS 2019b), which occurs primarily on sandy or stony beaches but may also occur in mudflats.

A few areas of sandy shoreline at Willoughby Spit and marsh under the I-64 bridges in Hampton and Norfolk were identified as suboptimal foraging areas in Norfolk and Hampton (Figure 1-3) because the shorelines within the Project area are hardened and/or developed and provide no habitat potential (VDOT and FHWA 2016). VDOT (2019) data indicate that one observation of red knot occurred at Fort Monroe, greater than one mile from the Project area. There are documented sightings of red knots in the Cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, and Suffolk (VDOT and FHWA 2016). A large portion of the shoreline within the Project area are hardened and/or developed and provide no habitat potential for this species. Suboptimal red knot foraging habitat occurs within the Project area. Bridge construction would result in temporary disturbance of this habitat. Bridge foundation construction and demolition activities would directly impact suboptimal habitat at Willoughby Spit and access to this area might disturb this habitat. This disturbance will be temporary. Red knots are highly mobile and could avoid Project activities in the unlikely event they are present in the suboptimal foraging habitat. Ongoing coordination will continue with Federal and State agencies.

I.5.3 NORTH EASTERN TIGER BEETLE

The VAFWIS May 2019 and Virginia Department of Conservation and Recreation's Virginia Natural Heritage Data Explorer query for Hampton (City) and Norfolk (City) on 3 May 2019 indicated that the northeastern beach tiger beetle has the potential to occur in the Project area. This species is only found along wide, saltwater beaches of medium to medium-coarse sand, from about the foredune to the high tide lines (Natureserve 2019); however, this type of habitat is not present in the Project area which contains primarily modified shorelines. Additionally, there were no confirmed sightings of this species in the Project area. This species is unlikely to be affected by Project activities.

I.5.4 NESTING SEA TURTLES

Sea turtle nesting is not expected in the action area, as nesting sites in Virginia are primarily limited to ocean facing beaches and this habitat is not present in the action area (VDOT and FHWA 2016). This species is unlikely to be affected by Project activities.

I.5.5 NORTHERN LONG-EARED BAT

Impacts to listed bat species (federally and state-listed Northern long-eared bat and state-listed brown bat and tri-colored bat) were considered in the Final SEIS and the re- evaluation (VDOT and FHWA 2016, 2017, 2018). Smaller fragmented areas of forest and individual trees may provide suitable roosting habitat, but in general would be considered suboptimal habitat. Additionally, no confirmed northern long-eared bat observations, maternity roosts, or hibernacula are located within a two-mile radius of the LOD (VAFWIS 2019, VDOT 2019). Some work in uplands and jurisdictional waters of the U.S. will require the selective removal or trees and other vegetation. The majority of the work that could require tree removal is adjacent to Interstate I-64 or underneath the I-64 trestle, in VDOT right of ways. Because bat habitat identified within the LOD limits of disturbance is sub-optimal and no confirmed maternity roosts or hibernacula are located within a two-mile radius of the LOD (VDOT and FHWA 2016, 2017, 2018), any trees that would be removed would be associated with already disturbed and fragmented habitat and construction activities would not affect the quality of the habitat. Additionally, because the northern long-eared bat was not included in the 11 August 2019 USFWS IPAC official species list, it is excluded from further consideration.

I.6 BALD AND GOLDEN EAGLE PROTECTION ACT

Bald and Golden eagles are protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The bald eagle can be found in this area year-round and as migrants that pass through the area. According to the USFWS, Chesapeake Bay Field Office, the Chesapeake Bay currently has one of the highest concentrations of bald eagles in the lower 48 states. In addition to the breeding population, the Chesapeake Bay supports a wintering population of bald eagles from as far north as Canada and summer migrants from Florida (USFWS 2011). Bald Eagle (*Haliaeetus leucophalus*)

A bald eagle nest search was conducted using the Center for Conservation Biology Virginia Bald Eagle Nest Locator database (Watts and Byrd 2013), the results are provided in Attachment 3 of this appendix as well as Figure I-4 below. No nests were found within the limits of disturbance (LOD) for the project and the LOD did not overlap with the primary 330 foot buffer or secondary 660 foot buffer around each nest. There were 3 active nests and one inactive nest located within a 2 mile buffer of the LOD. The closest nest is located more than 1,200 ft from project activities, and unlikely to experience adverse effects from noise or light produced by project activities. The remaining nests are considerable further from the project activities and less likely to experience adverse affects. Figure I-2 depicts distances from eagle nest buffers to the project area as well as other observations of state and federal threatened species.

Figure I-4: Threatened and Endangered Species Map

I.7 REFERENCES

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ATTACHMENT I-1 SPECIES CONCLUSIONS TABLE

SPECIES CONCLUSIONS TABLE

Project Name: Hampton Roads Bridge and Tunnel Expansion (HRBT)

Date: 08/11/2019

Species / Resource Name	Conclusion	ESA Section 7	Notes / Documentation
Northern long-eared bat	No suitable habitat present	No effect	This species was not identified in the IPAC August 11, 2019 Official Species List. No determination key was available. Habitat assessment indicates that fragmented areas of forest and individual trees may provide suitable roosting habitat, but in general would be considered suboptimal habitat (VDOT and FHWA 2016). No confirmed northern long-eared bat observations, maternity roosts, or hibernacula are located within a two-mile radius of the project area.
Northeastern beach tiger beetle	Species (listed/proposed) not present	No effect	This species was not identified in the IPAC August 11, 2019 Official Species List. Habitat for this species, saltwater beaches from about the foredune to the high tide lines (Natureserve 2019), is not present in the project area.
Piping plover	Species (listed/proposed) present	Not likely to adversely affect	No suitable nesting habitat, suboptimal foraging habit, several documented occurrences 1 - 2 miles from the project (Appendix G in VDOT and FHWA 2016; DGIF 2019; CEDAR 2019).
Red knot	Species (listed/proposed) present	Not likely to adversely affect	This species was not identified in the IPAC August 11, 2019 Official Species List. No suitable nesting habitat present, suboptimal foraging habitat present; several documented occurrences 1 - 2 miles from the project (Appendix G in VDOT and FHWA 2016; DGIF 2019; CEDAR 2019).
Critical habitat	No critical habitat present for species under USFWS	No effect	
Nesting sea turtles	No suitable habitat present	No effect	Sea turtle nesting is not expected in the action area, as nesting sites in Virginia are primarily limited to ocean facing beaches and this habitat is not present in the action

			area (VDOT and FHWA 2016). This species is unlikely to be affected by Project activities
Bald eagle	Unlikely to disturb nesting bald eagles, does not intersect with an eagle concentration area.	No Bald and Golden Eagle Act permit required.	Based on review Center for Conservation Biology VaEagles Nest Locator, no nests are within 660ft of the project area.

REFERENCES:

NatureServe. 2019. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://explorer.natureserve.org (Accessed: 6 May 2019).

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VDOT (Virginia Department of Transportation) and FHWA (Federal Highway Administration). 2017. Hampton Roads Crossing Study Final Supplemental Environmental Impact Statement.

ATTACHMENT I-2 NMFS BIOLOGICAL ASSESSMENT

APPENDIX – I, ATTACHMENT 1
BIOLOGICAL ASSESSMENT

I-64 Hampton Roads Bridge-Tunnel Expansion Project

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August 30, 2019

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I. ATTACHMENT 1: BIOLOGICAL ASSESSMENT

I.1 INTRODUCTION

The purpose of this Biological Assessment (BA) is to assess the potential effects of the Hampton Roads Bridge-Tunnel Expansion Project (HRBT) on marine Endangered Species Act (ESA)-listed species, or their designated critical habitat. This BA has been prepared by the Hampton Roads Connector Partners (HRCP), the HRBT design-build contractor, for Virginia Department of Transportation (VDOT), and in cooperation with the Federal Highway Administration (FHWA). This BA evaluates the potential effects of the infrastructure improvements proposed for the I-64 HRBT Project, in Hampton Roads, Virginia Beach, Virginia, on marine species listed under the ESA.

The purpose of HRBT is to relieve congestion at the I-64 HRBT in a manner that improves accessibility, transit, emergency evacuation, and military and goods movement along the primary transportation corridors in the Hampton Roads region, including the I-64, I-664, I-564, and Route 164 corridors. Because work will occur adjacent to, or in, the Chesapeake Bay, it could affect the following ESA-listed marine species that have the potential to occur in the area: hawksbill sea turtle (*Eretmochelys imbricata*); green sea turtle (*Chelonia mydas*) (North Atlantic Distinct Population Segments [DPSs]); loggerhead sea turtle (*Caretta caretta*) (Northwest Atlantic DPS); Kemp's ridley sea turtle (*Lepidochelys kempii*); leatherback sea turtle (*Dermochelys coriacea*); North Atlantic right whale (*Eubalaena glacialis*); fin whale (*Balaenoptera physalus*); Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) (New York Bight, Chesapeake Bay, South Atlantic and Carolina DPS; threatened Gulf of Maine DPS); shortnose sturgeon (*Acipenser brevirostrum*).

Early coordination and pre-consultation with National Marine Fisheries Service (NMFS) was conducted during a series of site visits, meetings, and phone conversations including: a letter to the NMFS in June 2015, and a November 2016 cooperating agencies meeting that requested concurrence on their determination that Alternative A, as described in the Draft Supplemental Environmental Impact Statement (EIS), should be recommended to the Commonwealth Transportation Board (CTB) as the preferred alternative because it represents the Least Environmentally Damaging Practicable Alternative (LEDPA) that meets the purpose and need of the HRBT Project. The actions of the Hampton Roads Transportation Planning organization (HRTPO) and the Hampton Roads Transportation Accountability Commission to endorse Alternative A and commit to its implementation with a series of other projects in the HRTPO 2040 Long Range Transportation Plan was a factor in this concurrence, as was the dedication of funding for the continued study of a new crossing of the Elizabeth River in the vicinity of Craney Island.

Concurrence was based on the planning level information that was provided in the Draft Supplemental EIS. However, NMFS was unable to provide substantive recommendations until the means, methods and materials for construction of various project elements have been determined. Therefore, as project planning and design advance, NMFS reserved the right to provide conservation recommendations in the future under the Magnuson Stevens Fishery Conservation and Management Act to protect essential fish habitat designated for federally managed species. NMFS also works to protect anadromous species from impacts under the Fish and Wildlife Coordination Act. Because federally-listed threatened and endangered species may also occur within the action area, coordination under Section 7 of the ESA is required as this project moves forward.

This BA documents potential effects that would result from the current design of the HRBT and the planned construction means and methods.

I.1.1 CONSULTATION HISTORY

In cooperation with FHWA, VDOT has coordinated with local, state, regional, and federal agencies (U.S. Fish and Wildlife Service (USFWS), NMFS) throughout the duration of the Hampton Roads Crossing Study (HRCS), the previous official name for this project. Coordination with local, state, regional, and federal agencies began in 1999 regarding the HRCS and the following coordination has occurred through the National Environmental Policy Act (NEPA) process.

In 2015, Pursuant to 40 CFR 1501.7, FHWA published a Notice of Intent (NOI) to prepare a SEIS in the Federal Register on 23 June 2015. Since the June 2015 NOI, the following coordination has occurred:

- On 27 July 2015, National Oceanic and Atmospheric Administration (NOAA) Fisheries was copied on a memorandum from the Commonwealth of Virginia to VDOT. This memorandum lists impacts to ESA-listed species within three alternative segments as well as their biodiversity significance rating. Impacted species under NMFS jurisdiction included Atlantic sturgeon, loggerhead sea turtle, and Kemp's ridley sea turtle.
- On 6 August 2015, NOAA Fisheries sent a letter to VDOT to provide preliminary comments as VDOT and FHWA work to develop a SEIS for the Hampton Roads Crossing Study (HRCS). In this letter, NOAA Fisheries states that the HRCS project area might overlap with areas known to support several ESA-listed species, including four species of sea turtles including leatherback sea turtle, green sea turtle, Kemp's ridley sea turtle, and the Northwest Atlantic Ocean DPS of loggerhead sea turtle, as well as five DPSs of Atlantic sturgeon. NOAA Fisheries encouraged VDOT to consider the effects of the alternatives on ESA-listed species and reminds them that any discretionary federal action that may affect a listed species must undergo consultation pursuant to Section 7 of the ESA. As the federal lead agency for the HRCS project, FHWA would be responsible for determining whether the proposed action is likely to affect the listed species.
- On 4 November 2015, VDOT sent a letter to NOAA Fisheries requesting their approval of the species list (including Atlantic sturgeon, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, green sea turtle, and hawksbill sea turtle) as those which will be addressed in the SEIS, approval of the proposed review actions noted in the attached table and body of text.
- In their 19 September 2016 comments on the Draft SEIS, NOAA Fisheries acknowledged that the information and level of detail needed to assess the potential for project impacts to aquatic resources, including listed species under their jurisdiction, is not normally available during the

NEPA process and isn't developed until after a Record of Decision (ROD) is issued. This includes specific information on the means, methods, materials, timing and duration of various construction elements. NOAA Fisheries also encouraged VDOT and FHWA to assess the effects of the proposed alternatives on ESA-listed species before selecting a Preferred Alternative. Finally, NOAA Fisheries indicated, "When specific project plans are being developed, FHWA should submit their determination of effects, along with justification for the determination of effects, and a request of concurrence to NOAA Fisheries Service ... " FHWA and VDOT will ensure that this determination and supporting information is submitted as soon as practicable.

- Within Appendix H of the FSEIS, the FHWA and VDOT provide written responses to comments provided by the NMFS. In response, FHWA and VDOT state that (1) Best Management Practices would be determined during the final design and permitting phases, after the issuance of a ROD and (2) Given the nature of the marine species and the extent of their habitat, the Preferred Alternative was not likely to adversely affect endangered and threatened species.
- On 16 November 2016, the cooperating agencies for the HRCS met to concur on a preferred alternative to be recommended to the Commonwealth Transportation Board (CTB). During the meeting, cooperating agencies concurred that Alternative A, as described in the Draft SEIS, should be recommended to the CTB as the preferred alternative because it represented the LEDPA that meets the purpose and need of the project.
- On 23 January 2017, NOAA Fisheries sent a letter to VDOT summarizing a meeting held between the two parties on 16 November 2016. During the meeting, cooperating agencies concurred that Alternative A, as described in the Draft SEIS should be recommended to the CTB as the preferred alternative because it represents the least environmentally damaging practicable alternative that meets the purpose and need of the project. However, NOAA Fisheries stated that they would not provide recommendations until the means, methods, and materials for construction have been determined during final design. Because federally listed threatened and endangered species may occur within the project area, coordination under Section 7 of the Endangered Species Act may be required as this project moves forward. NOAA Fisheries indicated that VDOT's responsibilities for EFH, anadromous fish and ESA-listed species consultation are outlined in the NOAA Fisheries letter to VDOT dated 6 August 2015.
- On 27 June 2019, HRCP held a teleconference with Jolie Harrison and Robert Pauline, NMFS Office of Protected Resources staff to discuss status of the HRBT planned actions and the approach to be used for the Marine Mammal Protection Act (MMPA) incidental take authorizations.
- On 28 June 2019, HRCP presented a Pile Driving & MMPA Meeting to the regulatory agencies. This was attended by David O'Brien, NOAA Fisheries, and Robert Pauline, NOAA Fisheries.

I.2 DESCRIPTION OF THE ACTION & ACTION AREA

I.2.1 PROJECT DESCRIPTION

The Hampton Roads Bridge Tunnel Expansion Project ("Project") will widen I-64 for approximately 9.9 miles along I-64 from Settlers Landing Road in Hampton, Virginia to the I-64/I-564 interchange in Norfolk, Virginia. The Project will create an eight lane facility with six consistent use lanes. The expanded facility will include four general purpose lanes, two new HOT lanes, and two new drivable (hard-running) shoulders to be used as HOT lanes during peak usage.

The Project will include full replacement of the North and South Trestle Bridges, two new parallel tunnels constructed using a Tunnel Boring Machine (TBM), expansion of the existing portal islands, and widening of the Willoughby Bay Trestle Bridges, Bay Avenue Trestle Bridges, and Oastes Creek Trestle Bridges. Also, upland portions of I-64 will be widened to accommodate the additional lanes, the Mallory Street Bridge will be replaced, and the I-64 overpass bridges will be improved.

I.2.2 PROPOSED ACTION

The existing bridge-tunnel facility is a four-lane facility including bridges, trestles, man-made islands, and tunnels under the main shipping channel for Hampton Roads harbor. It connects the Phoebus area of Hampton with Willoughby Spit in Norfolk. The Project will include the construction of two new two-lane tunnels, expansion of the existing portal islands, and full replacement of the existing trestle-bridges at the HRBT as well as the Willoughby Bay Trestle Bridge. Once construction is complete, there will be a total of four tunnels, two new and two old with two tunnels being used for eastbound traffic and two being used for westbound traffic. A full bridge replacement is planned for the Mallory Street interchange and the remaining landside bridges. Additionally, the roadway within the Project will be widened. Additional detail on components of the proposed action with the potential to affect listed species are described below.

I.2.2.1 PERMANENT FEATURES

I.2.2.1.1 PORTAL ISLAND EXPANSION:

The existing North and South Island structures need to be expanded to accommodate the new tunnels and associated structures. The North Island needs to be expanded by 715,000 ft^2 (16.41 acres). The South Island needs to be expanded by 115,000 ft^2 (2.64 acres). The island expansion will result in permanent loss of 19.41 acres of intertidal and subtidal benthic habitat. The existing benthic habitat in these footprints will be replaced by a variety of fill materials that will compose the area of the islands.

The footprint of the North and South Island expansion areas will be dredged to a depth of 3 ft. This dredging will remove soft sediment, existing shoreline armor stones (where needed) and other obstructions to prepare the area for island expansion. This will result in the direct removal of benthic substrates as well as organisms living within or on the substrates.

A gravel bund (berm) will then be placed around the outer edge of the island expansion footprint. The bund is then covered in underlayment stone and then capped with larger armoring stone to create a protected perimeter around the footprint of the island expansion. The area within the protected perimeter will be filled with a variety of materials. Sand will be placed at the North Island expansion and then compacted to form the new island footprint. At the South Island expansion area, piles will also be driven to prevent settling of the structures to be built in this area. Sheet piles will also be driven within the footprint of this area to support the excavation and construction of the structures in this area.

I.2.2.1.2 NORTH AND SOUTH TRESTLE BRIDGES

The existing 2 lane North and South Trestle Bridges will be demolished and reconstructed. The North Trestle Bridge will be replaced by two 4 lane structures with approximately 75 spans of 65 to 120 feet long. Span bents will be supported by approximately 478 precast 54-inch cylindrical piles or 30-inch precast square piles.

The two existing two-lane South Trestle Bridges will also be demolished. They will be replaced by an eight-lane structure with spans up to 130 feet long. Span bents will be supported by approximately 680 precast 54-inch cylindrical piles or 30-inch precast square piles. Piles will be driven to support approximately 91 spans including portions of the Y-shaped split at the north end of the trestle bridge.

I.2.2.1.3 WILLOUGHBY, BAY AVENUE, AND OASTES CREEK TRESTLE BRIDGES

The existing Willoughby Bay Trestle Bridge structure will be modified by widening the two existing structures to the outside in both directions to accommodate new travel lanes, shoulders, and new sound barriers. This will require installation of two to three additional piles at each pier location on the outside of both structures. Approximately 350 30-inch precast square piles will be driven to support the expansion.

The trestle bridges crossing Bay Avenue and Oastes Creek will be similarly expanded. With approximately 210 piles driven at the Bay Avenue crossing and 92 at Oastes Creek.

I.2.2.1.4 TEMPORARY STRUCTURES:

There are several temporary pile supported structures that are needed to support different components of the project. The duration that piles will be in place varies from a few months to several years. The installation of the piles will temporarily disturb the benthic sediments in the footprint of each pile. The piles will be driven with a combination of vibratory, impact, or down-the-hole hammers.

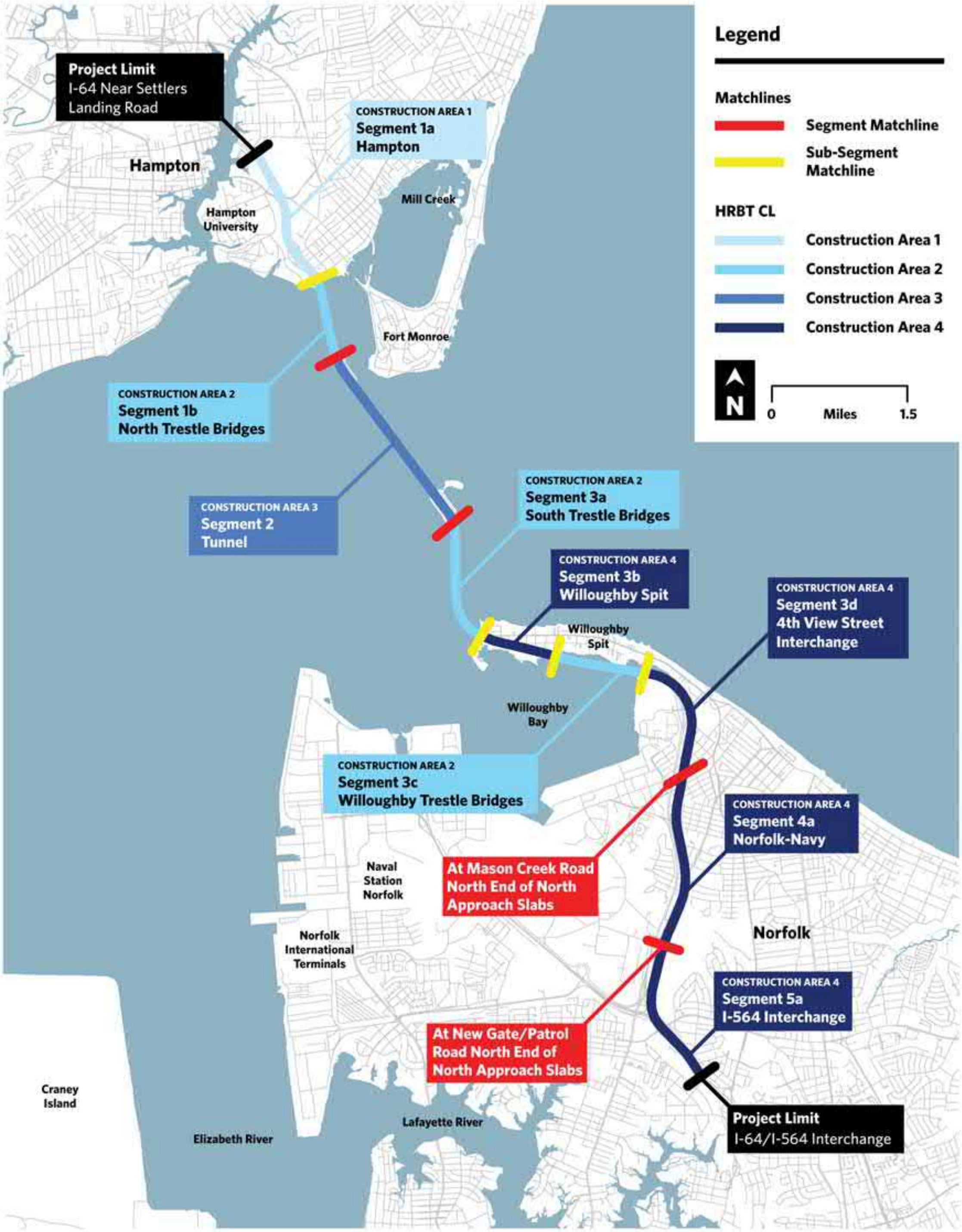
I.2.2.1.5 DREDGING

Dredging is also required to support construction of the permanent South Trestle Bridge and demolition of the existing structures. A total of 248,000 ft^2 (5.69 Acres) will be dredged. The areas to be dredged have depths of less than 4.5ft and will be dredged to allow access for project vessels and equipment.

I.2.3 ACTION AREA

The action area is defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. In Figure I-1 the area includes the project footprint where the work to construct the new bridge and tunnel as well as the removal of existing bridges will take place. This action area includes the areas where increased underwater noise levels, potential water quality impacts, onsite project vessel operations, as well as the transit routes in the James and Elizabeth Rivers where vessels will take when transporting dredge and tunnel boring spoils from the project site to facilities located at Port Tobacco at Weaneck or Chesapeake, Virginia for upland disposal (Figure I-3 below). The action area also includes the transit routes of vessels carrying bridge demolition debris to the same upland disposal facilities and potentially to four artificial reef locations located in the immediate vicinity of the Project area and mouth of the Elizabeth River.

Figure I-1: HRBT Expansion Project Segment Map



I.3 LISTED SPECIES & CRITICAL HABITAT IN THE ACTION AREA

Threatened and endangered marine species protected under the ESA with NMFS jurisdiction that have the potential to occur in the vicinity of the action area, were identified from previous SEIS and Re-Evaluation Statements (VDOT and FHWA 2017, 2018), the Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations (OBIS SEAMAP) database (Halpin et al. 2006; OBIS SEAMAP 2019), the U.S. Navy's Virginia Capes Marine Resource Assessments (Department of the Navy [DoN] 2008, 2009), the U.S. Navy's Atlantic Fleet Training and Testing Final EIS/Overseas EIS (DoN 2013), Movebank Data Repository (database of animal tracking data) (Movebank 2019),Comprehensive Environmental Data and Reporting System (CEDAR) database (VDOT 2019), NMFS ESA Section 7 Mapper (NMFS Greater Atlantic Regional Fisheries Office (GARFO) 2019), and Virginia Department of Game and Inland Fisheries (DGIF) Virginia Fish and Wildlife Information Service (VAFWIS) (DGIF 2019. The federally-listed threatened or endangered species that may be present in the HRBT action area are listed in Table I-1.

Table I-1: Marine Threatened and Endangered Species with potential to occur in the Action Area

Common Name	Scientific Name	Federal Status
Fin whale	*Balaenoptera physalus*	E
North Atlantic right whale	*Eubalaena glacialis*	E
Hawksbill sea turtle	*Eretmochelys imbricata*	E
Loggerhead sea turtle, Northwest Atlantic DPS	*Caretta caretta*	T
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
Green sea turtle, North Atlantic DPS	*Chelonia mydas*	T
Leatherback sea turtle	*Dermochelys coriacea*	E
Atlantic sturgeon, New York Bight DPS, Chesapeake Bay DPS, South Atlantic and Carolina DPS, Gulf of Maine DPS; Critical habitat	*Acipenser oxyrinchus oxyrinchus*	E
Shortnose sturgeon	*Acipenser brevirostrum*	E

Key: DPS = Distinct Population Segment, E = Endangered, T = Threatened

I.4 STATUS OF SPECIES WITHIN THE ACTION AREA AND EFFECTS DETERMINATION

I.4.1 SPECIES WITH "NO EFFECT" DETERMINATION

While the coordination and database searches indicates these species have potential to occur in the action area, relevant literature indicates that the following species would not occur in the action area; therefore, the actions being considered will have no effect or no impacts, positive or negative, to listed or proposed resources: hawksbill sea turtle, shortnose sturgeon, North Atlantic right whale, and fin whale. These species are listed as endangered species under the ESA. The rationale for these "no effect" determinations are presented below.

I.4.1.1 HAWKSBILL SEA TURTLE

Hawksbill turtles are classified as endangered under the ESA (Table I-1). Hawksbill sea turtle critical habitat includes coastal waters surrounding Mona and Monito Islands, Puerto Rico (63 FR 46693). There is no designated critical habitat for hawksbill sea turtles in the action area.

Hawksbill sea turtles are a tropical species that are circum-tropical in distribution and in the western North Atlantic Ocean; this species is found throughout the Gulf of Mexico, the Greater and Lesser Antilles, southern Florida, and along the mainland of Central America south to Brazil (DoN 2008) and is most commonly found among healthy coral reefs (NMFS and USFWS 2013a). Foraging populations in U.S. waters occur in the vicinity of the coral reefs off of Mona Island, Puerto Rico and Buck Island, St, Croix, U.S. Virgin Islands (DoN 2008). Nesting is rare in the continental U.S. and is restricted to the southeast coast of Florida and the Florida Keys (Dodd 1995, DoN 2008). The hawksbill sea turtle is considered to be rare north of Florida (Plotkin 1995; DoN 2008), although sightings and strandings have been recorded in Massachusetts, Virginia, North Carolina, and Georgia (Lee and Palmer 1981, Keinath et al. 1991, DoN 2008).

Hawksbill sea turtles have been observed in Virginia waters during all seasons (Keinath et al. 1991, DoN 2008, Diaz 2011a, b, Garrison 2013); however, the hawksbill sea turtle is a very uncommon species in the region and sightings are considered extralimital in the Chesapeake Bay (DoN 2008). Sightings of hawksbill sea turtles are expected to be within shelf waters or along the shelf break and not in shallower water of the Chesapeake Bay (DoN 2008). Waters of the Chesapeake Bay do not provide optimal developmental habitat for juveniles or foraging habitat for adults (Diez et al. 2003; DoN 2008). The only confirmed sightings in the inshore waters of Virginia since 1991 were three turtles: a commercial fisherman caught a juvenile hawksbill at the mouth of the James River in November 1991, which was later released in Florida (Keinath et al. 1991, DoN 2009), and two stranded turtles: one in December 2000 and one in November 2004 (Keinath et al. 1991; Virginia Institute of Marine Science (VIMS) 2008; DoN 2009; Barco and Lockhart 2016). Therefore, the hawksbill sea turtle is not expected in the action area and would not be exposed to any effects of bridge construction and is not discussed further.

I.4.1.2 SHORTNOSE STURGEON

The shortnose sturgeon is listed as endangered under the ESA (Table I-1) and there is no designated critical habitat for this species in the Chesapeake Bay. Shortnose sturgeon are freshwater amphidromous fish (i.e., spawns in fresh water, but regularly enters seawater during various stages of its life) (Shortnose Sturgeon Status Review Team 2010) that live in rivers and coastal waters along the east coast of North America (NMFS 1998). The current distribution and abundance of shortnose in the Chesapeake Bay is unknown (Shortnose Sturgeon Status Review Team 2010). Shortnose sturgeon spend most of their life in natal rivers and occasionally enter the ocean (NMFS 1998). Adults move far upstream and away from saltwater to spawn during the spring and after spawning, move rapidly back downstream to the estuaries, where they feed, rest, and spend most of their time (Shortnose Sturgeon Status Review Team 2010).

Shortnose sturgeon are rare in the Chesapeake Bay and most are reported in the upper Chesapeake Bay or in the Potomac River, outside of the action area (Balazik 2017); however, one shortnose sturgeon was collected in the freshwater portion of the James River in 2016 (Balazik 2017). The individual was considered mature and a subsequent genetic analysis assigned the fish to the Chesapeake Bay/Delaware population segment. It is unclear if the shortnose sturgeon captured in the James River is a remnant of a natural population that was almost extirpated, or a roaming fish from either the Potomac River, about 75 miles (120 km) away, or from the Delaware River, 211 miles (340 km) away, via the Chesapeake and Delaware Canal (Balazik 2017). A gravid female shortnose sturgeon was captured by VCU biologists in the lower James River in 2018. This fish was tagged and tracked back to the Delaware River, which is believed to be its natal river (Balazik and Garmin 2019). The action area does not represent important, staging, feeding, spawning, or overwintering habitat for shortnose sturgeon. Based on their rarity in the Chesapeake Bay, and the minimal effects expected from the HRBT Project, no effects on shortnose sturgeon are expected; therefore, this species is not discussed further.

I.4.1.3 NORTH ATLANTIC RIGHT WHALE

North Atlantic right whales are listed as endangered under the ESA (Table I-1), and are considered one of the most critically endangered large whale species in the world (Clapham et al. 1999; Weinrich et al. 2000; Hayes et al. 2018; 71 Federal Register (FR) 77704; 73 FR 12024). Three critical habitat areas were designated for this species in 1994: (1) the Cape Cod Bay/Stellwagen Bank, (2) the Great South Channel, and (3) waters adjacent to the coasts of Georgia and the east coast of Florida (59 FR 28805). In 2016, NMFS issued a final rule to replace the critical habitat for right whales in the North Atlantic with two new areas. The areas being designated as critical habitat contain approximately 29,763 nm^2 of marine habitat in the Gulf of Maine and Georges Bank region (Unit 1) and off the Southeast U.S. coast (Unit 2) (81 FR 4837). No critical habitat occurs in the action area.

Since the 1890s, commercial whalers had hunted North Atlantic right whales to the brink of extinction. Although whaling is no longer a threat to the species, the leading causes of known mortality for North Atlantic right whales are entanglement in fishing gear and vessel strikes (Hayes et al. 2018). North Atlantic right whales inhabit the Atlantic Ocean and belong to the Western stock (formerly the Western North Atlantic stock) (Hayes et al. 2018). The most recent estimate of abundance is 451 individuals in the Western stock while the minimum population estimate is 445 (Hayes et al. 2018). Based off the North Atlantic Right Whale Consortium 2018 Annual Report Card, the best population estimate for the end of 2017 is 411 North Atlantic right whales (Pettis et al. 2018). In 2017, 17 North Atlantic right whales were confirmed dead or stranded (12 in Canada; 5 in the U.S.) and in 2018, three whales were stranded in the U.S; these deaths declared an Unusual Mortality Event (UME) (National Oceanic and Atmospheric Administration (NOAA) Fisheries 2019). Despite recovery efforts, North Atlantic right whales face a high risk of extinction into the foreseeable future (NMFS 2012b).

The Western stock primarily inhabits coastal waters from southeastern U.S. (Florida) to New England north to the Bay of Fundy, Scotian Shelf, and Gulf of St. Lawrence (Hayes et al. 2018). Research suggests that there are seven major habitats or congregation areas for this stock (Hayes et al. 2018): (1) the coastal waters of the southeastern U.S. (winter calving grounds [Florida and Georgia]); (2) the Great South Channel (spring calving grounds); (3) Jordan Basin; (4) Georges Bank/Gulf of Maine (fall feeding grounds); (5) Cape Cod and Massachusetts Bays (late winter/spring feeding grounds and nursery grounds); (6) the Bay of Fundy (summer/fall feeding grounds); and (7) the Scotian Shelf (summer/fall feeding grounds) (Weinrich et al. 2000; Mellinger et al. 2011; Hayes et al. 2018). In addition, Jeffreys Ledge, off the coasts of Massachusetts, New Hampshire, and Maine, is considered an important fall feeding area and summer nursery area for these whales (Weinrich et al. 2000).

The Mid-Atlantic region has been identified as a primary migratory corridor for North Atlantic right whales (Knowlton et al. 2002; Firestone et al. 2008). Seasonal north-south migration of the Western stock occurs between feeding and calving areas, but North Atlantic right whales could be seen anywhere off the Atlantic U.S. throughout the year (Hayes et al. 2018). Seasonal occurrence of right whales in mid-Atlantic waters is normally during November through April, with peaks in December and April (Winn et al. 1986; Firestone et al. 2008) when whales are migrating to and from breeding/feeding grounds.

Passive acoustic studies have demonstrated that North Atlantic right whales occur off Virginia year-round (Salisbury et al. 2016). They have also been reported seasonally off Virginia during migrations in the spring, fall and winter (CETAP 1981, 1982; Niemeyer et al. 2008; Kahn et al. 2009; McLellan 2011b, 2013; Mallette et al. 2016, 2017, 2018; Palka et al. 2017; Cotter 2019). North Atlantic right whales are known to frequent the coastal waters of the mouth of the Chesapeake Bay and the area is a seasonal management area (1 November – 30 April) mandating reduced ship speeds out to approximately 20 nautical miles for the species; however, the HRBT Project is further inshore.

North Atlantic right whales have stranded in Virginia, one each in 2001, 2002, 2004, 2005: three during winter (February and March) and one in summer (September) (Costidis et al. 2017, 2019). All right whale strandings in Virginia waters have occurred on ocean-facing beaches along Virginia Beach and the barrier islands seaward of the lower Delmarva Peninsula (Costidis et al. 2017). Although there are no documented strandings near the action area, in January 2018, a dead, entangled North Atlantic right whale was observed floating over 60 miles offshore of Virginia Beach (Costidis et al. 2019). This stranding was included as part of the 2017-2019 North Atlantic Right Whale Unusual Mortality Event

(NOAA Fisheries 2019). This species is not likely to occur in the action area; therefore, it would not be exposed to any effects of bridge construction and is not discussed further.

I.4.1.4 FIN WHALE

The fin whale is listed as endangered under the ESA although no critical habitat is designated (Table I-1). Fin whales in the North Atlantic belong to the Western North Atlantic stock (Hayes et al. 2018). The fin whale is MMPA depleted throughout its range. Fin whales were once hunted by commercial whalers, which greatly lowered their population. Since the ESA listing in 1970, population numbers have increased which has had a positive effect on the species' recovery (NMFS 2019). NMFS initiated a 5-year review of the fin whale in January 2018 to determine whether a reclassification or delisting may be warranted (NMFS 2019). In February 2019, the review indicated that, based on the best available scientific and commercial information, that the fin whale should be downlisted from endangered to threatened; however, this downlisting has not occurred and is recommended for future actions (NMFS 2019).

The most recent estimate of abundance is 1,618 individuals in the Western North Atlantic stock while the minimum population estimate is 1,234 (Hayes et al. 2018). Fin whales are typically found in waters of the Atlantic Exclusive Economic Zone, from Cape Hatteras, North Carolina, northward to Maine (Hayes et al. 2018). New England waters tend to be the feeding grounds for the fin whale and it is believed that whales on these grounds exhibit patterns of seasonal occurrence and annual return (Hayes et al. 2018). Fin whales are in the mid-ocean near the Mid-Atlantic ridge from late fall through early winter (BOEM 2014).

The Chesapeake Bay region is considered to be a normal part of the range of the fin whale and it is noted that it was probably the most abundant large whale in Virginia's waters (Blaylock 1985; DoN 2009). Fin whales have been seen off Virginia (Cetacean and Turtle Assessment Program (CETAP) 1981, 1982; Swingle et al. 1993; Hyrenbach et al. 2012; Barco 2013; Mallette et al. 2016; Engelhaupt et al. 2017, 2018; Cotter 2019), and in the Chesapeake Bay (Bailey 1948; CETAP 1981, 1982; Morgan et al. 2002; DoN 2009; Barco 2013; Aschettino et al. 2018); however, they are not likely to occur in the action area. Rare sightings around the Chesapeake Bay Bridge Tunnel have occurred during the winter months; (CETAP 1981, 1982; Barco 2013; Aschettino et al. 2018).

Eleven fin whale strandings have occurred in Virginia from 1988-2016 mostly during the winter months of February and March, followed by a few in the spring and summer months (Costidis et al. 2017). Six of the strandings occurred in the Chesapeake Bay (three on eastern shore; three on western shore) with the remaining five occurring on the Atlantic coast (Costidis et al. 2017). Documented strandings near the action area have occurred: in February 2012, a dead fin whale washed ashore on Oceanview Beach in Norfolk (Swingle et al. 2013); in December 2017, a live fin whale stranded on a shoal in Newport News and died at the site (Swingle et al. 2018); in February 2014, a dead fin whale stranded on a sand bar in Pocomoke Sound near Great Fox Island, Accomack (Swingle et al. 2015); and, in March 2007, a dead fin whale stranded near Craney Island, in the Elizabeth River, Norfolk (Barco 2013).

While stranding data indicate that fin whales could potentially be present in the action area, all known occurrences of fin whales in the action area are strandings. Because no live fin whales have been documented in the action area, fin whales are not expected to occur in or near the action area. As such, it has been determined that the potential for fin whales to be exposed to any effects of Project construction is so low, it is discountable and the project is not likely to adversely affect fin whales. This species is not discussed further.

I.4.2 SPECIES WITH "MAY AFFECT, BUT NOT LIKELY TO ADVERSELY AFFECT" DETERMINATION

The marine species classified as threatened or endangered under the federal ESA that could occur in the waters surrounding the HRBT in the Chesapeake Bay are shown Table I-1. This includes four sea turtles, and one fish species. The following ESA-listed marine species occur within the action area, and may be affected by, but are not likely to be adversely affected by the proposed action: loggerhead sea turtle; green sea turtle; Kemp's ridley sea turtle; leatherback sea turtle, and Atlantic sturgeon. The rationale for this "may affect, but not likely to adversely affect" determination is presented below.

I.4.2.1 SEA TURTLES (LOGGERHEAD, KEMP'S RIDLEY, GREEN, AND LEATHERBACK)

Four listed sea turtle species have been observed in the Virginia waters of the Chesapeake Bay near the HRBT: **the loggerhead sea turtle** (endangered - Northwest Atlantic DPS) (HDR 2011; Engelhaupt et al. 2016; Mallette et al. 2016, 2017; Palka et al. 2017); **Kemp's ridley sea turtle** (critically endangered) (HDR 2011; Barco 2014; Engelhaupt et al. 2016; Palka et al. 2017; Barco and Lockhart 2014, 2015, 2016; Barco et al. 2017, 2018); **green sea turtle** (threatened - North Atlantic DPS) (Palka et al. 2017); and **leatherback sea turtle** (endangered) (HDR 2011; Garrison 2013; Barco 2014; Engelhaupt et al. 2016; Palka et al. 2017; Mallette et al. 2016, 2017) (Table I-1). Sea turtles in Virginia waters are migratory, appearing in the region in the late spring when water temperatures rise to approximately 20° Celsius, and leave in the fall when water temperatures decrease (Seney and Musick 2007; Mansfield et al. 2009; Barco and Lockhart 2016). Loggerhead and Kemp's ridley sea turtles are the most abundant sea turtle species off of Virginia (Musick and Limpus 1997; Swingle et al. 2010, 2011, 2012, 2013, 2014; 2015, 2016; Barco and Lockhart 2016; Palka et al. 2017; Barco et al. 2017, 2018a) and are expected to be seen in the action area (Barco and Lockhart 2015, 2016; Barco et al. 2017, 2018a; Barco 2018; Lockhart 2018).

Sea turtle strandings have been documented within the State of Virginia and the action area and are tracked by the Virginia Aquarium & Marine Science Center Foundation Stranding Response Program (VAQS). From 2011 to 2018 there were a total of 2031 strandings recorded with a yearly average of 254 (Table I-2). On average the majority of strandings were composed of Loggerheads (58.5%) and Kemp's Ridley (29%) while Green (7.7%), Leatherback (1.8%), and unknown species that could not be identified (3%) represent a minor portion of the total number of strandings. While the number of turtle strandings peaks during the months of May and June for all species, moderate numbers of strandings are observed consistently July through January, and are at their lowest levels from February through April (Table I-3). Please note that minor discrepancies were observed in the VAQS reports for the annual totals (Table I-2) of each species and the figure that provides the number of each species observed each month (Table I-3).

Table I-2: Number of sea turtle strandings in Virginia from 2011-2018. Data compiled from VAQS annual reports. (Swingle et al. 2012-2018 and Costidis et al. 2019).

Species	2011	2012	2013	2014	2015	2016	2017	2018	Total	Average
Loggerhead	131	170	171	146	125	133	163	149	1188	149
Kemp's Ridley	30	47	70	78	90	89	84	101	589	74
Green	5	12	11	12	69	19	13	16	157	20
Leatherback	4	1	6	2	4	8	11	0	36	5
Hawksbill	0	0	0	0	0	0	0	0	0	0
Unknown	3	2	5	10	7	14	12	8	61	8
Total	**173**	**232**	**263**	**248**	**295**	**263**	**283**	**274**	**2031**	**254**

Table I-3: Number of sea turtle strandings in Virginia per month from 2016-2018. Data compiled from VAQS annual reports.

Month	Loggerhead	Kemp's Ridley	Green	Leatherback	Unknown	*Monthly Total*
January	7	12	10	0	0	***29***
February	4	4	1	0	0	***9***
March	1	1	0	0	0	***2***
April	5	4	0	0	1	***10***
May	35	91	0	3	5	***134***
June	108	54	39	16	13	***230***
July	54	14	2	0	4	***74***
August	48	11	2	0	4	***65***
September	49	17	1	0	1	***68***
October	41	24	6	0	5	***76***
November	63	32	7	0	0	***102***
December	36	5	10	0	0	***51***

I.4.2.1.1 LOGGERHEAD SEA TURTLES

Loggerhead sea turtles are found throughout temperate and tropical regions of the Atlantic, ranging from Newfoundland to as far south as Argentina, and they are the most abundant species of sea turtle found in U.S. coastal waters of the Atlantic Ocean (NMFS 2013). Nesting occurs from April through early September on beaches in the northwest Gulf coast of Florida through Texas, east coast of Florida, Georgia, North Carolina, and South Carolina (NMFS 2013). There is no designated critical habitat in the action area; however, NMFS designated marine critical habitat for the Northwest Atlantic Ocean DPS of loggerhead sea turtles (79 FR 39855). The closest of these areas is off the coast of North Carolina. Specific areas for designation include 38 occupied marine areas within the range of the

Northwest Atlantic Ocean DPS; these areas contain one or a combination of habitat types: nearshore reproductive habitat, winter area, breeding areas, constricted migratory corridors, and *Sargassum* habitat (79 FR 39855). Juvenile loggerhead sea turtles are frequent visitors to the Hampton Roads area of the Chesapeake Bay (Barco and Lockhart 2015; VDOT and FHWA 2016). The Chesapeake Bay is an important temperate foraging area for juvenile, sub-adult, adult male and post-nesting female loggerhead turtles that travel to the Mid-Atlantic Bight from breeding grounds in the southeastern U.S. (Griffin et al. 2013; Barco et al. 2018b). Loggerhead sea turtles feed on mollusks, horseshoe crabs (*Limulus polyphemus*), blue crabs (*Callinectes sapidus*), barnacles, echinoderms, and sponges (Seney and Musick 2007; VDOT and FHWA 2016).

I.4.2.1.2 KEMP'S RIDLEY SEA TURTLES

Kemp's ridley sea turtles are distributed throughout the Gulf of Mexico and U.S. Atlantic, from Florida to New England and as far north as Nova Scotia and Newfoundland (NMFS et al. 2011). The Kemp's ridley is the most endangered sea turtle and no critical habitat is designated for the species (NMFS et al. 2011). Most Kemp's ridley nests located in the U.S. have been found in south Texas, especially Padre Island, and less frequently in Florida, Alabama, Georgia, South Carolina, and North Carolina (NMFS et al. 2011). Nesting does not occur in the Chesapeake Bay, Virginia. The majority of the Kemp's ridley sea turtles in the Chesapeake Bay are also juveniles, which enter the bay to forage as the water warms, and leave by early November (VDOT and FHWA 2016). Kemp's ridley sea turtles feed on blue crabs, spider crabs, hermit crabs, clams, mussels, and shrimp, fish, sea urchins, squid and jellyfish (NMFS et al. 2011). Kemp's ridley and loggerhead sea turtles would primarily use the action area to opportunistically forage from April to November (VDOT and FHWA 2016).

I.4.2.1.3 NESTING GREEN SEA TURTLES

In the North Atlantic, nesting green sea turtles are primarily found in Puerto Rico, the Virgin Islands, and the east coast of Florida with lower numbers in Georgia, South Carolina, and North Carolina (63 FR 46693). Juveniles are prevalent in all of these areas, and also coastal areas of the Gulf of Mexico. The green sea turtle is threatened and in 1998, it was determined that habitat loss and degradation of seagrass beds were primary factors slowing the recovery of green turtles in the Caribbean. As a result, critical habitat was designated for green turtles to include the coastal waters around Culebra Island, Puerto Rico (63 FR 46693). Therefore, no critical habitat is designated for the action area. Green sea turtles occur in the Chesapeake Bay during the late summer and early fall, and most are juveniles (Barco and Lockhart 2015; VDOT and FHWA 2016; VIMS 2019). Green sea turtles forage mainly on marine sea grasses in the shallow areas of the Chesapeake Bay, though they may also forage on sponges and other invertebrates (VDOT and FHWA 2016).

I.4.2.1.4 LEATHERBACK SEA TURTLES

Leatherback sea turtles in the Atlantic Ocean are found as far north as the North Sea, Barents Sea, Newfoundland, and Labrador (James et al. 2005a) and as far south as Argentina and the Cape of Good Hope, South Africa (Hughes et al. 1998; Luschi et al. 2003b, 2006; Marquez 1990; NMFS and USFWS 2013b). The leatherback sea turtle is endangered throughout its range and critical habitat in the Atlantic Ocean has been designated off St. Croix, U.S. Virgin Islands (43 FR 43688; NMFS and USFWS 2013b). Critical habitat is not designated for the action area. Leatherback sea turtles nest on beaches in the tropics and sub-tropics and forage in higher-latitude subpolar waters (NMFS and USFWS 2013b). Within the U.S., the majority of leatherback sea turtle nesting colonies are in Puerto Rico and the Virgin Islands, with some nesting in southeast Florida. The leatherback sea turtle, the third most abundant turtle in Virginia's waters (VIMS 2019), appears to occur further off the Virginia coastline (Keinath et al. 1991) and nesting does not occur on Virginia beaches (VDOT and FHAW 2016). Leatherback sea turtles roam near shore and into estuaries, but usually feed in coastal and offshore waters (VDOT and FHWA 2016). Leatherback sea turtles would primarily use the action area to opportunistically forage from April to November (VDOT and FHWA 2016) and could be seen in small numbers.

Sea turtles are mobile and are able to avoid sources of temporary disturbance, if necessary, therefore, sea turtles are not likely to be adversely affected by the proposed action. The potential impact to Sea turtles are discussed in greater detail in subsequent sections.

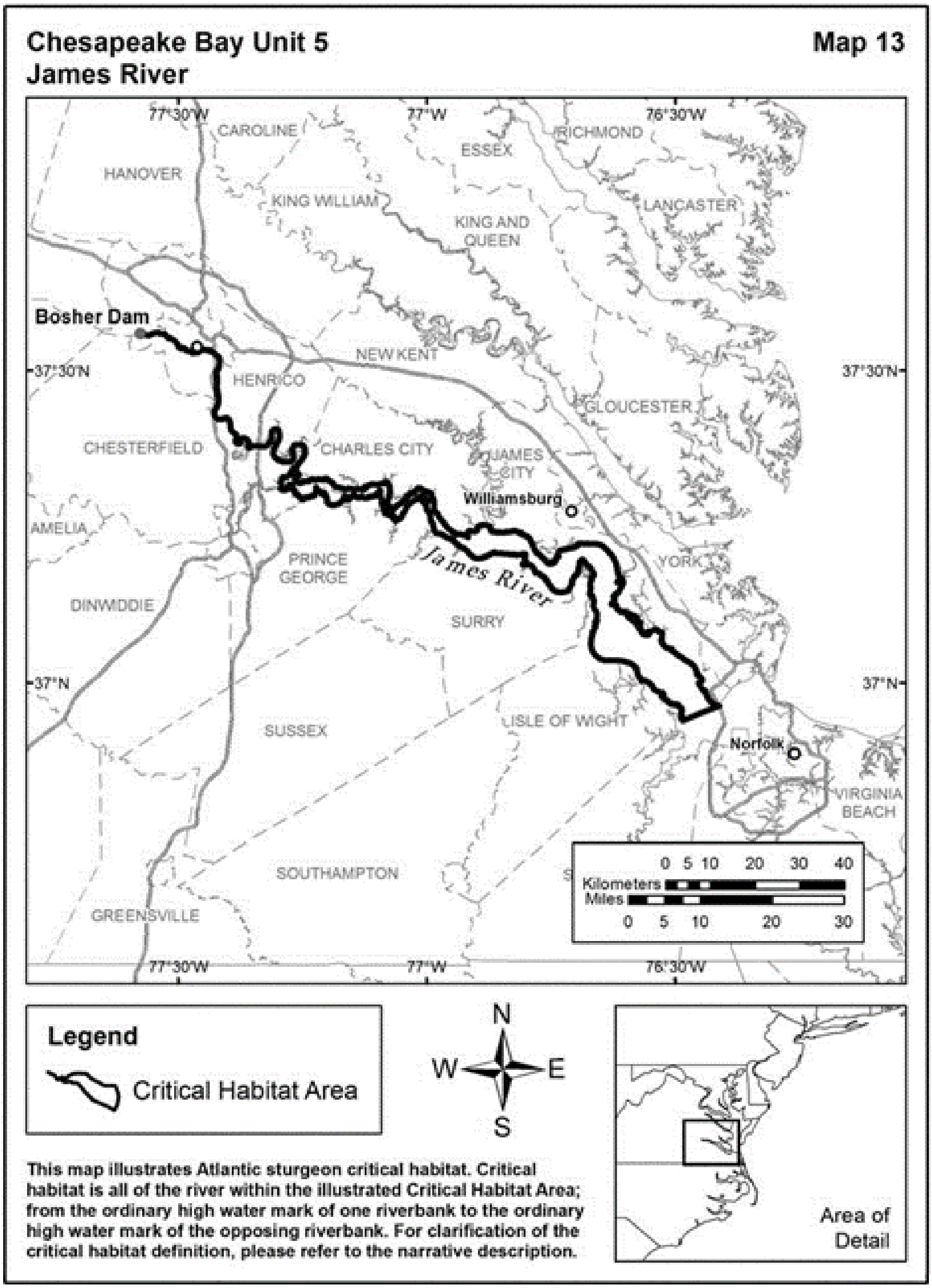
I.4.2.2 ATLANTIC STURGEON

Atlantic sturgeon are anadromous fish (i.e., migrate from the ocean into freshwater to spawn) that live in rivers and coastal waters from Canada to Florida (Atlantic States Marine Fisheries Commission 2017; Balazik and Garman 2019). Atlantic sturgeon in the Chesapeake Bay and surrounding areas belong to the Chesapeake Bay DPS and are listed as endangered under the ESA and critical habitat has been designated for this DPS (81 FR 35701; 82 FR 39160; 84 FR 13809; VDOT and FHWA 2017) (Figure 1; Table 1). In Virginia, the final rule designated critical habitat in occupied areas of the following rivers within the Chesapeake Bay DPS: Potomac, Rappahannock, York, Pamunkey, Mattaponi, and James (82 FR 39160; VDOT and FHWA 2017). All portions of the James River from Boshers Dam west of Richmond, downstream to where the main stem river discharges at the mouth of the river into the Chesapeake Bay at Hampton Roads is critical habitat for the Atlantic sturgeon (81 FR 35701; 82 FR 39160; VDOT and FHWA 2017) (Figure I-2). The critical habitat area does not include the portion of the James River at the HRBT.

Atlantic sturgeon primarily use the action area as a migration corridor between coastal marine and riverine habitats during spawning migrations (Balazik and Garman 2019). Spawning has been documented in the James River in the spring and fall and the groups are genetically distinct (Balazik and Garman 2018, 2019). The James River (including Hampton Roads) is identified as a Confirmed Anadromous Fish Use Area and Atlantic Sturgeon use these areas to complete their life cycles (VDOT and FHWA 2017; DGIF 2019). During migrations, Atlantic sturgeon primarily transit along the river within natural or artificial channels (Balazik et al. 2012; Balazik and Garman 2018, 2019). Atlantic sturgeon would generally be found within these deep water habitats during the migration period (VDOT and FHWA 2017). Potential foraging habitat is present throughout Hampton Roads as the entire substrate is composed of sand, mud, or a combination suitable for benthic species (VDOT and FHWA 2017). However, the action area does not represent important staging, feeding, spawning, or overwintering habitat for sub-adult or adult Atlantic sturgeon (Balazik and Garman 2018, 2019).

A telemetry study conducted in the action area between July 2017–June 2018 and June 2018–March 2019 indicated that adult and sub-adult Atlantic sturgeon use the action area as a migratory corridor and move through the area quickly (e.g., hours rather than days or weeks) (Balazik and Garman 2018, 2019) (See attachment 4). Preliminary results of a second year telemetry study supported that adults and subadults move through the action area quickly and confirmed that juvenile Atlantic sturgeon are not expected in the action area (Balazik and Garman 2018, 2019). The action area may be the only pathway for Atlantic sturgeon between the Bay and the James River and as a consequence, the area remains critically important as a migration corridor, especially during spring and late fall/early winter months, for adult and subadult Atlantic sturgeon from both spawning cohorts (Balazik and Garman 2018, 2019). Atlantic Sturgeon have a transient presence in the project area and area able to avoid sources of temporary disturbance, if necessary, therefore Atlantic sturgeon would not likely to be adversely affected by the proposed action. The potential impacts to Atlantic sturgeon are discussed in greater detail in subsequent sections.

Figure I-2: Chesapeake Bay Atlantic sturgeon Critical Habitat.



I.5 ENVIRONMENTAL BASELINE CONDITIONS

Marine construction will occur in the intertidal and subtidal estuarine areas at the mouth of Hampton Roads, which is the confluence of the James River, Elizabeth River, and the Chesapeake Bay. The Project site is an active tidal harbor with a maintained navigation channel. Uses include U.S. Navy operations/facilities, shipping, and fishing. Temperature and salinity vary seasonally in these areas. Salinity is lower in March-May and increases in the summer and early fall (VDOT and FHWA 2016, 2017). Temperature in the water column is well-mixed in spring and winter due to turbulent mixing and weaker surface heating and stratified in the summer-fall, primarily due to solar heating. Overturning occurs during fall as the surface water becomes progressively cooler and eventually colder (more dense) than the bottom water (VDOT and FHWA 2016, 2017).

Section 305(b) of the Clean Water Act (CWA) requires each state to submit a biennial report to the United States Environmental Protection Agency (USEPA) describing the water quality of its surface waters (VDOT and FHWA 2016, 2017). The 305(b) report assesses six primary designated uses, as appropriate for a particular waterbody, based upon the state's Water Quality Standards. The primary uses include:

- Aquatic Life Use – supports the propagation, growth, and protection of a balanced indigenous population of aquatic life that may be expected to inhabit a waterbody.
- Recreation Use – supports swimming, boating, and other recreational activities
- Fish Consumption Use – supports game and marketable fish species that are safe for human health.
- Shellfishing Use – supports the propagation and marketability of shellfish (clams, oysters, and mussels).
- Public Water Supply Use – supports safe drinking water.
- Wildlife Use – supports the propagation, growth, and protection of associated wildlife.

Virginia's Water Quality Standards (9 VAC 25.260) define the water quality needed to support each of these uses by establishing numeric physical and chemical criteria. If a waterbody fails to meet the Water Quality Standards, it would not support one or more of its designated uses as described above. These waters are considered to be impaired and placed on the 303(d) list as required by the CWA.

Once a waterbody has been identified as impaired due to human activities and placed on the 303(d) list, VDEQ is required to develop a Total Maximum Daily Load (TMDL) for the parameters that do not meet state water quality standards. The TMDL is a reduction plan that defines the limit of a pollutant(s) that a waterbody can receive and still meet water quality standards. A TMDL implementation plan, including Waste Load Allocations (WLA), is developed by VDEQ once the TMDL is approved by USEPA. The ultimate goal of the TMDL Implementation Plan is to restore the impaired waterbody and maintain its water quality for its designated uses.

Hampton Roads is considered impaired for:

- Aquatic Life because of exceedances of Chlorophyll-a and Nutrient/Eutrophication Biological Indicators, and
- Fish Consumption because of exceedances of polychlorinated biphenyls (PCB) in Fish Tissue.

The shallow water habitat (< 6.6 feet deep) of the action area provides forage, refuge, spawning, and rearing habitat for fish, their prey, and other aquatic organisms such as shellfish and benthos. Shallow water habitat can be suitable for submerged aquatic vegetation (SAV) and sediment retention (VDOT and FHWA 2016). Based on the result of the site-specific benthic and shellfish surveys (Wesson 1995; USEPA 2012; NOAA 2015), sediments at the site are mostly fine and medium sands with various amounts of coarse sand and gravel, and low organic carbon content. In the Fort Wool cove, sediments were fine and very fine sands with various amounts of silt and clay. There is no naturally occurring rocky or cobble bottom present at or adjacent to the project site. Rocky intertidal habitat is comprised of manmade riprap.

Benthic species that live at the bottom of the Chesapeake Bay form an important part of the food web in the vicinity of the action area (VDOT and FHWA 2016). There are potentially hard clam (*Mercenaria mercenaria*), blue crab, and eastern oyster (*Crassostrea virginica*) present in, on, or adjacent to the soft sediments or other structures at the project site. The density and biomass of oysters and mussels is high at the inner tip of the north portal island exhibited high density and biomass. Throughout the sampled regions clam densities were <0.3 clams/m^2, comparable to or less than 2001-2002 clam densities for the same region and below that generally targeted by for commercial fishing (typically ~1.00 – 8.00 clams/m^2). The observed 2018 clam densities and size distributions are not indicative of regular clam recruitment of any notable magnitude (VIMS 2018).

There is documented SAV on or immediately adjacent to the project site. Species of SAV most commonly found in the Chesapeake Bay and its tributaries, and within the vicinity of the Study Area Corridors, include eelgrass (*Zostera marina*) and widgeon grass (*Ruppia maritima*). Other species, less likely to occur due to their association with freshwater and lower salinity levels, include wild celery (*Vallisneria americana*), hydrilla (*Hydrilla verticillata*), redhead grass (*Potamogeton perfoliatus*), sago pondweed (*Stuckenia pectinata*), and Eurasian watermilfoil (*Myriophyllum spicatum*) (Orth et al. 2015).

There are wetlands present in or adjacent to the project site. The diversity of wetlands in this region spans a range of freshwater to saline, lunar-tidal estuaries; tidal and palustrine swamps; non-riverine, groundwater-saturated flats; seasonally flooded ponds and depressions; seepage slope wetlands; and various tidal and non-tidal aquatic habitats (VDOT and FHWA 2016, 2017).

Underwater noise measurements conducted at busy ports such as Norfolk, Virginia indicated that the ports were noisy and average levels in the ports were up to 20 dB higher than noise levels extrapolated levels for sea state 6, a standardized oceanographic code that corresponds to very rough conditions with 13-20 ft waves (Anderson and Gruber 1971 as cited in Urick 1984). Sources of noise at the project site include natural (wind, waves, fish, tidal currents, mammals) and anthropogenic (commercial and recreational ships/vessels, dredging, pile driving, etc.) sources. Naval Station Norfolk, the largest naval station in the world, uses Norfolk Harbor. In fiscal year 2015, 38 container ships (non-Navy) per week called at the Port of Virginia; 63 percent of the cargo was moved to and from the port by trucks and 33 percent was moved by train. Noise sources for vessels include cranes, whistles, and various motors for propulsion, while adjacent dockside noise sources include cranes, trucks, cars, and loading and unloading equipment. There are also three airports within 15 miles (Norfolk International Airport, Chamber's Field, and Langley Air Force Base). DoN (2017) provides a snapshot of background noise measured prior to pile driving in 25 October and 27 October 2014. Average ambient noise was 123 and 122 dB 1-second rms SPL (range = 116 to 140 dB), respectively and 124 and 123 dB 10-second rms SPL (range=119 – 132), respectively. The baseline level of vessel traffic at the project area is high as documented in the USACE Waterborne Commerce of The United States Waterways and Harbors on the Atlantic Coast) for the year of 2017. Notably, 17,419 and 16,621 round trips were documented through the Port of Virginia and Norfolk Harbor respectively which are in close proximity to the project area. These figures likely underestimate the total volume of vessel traffic as they do not include any recreational or other non-commercial vessels, ferries, tug boats assisting other larger vessels or any Department of Defense vessels (i.e., Navy, USCG, etc.) The exclusion of naval vessel traffic is a major consideration given the significant naval presence in Norfolk

I.6 EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action, and any interrelated and interdependent actions, on the species mostly likely to be observed in the action area and/or critical habitat. Sea turtles are migratory and seasonally present in Virginia, appearing in the region in the late spring when water temperatures rise to approximately 20° Celsius, and leave in the fall when water temperatures decrease (Mansfield et al. 2009; Barco and Lockhart 2016). The Chesapeake Bay is an important area for sea turtle foraging and development.

Atlantic sturgeon have a transient presence in the project area and generally pass through during spawning migrations, which occurs in the James River during the spring and fall (VDOT and FHWA 2016; Balazik and Garman 2018). Atlantic sturgeon occur within deep water habitats, such as federally maintained channels of the James River, during the spring and fall migration periods. The nearest spawning areas for Atlantic sturgeon are approximately 70 miles upstream at Turkey Island; therefore, the HRBT Project will not impact spawning habitat (VDOT and FHWA 2016). While potential foraging habitat is present throughout Hampton Roads, the action area does not constitute an important foraging area for Atlantic sturgeon (Balazik and Garman 2018, 2019).

I.6.1 BOTTOM DISTURBING ACTIVITIES AND TURBIDITY

Bottom disturbing activities, such as dredging, filling associated with island expansion, and pile driving have the potential to increase sedimentation and turbidity. The life stages of sturgeon most vulnerable to increased sediment are eggs and larvae which are subject to burial and suffocation; however, no eggs and/or larvae will be present in the portion of the action area where these activities will take place (NMFS 2017). Juvenile and adult sturgeon are frequently found in turbid water and would be capable of avoiding any sediment plume by swimming to an adjacent area. Laboratory studies (Niklitschek 2001 and Secor and Niklitschek 2001 as cited in NMFS 2017) have demonstrated shortnose sturgeon are able to actively avoid areas with unfavorable water quality conditions and that they will seek out more favorable conditions when available. Johnson (2018) documents the potential behavioral, sub-lethal and lethal effects of turbidity and suspended sediments on sturgeon species. This NOAA study concludes that sturgeon species are adapted to living in fairly turbid environments and that adults and juvenile sturgeon should have the ability to avoid intolerable suspended sediment levels. The study recommends that suspended sediment concentrations do not exceed 1,000 mg/L above baseline/ambient concentrations at a project site for longer than 14 days. Total suspended solids (TSS) levels produced by dredging and are typically much lower than 1000 mg/l. TSS concentrations associated with mechanical clamshell bucket dredging operations have been shown to range from 105 mg/L in the middle of the water column to 445 mg/L near the bottom (210 mg/L, depth-averaged) (ACOE 2001). Furthermore, a study by Burton (1993) measured TSS concentrations at distances of 500, 1,000, 2,000 and 3,300 feet (152, 305, 610 and 1006 meters) from dredge sites in the Delaware River and were able to detect concentrations between 15 mg/L and 191 mg/L up to 2,000 feet (610 meters) from the dredge site. Background levels of TSS in the Hudson River in the vicinity of Tappan Zee Bridge, a comparable estuarine river system and location, typically ranged from 15-50mg/l (FHWA 2012).

Suspended sediments are most likely to affect subadult or adult Atlantic sturgeon if a plume causes a barrier to normal behaviors or if sediment settles on the bottom affecting their benthic prey; however, as previously noted, the action area does not constitute important foraging habitat for sturgeon.

Temporary increases in turbidity associated with bottom disturbing activities are expected to have negligible effects on sea turtles (VDOT and FHWA 2016, 2017). As sea turtles breathe air and increased suspended sediments are not likely to have an effect on turtle respiration (VDOT and FHWA 2016). Increased turbidity has the potential to temporarily impair foraging activity due to a decrease in visibility. Additionally increased levels of turbidity have the potential to alter sea turtle behavior and may cause them to avoid areas of elevated turbidity that may represent a visible barrier. However, sea turtles are highly mobile and should be able to avoid the limited spatial and temporal extent of any sediment plumes produced by project activities (VDOT and FHWA 2016).

Because any increase in suspended sediment is likely to be within the range of normal suspended sediment levels in the James River, it is unlikely to affect the movement of individual sturgeon. Even if the movements of sturgeon were affected, these changes would be small as the resultant plumes would occupy a limited portion of the more than 3.5 mile wide project area. As sturgeon are highly mobile any effect on their movements or behavior is likely to be insignificant. Based on this information, it is likely that the effects of increased suspended sediment and turbidity will be insignificant.

I.6.2 HABITAT MODIFICATION AND REMOVAL

The Project will permanently impact 22.69 acres of habitat in the action area. Of the 22.69 acres, 5.91 acres will be converted to another type of habitat resulting in a net loss of 16.78 acres (Table I-4). The vast majority (98%) of project-related impacts occur at the North Trestle (Figure I-3) and due to the expansions of the north (Figure I-3) and south islands (Figure I-4), primarily as a result of conversion of 14.77 acres of mid-depth and deeper open water habitat to 14.13 acres of uplands. This conversion provides virtually no habitat value to aquatic organisms with the exception of potential basking/ haul out habitat for seals that may occur seasonally in the vicinity of the project area. In addition, 0.70 acres of intertidal sand habitat will be lost, while intertidal rock habitat will increase from 0.70 acres to 0.99 acres. Shallow-water habitat, which supports SAV and shellfish resources in the vicinity of the study area, will increase, from 1.24 to 2.21 acres, offsetting a portion of the loss in function attributed to the conversion of mid-depth and deeper open water to uplands/intertidal rock habitat.

Table I-4: Permanent impacts to aquatic habitats

Habitat Type	Pre-Construction* (acres)	Post-Construction (acres)
Upland	0	14.13
Estuarine Intertidal Emergent Wetland	2.17	0
Estuarine Intertidal Rocky Shore	0.70	0.99
Estuarine Intertidal Sandy Shore	0.70	0
Estuarine Intertidal Mudflat	0	0
Estuarine Subtidal Shallow Open Water	1.24	2.21
Estuarine Subtidal Mid-Depth Open Water	13.41	0.89
Estuarine Subtidal Deep Open Water	3.99	1.82
Estuarine Subtidal Deeper Open Water	0.08	0
Estuarine Subtidal Deepest Open Water	0	0
Submerged Aquatic Vegetation	0.40**	0**
Total	22.69	5.91

***Pre-Construction acreages only account for those areas that will be permanently impacted.**

****Primarily extended temporary shading impacts, which are considered permanent as the impact will be longer than 6 months.**

The island expansion will result in permanent loss of 13.74 acres of habitat (12.32 North Island, 1.42 South Island) due to the conversion of intertidal and subtidal aquatic habitat to non-aquatic upland areas. The existing benthic habitat in these footprints will be replaced by a variety of fill materials that will compose the area of the islands. Based on baseline sampling conducted in 2018, the substrate within the area of northern island expansion is dominated by sand and very fine sand while the southern island footprint is predominantly medium and fine sand as well as some silty clay (Wong et al 2018). This loss of fine sediment habitat will result in a reduction in foraging habitat to Atlantic sturgeon and Sea turtles as these areas support a variety of benthic macroinvertebrate prey resources (Wong 2018).

The construction of permanent pile supported bridge/trestle structures will permanently occupy benthic sediments. The new permanent structures are wider than the existing structures and will result in a reduction of benthic habitat in some areas and a gain in others due to the reduction in number of foundations. In Willoughby Bay the existing bridge will be widened which will result in a net loss of benthic habitat in this area due to the driving of additional piles to support the expanded bridge. The new north and south bridges will be wider than the existing bridges but will have significantly fewer foundations as discussed above, which will result in a smaller benthic footprint with a net gain of 0.14 acres of habitat.

Figure I-3: North Tunnel Island Expansion Impacts

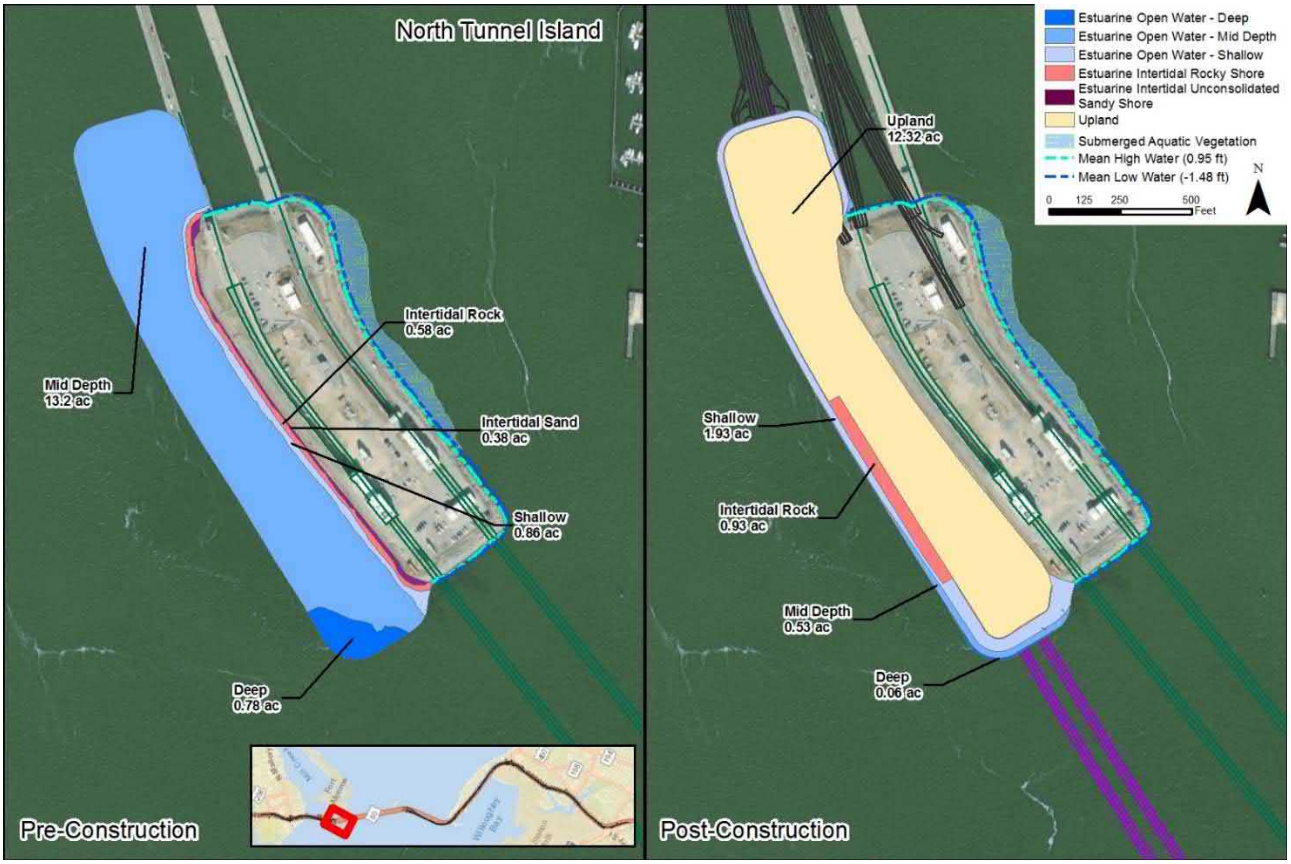
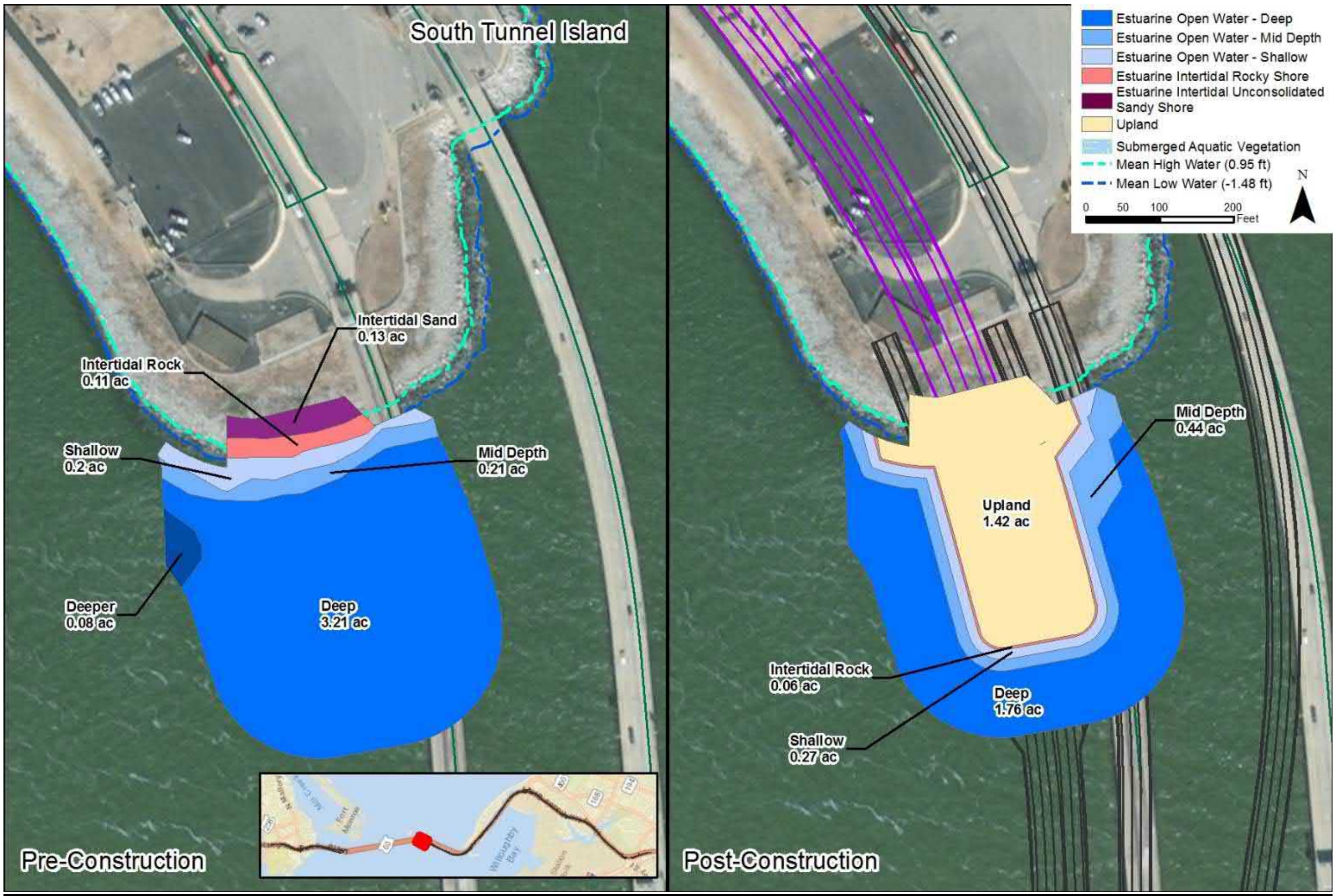


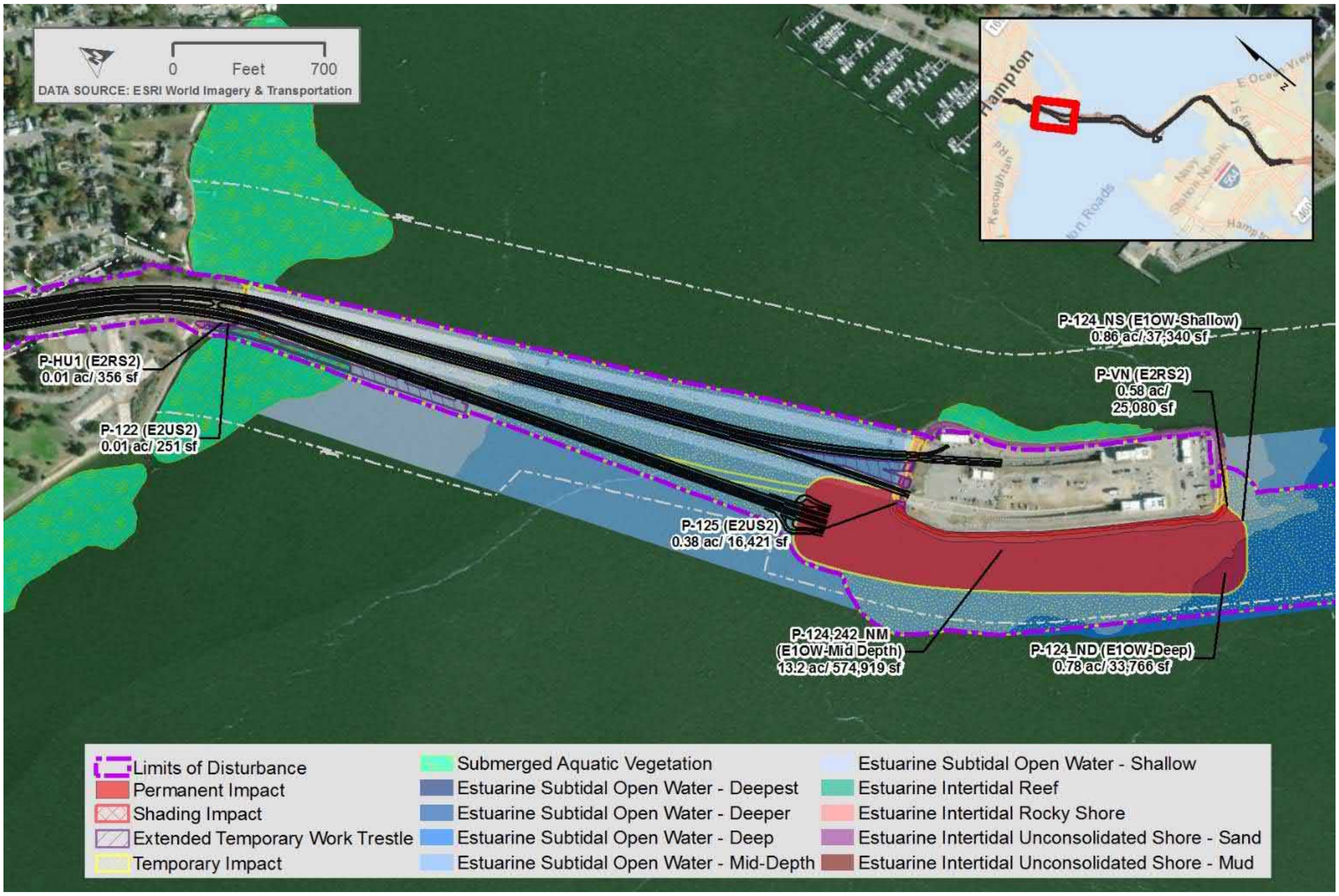
Figure I-4: South Tunnel Island Expansion Impacts



SAV is only present along the eastern side of the north island of the HRBT and along the Hampton shore. All efforts to avoid impacts to SAV were made; however, minimal impacts to SAV in the area of the northern bridge and shoreline will be unavoidable. The construction of temporary and permanent trestles as well demolition of the existing northern trestle in this area will result in 0.53 acre of temporary disturbance and 0.40 acre of permanent shading impact to SAV. An extended temporary trestle west of the existing bridge is anticipated to be in place for several years, thus the shading impact will be considered permanent. Perhaps the SAV will be able to recolonize post-construction. Additionally, one permanent pile will be directly driven into the SAV. No shading impacts are associated with the permanent trestle.

The construction of temporary work trestles will result in the shading of areas of SAV and shallow water habitat with the potential to support SAV The use of "jump trestles" minimizes the potential for shading impacts. The jump trestles will be used to support the construction of the new north, south, and Willoughby bay bridge structures and consist of a small section of trestle that is limited to the area of active work. When the work in an area is completed the piles at the rear of the trestle will be removed and additional piles will be driven off the front allowing the trestle to progress. Relative to a single continuous trestle or large areas dredging the use of jump trestles allow the work to be completed with minimal impacts. SAV is an important foraging habitat for Sea turtles, however temporary and permanent impacts to SAV are spatially limited and represent a small portion of the available SAV habitat within the action area and lower Chesapeake Bay system. Therefore any impacts to SAV are expected to be insignificant and unlikely to adversely affect listed species of Sea turtles.

Figure I-5: SAV Locations



The island expansion will lead to a permanent minor reduction in the amount of shellfish habitat in the project area. The removal of the existing trestles may lead to a temporary loss of shellfish that had encrusted the pilings, however this loss will be offset by the installation of new pilings that can be recolonized. Dredging will lead to a loss of habitat and the direct removal of those shellfish within the dredged sediments. Given the low density of shellfish and abundance of similar available habitat within the project area potential impacts related to temporary benthic disturbance and permanent habitat conversion due to the island expansion or trestle foundation installation would be minimal, and impacts to Atlantic sturgeon and Sea turtles are expected to be insignificant.

Limited dredging will occur along the southern extent of the existing bridge between the south island and Willoughby Spit and in other select areas that are too shallow to allow access for construction vessels. Approximately 5 acres will be dredged from estuarine open water and 0.18 acre will be dredged from estuarine sandy shore. Dredging will be limited to the minimum depth necessary to allow access which in most cases is 1-2 feet deep. This dredging will lead to a temporary increase in depth in those areas. There will not be maintenance of the dredged areas, and natural sedimentation processes should return the area to the pre dredging depths. The dredging will also result in the direct removal of benthic macroinvertebrates and any other entrained motile organisms which will result in the temporary reduction in available prey resources for Atlantic sturgeon and Sea turtles. Benthic organisms have been observed to recolonize dredged areas relatively rapidly (months to year) following dredging events (Hirsch et al 1978, LaSalle et al 1978, Bain et al 2006). The areas to be dredged represent a small portion of the total available benthic habitat in the project area. As discussed further below, the use of temporary work trestles will minimize the extent of dredging required. A reduction in dredging minimizes the removal of benthic sediments and the prey species contained within.

Dredging could result in the capture of sea turtles (VDOT and FHWA 2016). The use of sea turtle deflectors on hopper dredges, small cutterhead dredges, or mechanical bucket dredges would help reduce the likelihood of entrainment (VDOT and FHWA 2016). Additionally, sea turtles are strong enough swimmers to avoid most dredge equipment and they are not known to be vulnerable to cutterhead or mechanical clamshell dredges; however hopper dredges have been known to entrain and impinge sea turtles (VDOT and FHWA 2016).Mechanical dredges are proposed for use on the Project and sea turtles are likely able to avoid the slow moving head of the mechanical dredge bucket. From 2016-2018 only 1 Sea turtle was reported as captured during dredging activities (Swingle et al. 2017, Swingle et al. 2018, Costidis et al. 2019)).

The access related dredging will temporarily increase the depth in limited areas that are currently less than 4.5ft. The removal of the existing trestles and construction of newer trestles may lead to some localized changes in scour and deposition, but this would not significantly alter depths throughout the project area. The use of temporary trestles minimizes the amount of dredging and changes to water depth. The tunnel will be bored below the substrate, therefore no changes to water depth are anticipated. Any changes associated with depth associated with dredging would be temporary and spatially limited.

I.6.2.1 VESSEL INTERACTIONS

Ship strikes have been documented for Atlantic sturgeon on the James River and have been identified as a source of sturgeon mortality. (Atlantic Sturgeon Status Review Team 2007; Shortnose Sturgeon Status Review Team 2010); however, ship strike deaths were most likely due to deep draft ocean cargo vessels in narrow up-estuary sections of the James River (Shortnose Sturgeon Status Review Team 2010, Balazik et al 2012). The overwhelming majority of sturgeon vessel mortalities documented were observed within 4km of a narrow section of James River Channel that cuts across an oxbow at river kilometer (rkm) 120 (Balazik 2012). This section of channel is known as the Turkey Island Cutoff and coincides with a potential aggregation area for sturgeon. The Turkey Island Cutoff represents an area of elevated risk for sturgeon vessel interactions, particularly when larger deep draft tankers and ocean going vessels pass through; the river is much narrower in this area and these vessels occupy the lower portions of the water column where sturgeon spend the majority of their time. While project vessels related to construction will not occur in this area, disposal vessels using the Port Tobacco disposal location which is located less than one mile downstream from the Turkey Island Cutoff will approach this region. However, the river is considerably wider in the area of Port Tobacco than the Turkey Island Cutoff area which reduces the chances of vessel strikes relative to the narrower channel in upriver areas. Atlantic sturgeon may exhibit avoidance behavior and appear capable of detecting some vessels (Barber 2017; Atlantic States Marine Fisheries Commission 2017). Additionally, Atlantic sturgeon are expected to occur in deeper waters in the main navigation channel (Balazik and Garman 2018, 2019). Based on avoidance behavior and the water depth in the main channel, vessel interactions with Atlantic sturgeon are not expected in the action area.

Ship strikes have also been documented as a source of mortality to sea turtles within the action area and throughout the sea turtles range; from 2016-2018 a total of 188 sea turtles were documented in Virginia with injuries consistent with a vessel strike. (Swingle et al. 2017, Swingle et al. 2018, Costidis et al. 2019). Sea turtles could be susceptible to vessel strikes from construction vessels since they spend more time closer to the surface.; however, sea turtles are more vulnerable to being struck by faster moving vessels which reduces the amount of time for a turtle to detect and avoid an incoming vessel. Typically dredges, barges, and support vessels that would be used for the project move at slow speeds (i.e., on average 8-10 knots) (VDOT and FHWA 2016). The slow speed of construction vessels in combination with operator awareness training greatly reduces the likelihood of vessel strike. Thus, it is extremely unlikely for sea turtles to be struck by vessels during construction.

I.6.2.2 CONSTRUCTION VESSELS

Project vessels at the construction site are anticipated to consist of tug boats with a draft of 3 to 6 ft, crew boats with an estimated draft of 3 ft or less, and approximately unpowered barges with a draft of 4 to 10 ft that would be pushed by tug boats. The number of powered project vessels necessary is minimized by the use of temporary construction trestles in several portions of the site. The baseline level of vessel traffic at the project area is high. The additional vessel traffic produced by Project tug and crewboats, is unlikely to result in a meaningful increase in risk of vessel strike to sturgeon or sea turtles given the significant baseline levels of vessel traffic.

The project will lead to a minor temporary increase in the number of vessels operating in the project area. The project will not result in a permanent increase in the amount of vessel traffic. Given the significant baseline level of vessel traffic in the project area, the addition of a limited number of project vessels related to construction will increase the risk of sturgeon and sea turtle vessel strike by an amount that is too small to be meaningfully measured or detected. Therefore the operation of vessels at the Project site will result in an insignificant increased risk of vessel strike.

I.6.2.3 DISPOSAL VESSEL TRAFFIC

Project disposal vessels will consist of tug boats pushing unpowered barges loaded with material produced by project activities. The tug boats will transit from the Project site to disposal locations up the James and Elizabeth Rivers at slow speeds and remain in the navigation channel. In total an estimated 2.8 million cubic yards of material will be transported and disposed over the course of 5 years.

The total number of trips to dispose this material will vary depending on the volume of the disposal barges utilized, the density of the material being loaded, and the draft to which disposal barges are loaded. It is assumed that disposal barges will consist of hopper barges loaded with 2,000 cubic yards of material, which would yield a total of 1,400 round trips to the disposal locations if each barge is transported individually. The distribution of disposal vessel traffic throughout the action area may vary as there are currently three upland disposal locations, serviced by two waterfront terminals. If disposal is split evenly between the three locations over the 5 years of the project approximately 467 barges will go up the James River and 933 will go up the Elizabeth River. Two of the disposal locations are in the Elizabeth River in the vicinity of Chesapeake Virginia, approximately 20 miles from the Project site; these upland disposal locations would be serviced from the same waterfront site at Pre Con Marine. The other disposal location is approximately 73 miles from the Project site up the James River at the Port Tobacco Facility in the vicinity of Shirley Plantation. See Figure I-2 for a depiction of potential disposal routes.

Table I-5: Potential distribution of disposal trips within the action area

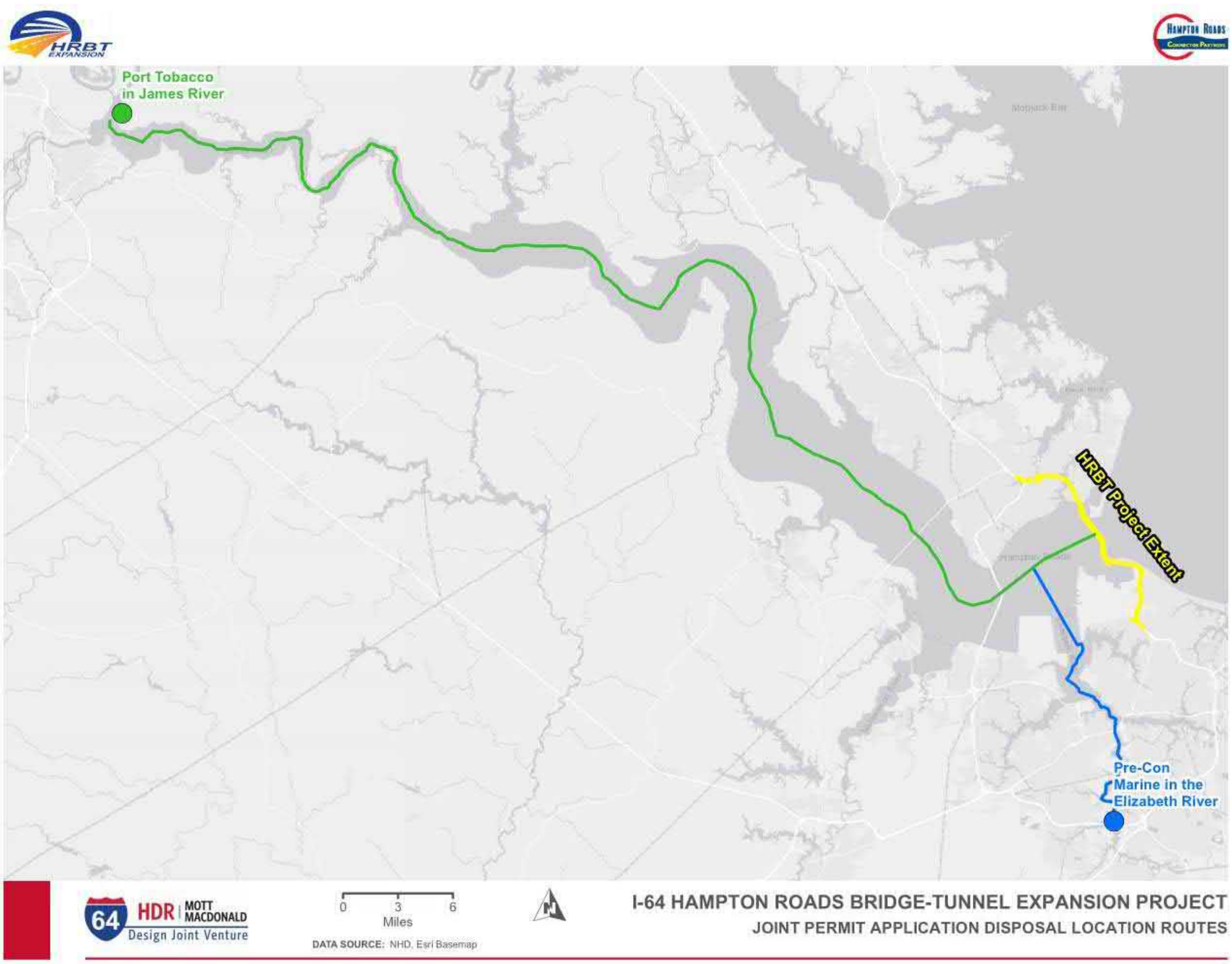
Facility	River	Location	Distance from Project Site (miles)	Total Trips over 5 Years	Trips Per Year	Trips per day
Port Tobacco	James	Shirley Plantation, Charles City County, VA	73	467	93.4	0.25
Precon Marine: Waterside shipping point for Precon Marine and Dominion Recycling Disposal locations.	Elizabeth	Chesapeake, VA	20	933	186.4	0.51

Under the assumed scenario of an even split between the disposal facilities over the duration of the project, the James River will receive on average an additional (0.25) round trips per day while the Elizabeth River would receive an additional (0.51) round trip per day or a single one way trip per day. If all disposal trips were sent to a single river that river would receive on average 0.75 additional round trips per day.

Sea turtles are expected to be present in the lower sections of the action area near the Project site where baseline levels of traffic are highest. This area represents a minor portion of the distance that a disposal vessel would travel to the upriver disposal sites, which greatly limits sea turtles exposure to disposal vessel traffic. Disposal vessels represent an increased risk of vessel strike to sea turtles that is so small it cannot be meaningfully measured and is therefore insignificant.

Atlantic sturgeon are potentially present along the entire disposal route in the James and Elizabeth Rivers. Due to the amount of baseline vessel traffic in the vicinity of the Elizabeth River it is unlikely that additional vessel traffic due to disposal will result in an increased risk of vessel strike that can be meaningfully measured or detected and is therefore insignificant.

Figure I-6: Anticipated routes to disposal locations for barges carrying material produced at the project site



According to USACE data from 2017 there were a total of 34,861 round trips for commercial vessels recorded in the James River. The additional vessel traffic due to disposal would represent an insignificant (0.25%) increase relative to baseline conditions throughout the entire river system.

However much of this vessel traffic is concentrated in the lower portions of the James River. To assess conditions further up the James River closer to the Port Tobacco disposal location the number of trips recorded at the Port of Richmond and Port of Hopewell were reviewed. These locations are upstream of the disposal area and a vessel would have to transit past or in close proximity to the disposal location and represent a reasonable estimate of the volume of commercial traffic. Combined, these ports recorded a total of 595 round trips in 2017, and the projected number of disposal vessel trips would represent approximately 15.5% of this total.

This represents a temporary increase in vessel traffic that is unlikely to result in an increased risk of vessel strike that would adversely affect Atlantic sturgeon. The vessel traffic associated with disposal will be temporary, intermittent, and occupy a small portion of the action area at any given time, and avoid the narrow section of channel near Turkey Island that represents the greatest risk to Atlantic Sturgeon. The disposal tugs have relatively shallow drafts, will travel slowly, and operate in the navigation channel; therefore, the risk of vessel strike is limited relative to deeper draft vessels that make up a considerable portion of the vessel traffic in within the action area.

I.6.2.4 WATER QUALITY DISCHARGES

Multiple construction operations have the potential to produce a discharge to the Hampton Roads waterbody, these include: tunnel boring, jet grouting, slurry wall construction, and excavation dewatering. A Virginia Pollutant Discharge Elimination System (VPDES) permit will be obtained for these discharges, therefore discharges will comply with the permit required thresholds. The spoils for each of these operations will be subject to an onsite treatment process treated prior to discharge to the environment in order to minimize potential impacts to water quality.

Jet grouting operations and slurry wall construction will produce spoils that consist of native materials and water that is exposed to bentonite and grout. The spoils will be conveyed to multiple decant tanks to remove solids. The exposure to grout and bentonite will raise the pH of the solution, which will require adjustment to an acceptable range prior to discharge. These operations will take place on both the North and South islands, therefore there will be discharges from two locations. The discharge at the south island is projected to be in operation for 263 days and discharge an estimated 384,000 gallons a day. The discharge at the North Island is projected to be in operation for 104 days and discharge an estimated 384,000 gallons per day. Based on the project schedule there is a limited period of time (approximately one month) where both of these discharges would be in operation simultaneously. These discharges are not anticipated be in operation concurrent with the discharge from the Tunnel Boring Machine (TBM) which is described below.

The spoils from the Tunnel Boring Machine will be sent to an onsite Slurry Treatment Plant/Separation Treatment Plant (S&TP) located on the South Island near the portal. The spoils will contain water, native sediments such as sand and clay, but will also be exposed to grout, bentonite, and EZ Mud used in the boring operation. EZ mud is a liquid polymer emulsion containing partially hydrolyzed polyacrylamide/polyacrylate (PHPA) copolymer that is used primarily as a viscosifier and borehole stabilizer during drilling operations. According to the SDS for this product, it contains hyrdrotreated light petroleum distillate, is acutely toxic to crustaceans at 98mg/l, and acute toxicity for fish has not been determined. The S&TP will remove solids from the incoming material, the remaining liquid will either be returned to the tunnel to support continued boring, or sent to a water treatment unit (WTU) for additional treatment prior to discharge. The exposure to grout and bentonite will raise the pH of the solution. The WTU will pass the incoming water through multiple levels of filtration before adjusting the pH to acceptable ranges before discharge into the sewer system or directly to the adjacent waters of Hampton Roads. The S&TP and WTU greatly minimize the potential for water quality impacts.

Additionally there are excavations at the North and South Island associated with the tunnel approach structures that will need to be dewatered due to the intrusion of ground water and potentially seawater. These excavations will need to be dewatered to allow construction to progress. This water may be exposed to sediments, residual grout or bentonite and will be treated using at the same process as described for the jet grouting and slurry operations.

The spoil material from each of these operations is expected to be contained and conveyed through pipes on site. Therefore any releases of untreated material are expected to be incidental, limited in spatial/temporal extent, and unlikely to result in impacts to sturgeon. The treatment process and limited spatial extent of the discharges is unlikely to result in adverse impacts to water quality or Atlantic sturgeon or Sea turtles, and any impacts are expected to be insignificant.

The TBM will need to be cooled with water while in operation to prevent overheating. The source water will be taken from existing water supplies and will not be withdrawn from the surrounding waterbody. The cooling water will run through the TBM within an enclosed system that does not contact boring materials. The cooling water will not result in a constant discharge while in operation, but rather would only be discharged periodically. A discharge may consist of 30,000 gallons of water and is currently projected to occur 8 times over the 781 days that the TBM would be in operation. The discharge will be subject to a VPDES permit, and the cooling water discharge temperature will comply with the limits of the permit. Prior to discharge, the water will be allowed to cool below permitted thresholds.

The water will then be discharged into the surrounding James River. These thermal discharges will have a single point of discharge and may cause localized increases in temperature. The cooling water discharges will represent a small volume relative to the Hampton Roads project area. The discharge will occur from a single point at the surface and will likely form a localized plume of warmer water in the upper portion of the water column. The plume will represent a limited area, and as fish are highly mobile they will be able to avoid the plume if conditions are suboptimal and swim to similar adjacent habitats where conditions are more suitable. Since the plume would be primarily at the surface, the impact to sessile benthic organisms would be limited, thus impacts to prey resources are not anticipated. The thermal discharges will represent a temporary, intermittent impact to water quality that is spatially limited and is therefore unlikely to adversely affect sturgeon or sea turtles.

The discharges described above are temporary, intermittent, spatially limited, and subject to treatment processes that minimize potential impacts to water quality. Therefore any potential water quality impacts associated with these discharges are unlikely to adversely affect Atlantic Sturgeon or Sea Turtles and will be insignificant.

I.6.2.5 UNDERWATER NOISE

Noise created by the installation of marine pilings has the potential to impact Atlantic sturgeon and sea turtles. Effects from sound can include behavioral impacts and physiological effects. NMFS uses a peak sound pressure level (SPL) of 150 decibels (dB) as a conservative indicator of the noise level at which there is the potential for behavioral effects to Atlantic sturgeon. A peak SPL of 206 dB or a cumulative sound exposure level (cSEL) of 187 dB has been used as a conservative indicator of potential physiological effects. NMFS uses a threshold noise level of166 dB re 1μPa rms for behavioral effects on sea turtles and 180 dB re 1μPa rms for injury (FHWA et al. 2018).If vibratory pile driving is used, none of these values are likely to be exceeded, and if impact driving is used, the 150 dB peak SPL behavioral effects criteria and the 187 dB cSEL physiological effects criteria would likely be exceeded, and the 206 dB peak SPL physiological effects criteria may be exceeded (VDOT and FHWA 2016). Since Hampton Roads is approximately 3.5 miles wide, it is expected that the majority of the waterway would be unaffected by the sound and Atlantic sturgeon and sea turtles would be able to avoid the affected area (VDOT and FHWA 2016), see Figures I-4 and I-5. No pilings would be driven in the proximity of the deepest water within the habitat where Atlantic sturgeon would most likely occur since the tunnel will be constructed beneath the navigation channel.

Distances to the thresholds described above were estimated for project piles using the Greater Atlantic Fisheries Organization (GARFO) Acoustics Tool, a spread sheet developed by GARFO to analyze the potential effects of pile driving on ESA-listed species the Greater Atlantic Region (GARFO 2018). Since the project is located in a shallow water near shore environment, the Simplified Attenuation Formula (SAF) was used to estimate the distance to the various thresholds. The SAF is recommended for use in rivers and nearshore waters where underwater sounds are attenuated at greater rate than deep open water environments due to the greater influence of the sea bed and shoreline in nearshore areas. The SAF was developed by GARFO, and utilizes attenuation rates that were calculated using under water noise measurements of pile driving projects documented in “Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish (Caltrans, 2015). The practical spreading loss model (PSLM) was not selected as it is best suited for deep open water environments where sound pressure levels are not attenuated as strongly due to influence from the seabed and adjacent structures such as shorelines, islands, and docks. The PSLM can overestimate the extent of underwater noise levels if used in shallow and nearshore environments.

Noise values from surrogate piles were entered into the GARFO worksheet to estimate underwater noise levels that may occur during the driving of project piles. Surrogate piles were selected from information that came with the spreadsheet as well as a representative pile from the Chesapeake Bay Bridge Tunnel Project (CTJV, 2018). In instances where there were multiple surrogate piles that could potentially apply to a project pile, the surrogate pile with the larger underwater noise values were selected as a conservative measure. Table I-**3** below summarizes the project piles, the estimated distances to impact thresholds, and surrogate piles used.

Table I- 6: Surrogate piles used as inputs into the GARFO spreadsheet to estimate underwater noise impacts

Project Location	Water Depth (ft)	Pile Size (in)	Pile Type	Hammer Type	Attenuation rate (dB/10m)	Applicable HRBT Piles
Sound pressure levels taken from Table I.2-1 of Caltrans (2012). No project specific info provided - SPLs are likely an average of multiple measurements taken for this size pile.	49	24	Concrete	Impact	5	30 and 54in Concrete
Chesapeake Bay, VA	16	36	Steel Pipe	Impact	5	30, 36 and 42in Steel

Table I- 7: Surrogate Based Estimates for Underwater Noise values at 10 m from the source and entered into the SAF.

Type of Pile	Hammer Type	Estimated Peak Noise Level (dB_{Peak})	Estimated Pressure Level (dB_{RMS})	Estimated Single Strike Sound Exposure Level (dB_{sSEL})	Applicable HRBT Piles
24in Concrete	Impact	188	176	166	30 and 54in Concrete
36inSteel Pipe	Impact	210	193	183	30, 36 and 42in Steel

Table I- 8: Estimated distances to Atlantic Sturgeon Injury and Behavioral thresholds produced using the SAF in the GARFO pile driving spreadsheet

Type of Pile	Distance (ft) to 206dB$_{Peak}$ (injury)	Distance (ft) to sSEL of 150 dB (surrogate for 187 dBcSEL injury)	Distance (ft) to Behavioral Disturbance Threshold (150 dB$_{RMS}$)	Applicable HRBT Piles
24in Concrete	NA	138	203	30 and 54in Concrete
36in Steel Pipe	59	249	315	30, 36 and 42in Steel

Table I- 9: Estimated distances to Sea Turtle Injury and Behavioral thresholds produced using the SAF in the GARFO pile driving spreadsheet

Type of Pile	Distance (ft) to 180 dB RMS (injury)	Distance (ft) to 166 dBRMS (behavior)	Applicable HRBT Piles
24in Concrete	NA	98	30 and 54in Concrete
36in Steel Pipe	118	210	30, 36 and 42in Steel

Figure I- 7: Distances to underwater noise impact thresholds for sturgeon and zones of passage during the impact hammering of 36" steel piles at 4 different locations

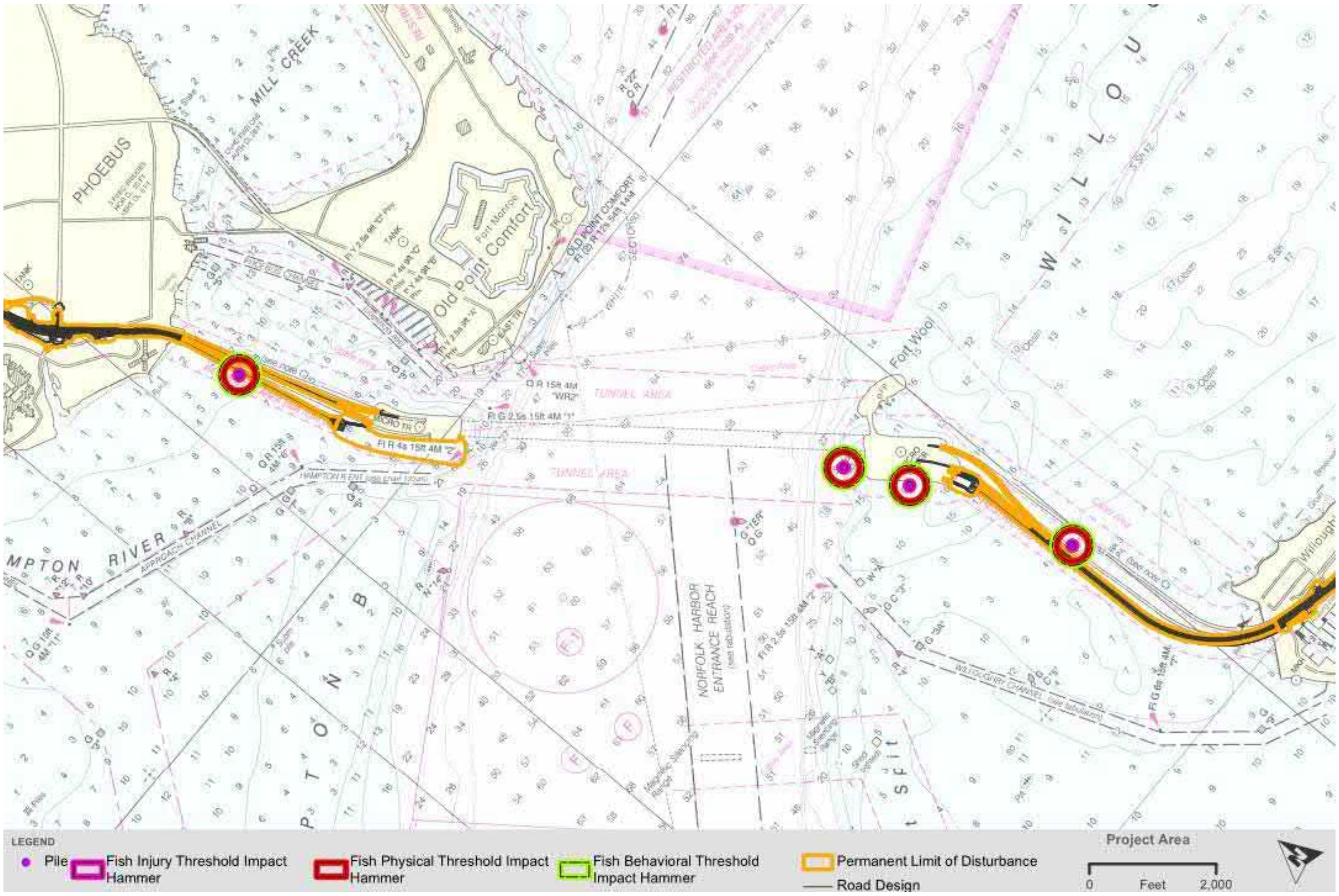
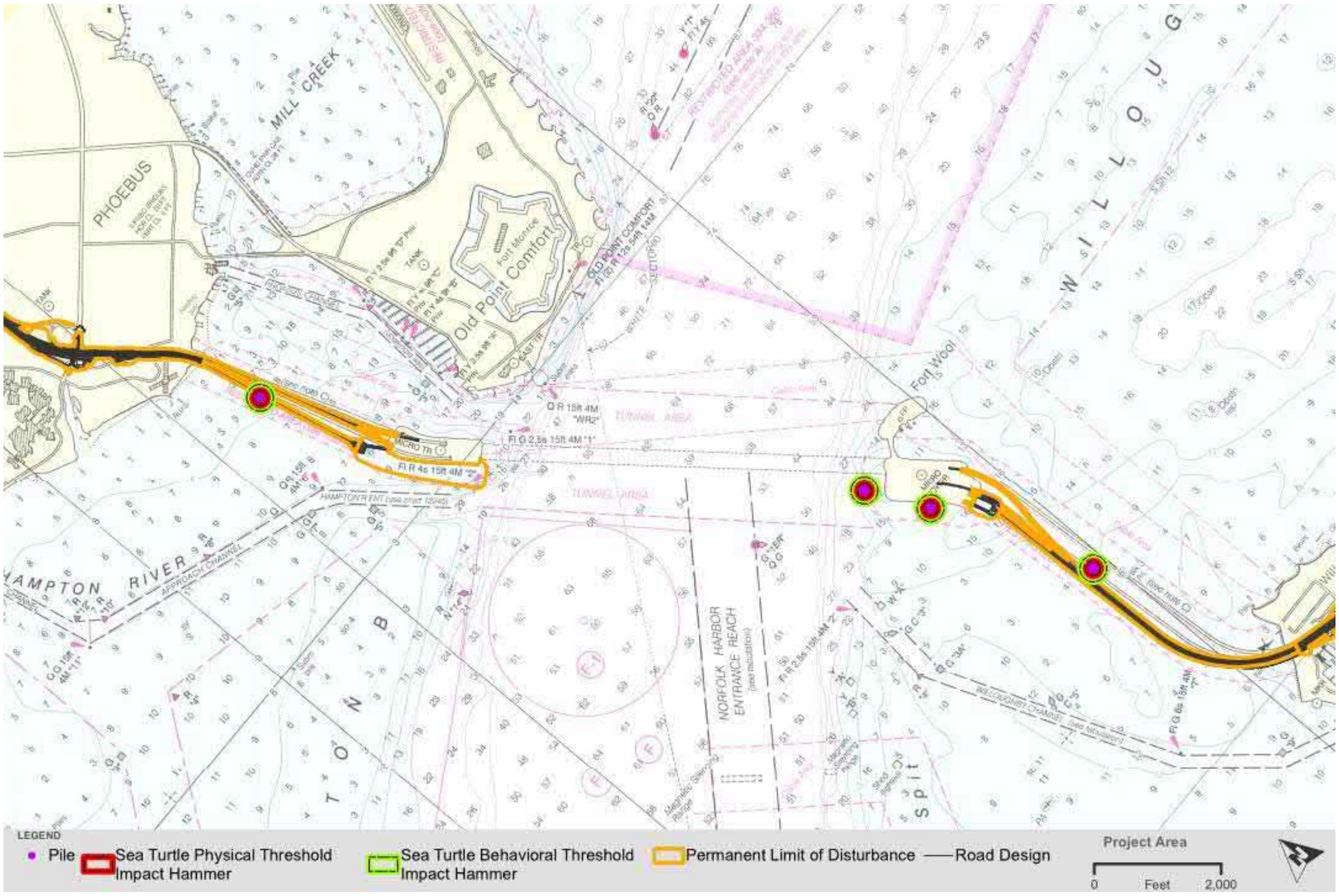


Figure I- 8: Depiction of distances to underwater noise impact thresholds for sea turtles and zones of passage during the impact hammering of 36” steel piles at 4 different locations



Project pile driving will not result in conditions where fish or sea turtles are unable to pass through the Project site due to elevated sound levels with the potential to cause behavioral effects as detailed below. The tunnel design does not necessitate the driving of piles across the main channel between the north and south portal islands which leaves a greater than one mile wide expanse of river below the acoustic thresholds regardless of pile driving activities in other portions of the project site. Based on a site specific telemetry study, the main channel is known to be the area where sturgeon spend the majority of their time including migratory movements through the site (Balazik and Garmin 2018). Therefore, the area of primary importance to fish passage through the project site will not be impacted by underwater noise from pile driving.

The distance between the north and south portal islands is approximately 6,300 ft. The installation of temporary piles at the jet grouting trestles off the southern island is the only pile driving activity that would encroach on this area. The diameter of the largest isopleth associated with the pile driving for the jet grout trestle is 630 feet. Therefore even when driving the piles that extend the furthest into the channel, there will still be a continuous approximately one mile wide area between the north and south portal islands that will be free from underwater noise levels with the potential to cause behavioral impacts.

For comparison, during impact pile driving of 48 and 72in steel piles at the Tappan Zee Bridge over the Hudson River in New York, the maintenance of a 5,000 ft corridor of river where the underwater noise level was below 150 dB re 1uPa2·s was a project requirement. The corridor was required to be continuous to the maximum extent possible but any contributing segment to the 5,000 ft total had to be at least 1,500 ft wide, and the location of the corridor or contributing segments could vary. The Hudson River at the Tappan Zee site is roughly 2.9 miles wide relative to the 3.5 miles of the Hampton Roads (excluding Willoughby Bay) and piles were driven in locations across the full width of the Hudson River. Further, the piles being driven at Hampton Roads are smaller than those driven at Tappan Zee. At all times during pile driving at the Project site a corridor of greater than 5,000 feet will be maintained regardless of the number of locations of concurrent pile driving.

Impact pile driving is projected to take place at 3 to 4 locations concurrently. If the largest estimated diameter behavioral effects isopleth (630 ft) is assumed, and the isopleths do not overlap, only 14% of the width between the northern shoreline and Willoughby Spit will be occupied. There is a potential for a maximum of 7 concurrent pile driving locations however, the potential concurrent pile driving scenarios are unlikely to occupy 14% due to the amount of pile driving in close proximity to the portal islands and shorelines that will occupy portions each isopleth, and the likelihood of overlapping isopleths due to the sequencing of project operations. Based on the projected isopleth sizes and number of concurrent pile driving locations any combination of locations will not produce a configuration of isopleths that would represent a barrier to fish or turtle passage through the project site due to the small size of the isopleths relative the total width of habitat available for passage and lack of pile driving in the main channel. The driving of piles in a limited number of additional locations is unlikely to change this conclusion, for the reasons outlined above.

Given that sturgeon primarily use the project area during seasonal migrations and their presence is transient, it is unlikely that exposure to underwater noise from pile driving would result in an adverse behavioral impact. If exposed to pile driving noise it is likely that a sturgeon would take evasive action and depart the ensonified area to continue along their migratory route. In the Biological Opinion for the Tappan Zee Bridge the swimming speed of a number of sturgeon species were reviewed, and a minimum prolonged swimming speed of 1.1 feet per second was assumed during the review of exposure to pile driving noise. If these same swim speeds are assumed it would take a sturgeon a maximum of 9.5 minutes to transit the entire diameter of the largest anticipated behavioral impacts isopleth. This estimate likely over-estimates the potential duration as it does not reflect burst swim speeds or sturgeon utilizing shorter routes. Atlantic sturgeon are even less likely to be exposed to sound levels with the potential to cause injury, as these isopleths are even smaller than the behavioral impacts. The potential for impacts is further mitigated by the use of a vibratory pile driver for significant portions of many pile driving components as well as the implementation of ramp up procedure while impact hammering which can cause fish to move away from the pile prior to onset of full energy pile driving. For the reasons detailed above, Project pile driving may affect and is not likely to adversely affect Atlantic sturgeon or Sea turtles and any impacts will be insignificant.

The analysis for this project considered that the majority of the construction activities will occur in the shallow portions of the action area, outside of the main channel and that Atlantic sturgeon primarily use the deeper main channel while migrating quickly through the action area, making it unlikely that Atlantic sturgeon will encounter project activities and components. Based this analysis, the Project may affect, but is not likely to adversely affect endangered or threatened DPSs of Atlantic sturgeon.

No time of year restriction (TOYR) is recommended on the James River and its tributaries below the Route 17 Bridge or on the Elizabeth River unless the project spans the width of the River to an extent that significantly impedes fish passage (VDOT and FHWA 2016). A TOYR for Atlantic sturgeon from 15 February – 30 June for instream construction within channel habitat would be considered if the Project impedes fish passage. However, the above analysis indicates that marine construction activities would not impede fish migration at the Project site, and therefore no TOYR restriction is proposed.

I.7 CUMULATIVE EFFECTS

Section 7 regulations require the Federal action agency to provide an analysis of cumulative effects, along with other information, when requesting initiation of formal consultation. No formal consultation has been requested.

I.8 PROPOSED MITIGATION

The project area is an active harbor with a maintained navigation channel subject to frequent disturbance. The spatial extent of permanent construction impacts is limited and represents a very small amount of the available habitat in the Hampton Roads and lower Chesapeake Bay Area. The extent of temporary construction impacts will be limited spatially and temporally such that they will not represent a barrier to fish movements through the project site or permanently reduce the quantity and quality of habitat at the project site.

I.8.1 VESSEL OPERATIONS

Barges, tugs, and other related Project vessels will travel at reduced speeds to avoid strikes to fish, sea turtles, marine mammals, and birds. Operators will receive endangered species awareness and avoidance training.

I.8.2 NOISE

During pile driving activities vibratory hammers will be used for significant portions of most pile driving elements which minimizes the amount of impact hammering and reduces exposure to elevated levels of underwater noise.

I.8.3 TURBIDITY AND WATER QUALITY

Erosion and sedimentation Best Management Practices (BMPs) will be installed prior to construction in compliance with the Virginia Erosion and Sediment Control Handbook (VESCH) and according to the projects approved Erosion and Sediment Control Plan. Examples of such measures include: silt fence installation, culvert outlet protection, storm water conveyance channels, soil stabilization blankets and matting, dust control, and temporary and permanent seeding. Water will be diverted around the work area to prevent sedimentation of downstream aquatic resources. Impacts will be minimized by strict enforcement of BMPs for the protection of surface waters, restrictions against the staging of equipment in or adjacent to waters of the US, and coordination with the permitting agencies.

During dredging and placement activities, contractors will:

- Use mechanical dredging instead of hydraulic, which reduces localized turbidity and potential entrainment of aquatic organisms.
- Prevent overfilling of bucket to minimize additional loss of material during ascent through the water column.
- Verify that the bucket is completely closed prior to raising it to the surface.
- Will not drop the load at the water surface to dislodge debris, but will complete the dredge pass and place the debris on the barge or scow.
- Pause the bucket after ascent through the water column to allow free water to drain prior to swinging the bucket to the barge.
- Reduce the bucket ascent rate, which minimizes loss of residuals from the clamshell bucket.
- Implement an approved Water Quality Monitoring Plan during dredging activities.

I.9 CONCLUSIONS

In conclusion, based on these Project construction methods and controls, the proposed action will have no effect or may affect, but is not likely to adversely affect the following marine threatened and endangered species under NMFS jurisdiction.

The HRBT Project will have no effect on the following threatened and endangered species:

- Hawksbill sea turtle (endangered)
- Shortnose sturgeon (endangered)
- North Atlantic right whale (critically endangered)
- Fin whale (endangered)

These species are not expected to occur in the action area.

The HRBT Project may affect, but is not likely to adversely affect the following threatened and endangered species:

- Loggerhead sea turtle (threatened - Northwest Atlantic DPS)
- Kemp’s ridley sea turtle (critically endangered)
- Green sea turtle (threatened - North Atlantic DPS)
- Leatherback sea turtle (endangered)

- Atlantic sturgeon (endangered - New York Bight, Chesapeake Bay, South Atlantic and Carolina DPSs; threatened Gulf of Maine DPS)

The potential for fin whales to occur in the action area is so low, it is discountable. While the loggerhead sea turtle, Kemp's ridley sea turtle, green sea turtle, leatherback sea turtle, and Atlantic sturgeon are likely to be present in the action area, based on this analysis, the HRBT marine construction activities may affect, but are not likely to adversely affect these listed species. VDOT and FHWA are requesting NMFS concurrence with this determination.

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ATTACHMENT I-3 USFWA IPAC

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
http://www.fws.gov/northeast/virginiafield/

In Reply Refer To: August 11, 2019
Consultation Code: 05E2VA00-2019-SLI-5741
Event Code: 05E2VA00-2019-E-14254
Project Name: Hampton Roads Bridge Tunnel Expansion - Limits of Disturbance Plus 1000-ft

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Consultation Code: 05E2VA00-2019-SLI-5741

Event Code: 05E2VA00-2019-E-14254

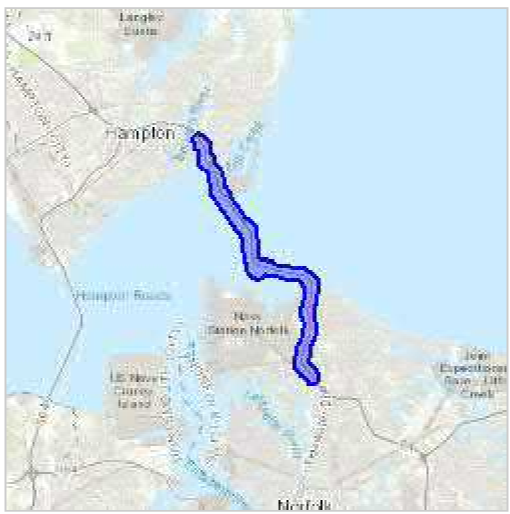
Project Name: Hampton Roads Bridge Tunnel Expansion - Limits of Disturbance Plus 1000-ft

Project Type: BRIDGE CONSTRUCTION / MAINTENANCE

Project Description: The species list will be used to assess the potential effects of the Hampton Roads Bridge and Tunnel Expansion Project.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/36.9697226510667N76.29874522452505W



Counties: Hampton, VA | Norfolk, VA

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened

Critical habitats

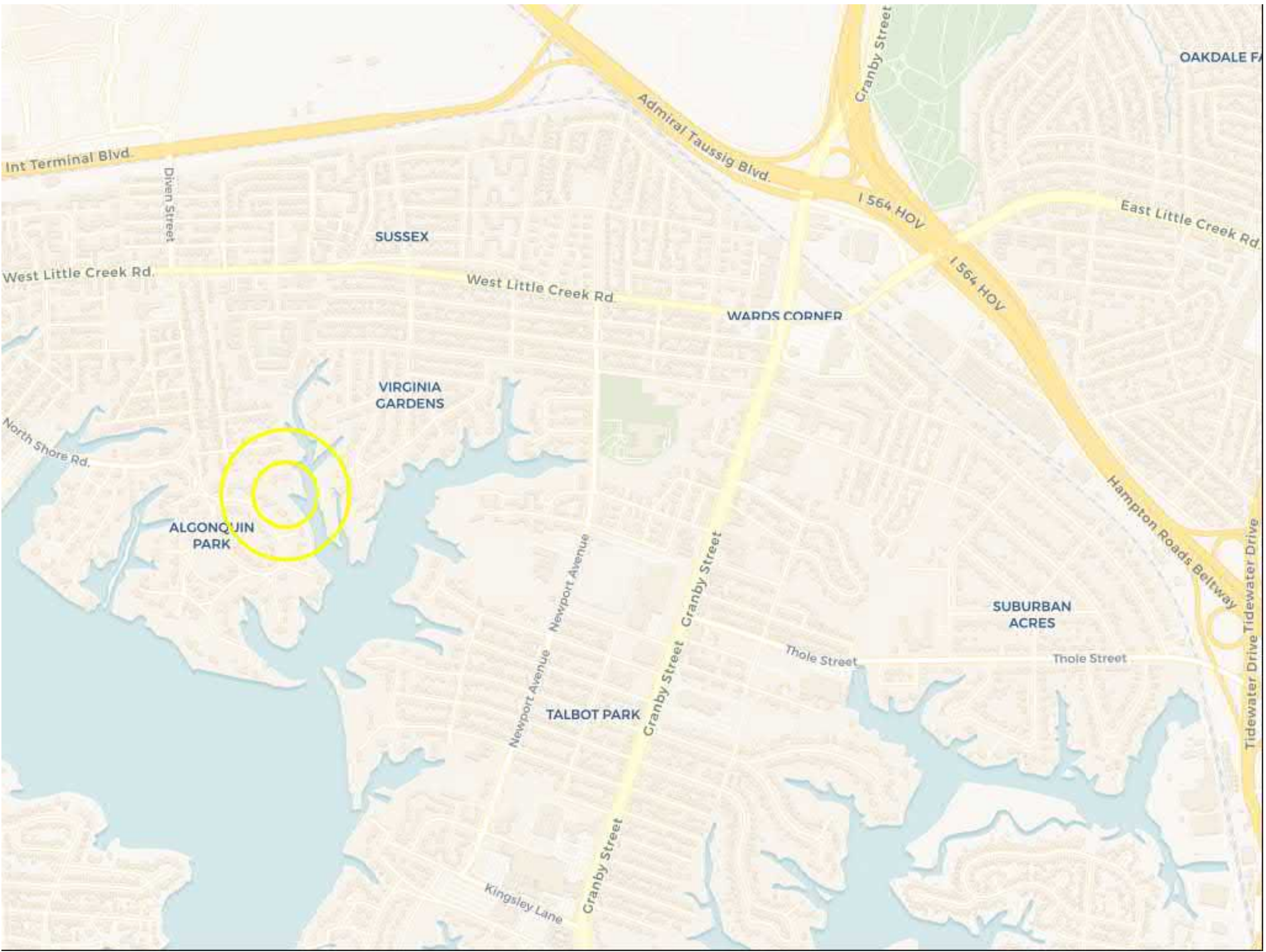
THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

CCB Mapping Portal



Layers: VA Eagle Nest Locator, VA Eagle Nest Buffers

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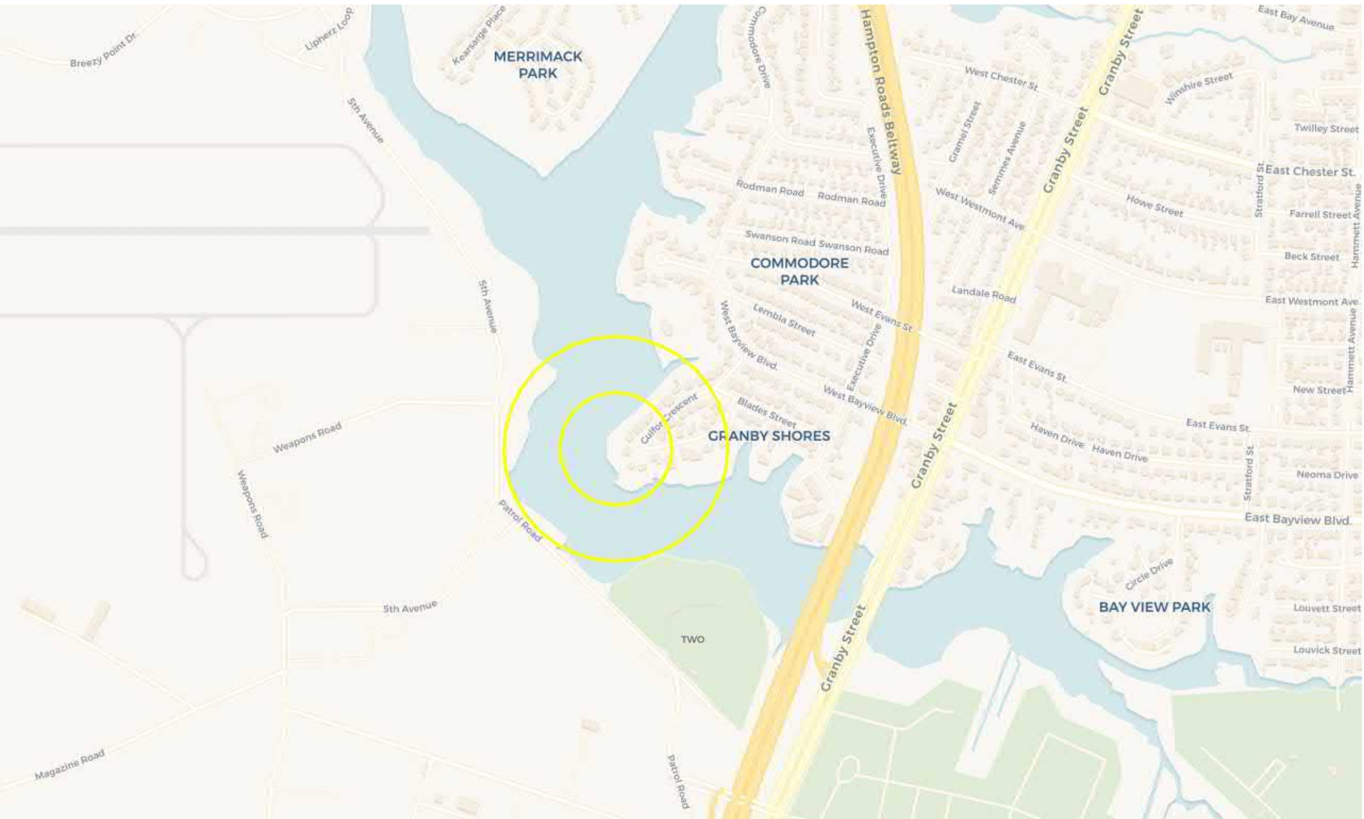

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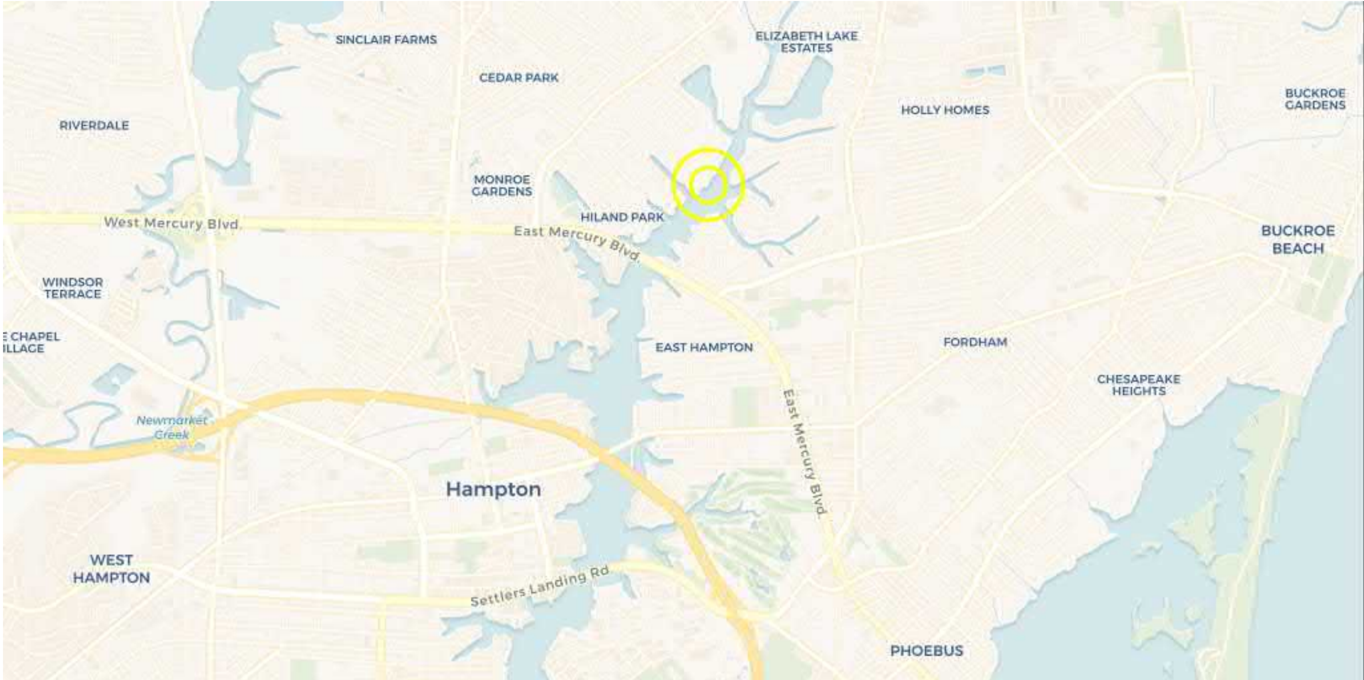

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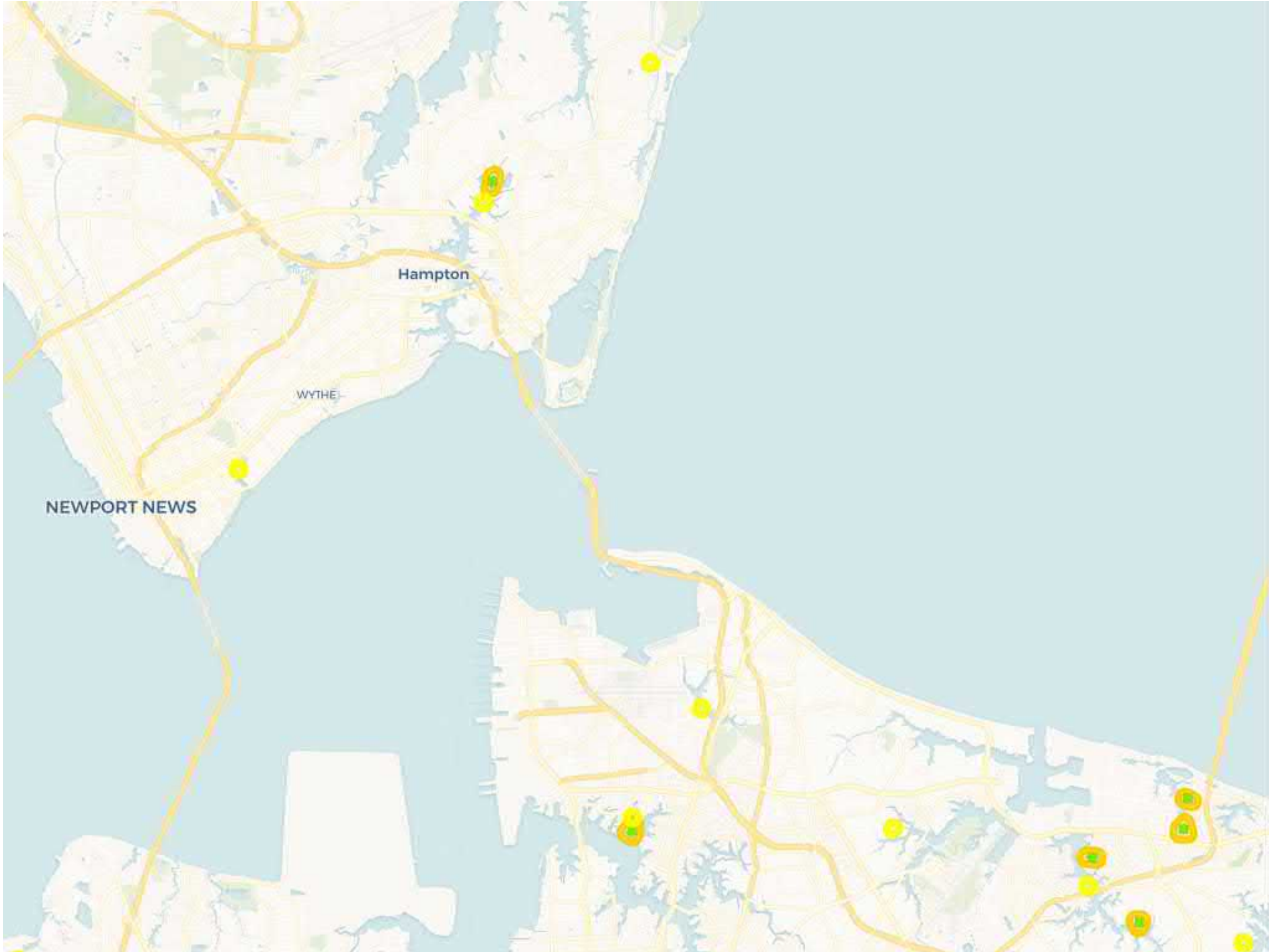
Report Generated On: 08/06/2019

ATTACHMENT I-4 CCB EAGLE NEST MAPS

CCB Mapping Portal



Layers: Eagle Roost Buffers, Eagle Roosts, Eagle Roost Polygons, VA Eagle Nest Buffers, VA Eagle Nest Locator

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Map Link:
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Report Generated On: 08/06/2019

ATTACHMENT I-5 VDOT STURGEON REPORT (2019 VDOT REPORT TELEMETRY)

Use of Acoustic Telemetry to Document Occurrence of Atlantic Sturgeon Within the Inventory Corridor for the Hampton Roads Crossing Study
Phase II June 2018 – March 2019

A Report to the Virginia Department of Transportation

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May 29, 2019

Project Background

Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) (ATS) were once abundant along the Atlantic Slope of North America and were culturally important to Native Americans and early European colonists. Throughout the 19th Century, Atlantic Sturgeon were fished unsustainably for roe (caviar) and flesh. The peak coastal harvest of Atlantic Sturgeon (>7 M pounds) occurred in 1890 but by 1920 annual harvest was less than 100,000 pounds. Virginia imposed a moratorium on sturgeon catches in 1974 and the Atlantic States Marine Fisheries Commission (ASMFC) followed with a broader prohibition in 1998. At present, most Atlantic Sturgeon (ATS) populations, including the Chesapeake Bay distinct population segment (DPS), are federally protected as Endangered under the Endangered Species Act (ESA). The tidal James River Basin in Virginia supports the largest number of Atlantic Sturgeon in the Chesapeake Bay watershed, if not the entire mid-Atlantic region. In 2015, VCU biologists confirmed the occurrence of the federally-endangered Shortnose Sturgeon (*A. brevirostrum*) in the lower James River. A gravid Shortnose Sturgeon was caught by VCU biologists in the lower James River in 2018; this fish was telemetered and tracked to the Delaware River, which is most likely its natal river.

Atlantic Sturgeon are anadromous, with adults returning to tidal freshwater reaches of natal rivers to spawn; lower reaches of these same rivers provide critical nursery and foraging habitats for juveniles and sub-adults. In the James, migrations between coastal marine and riverine habitats occur within the inventory corridor for the Hampton Roads Crossing Study, as designated by the Virginia Department of Transportation. VCU biologists recently documented in-river activity by both Fall (September-October) and Spring (April-May) spawning cohorts of ATS in the upper tidal James River, Virginia, including extended staging periods in the lower river. Preliminary findings (Balazik et al., 2017) suggest that these groups are genetically distinct. As a consequence, migrating (adult) and resident (sub-adult) Atlantic Sturgeon may be present year-round in the Hampton Roads vicinity.

Approximately 200 James River Atlantic Sturgeon, including adults, subadults, and juveniles, implanted by VCU biologists with internal acoustic transmitters, remain at liberty with active tags and fish occurrence may be documented by appropriate telemetry receiver hardware deployed *in-situ*. Other research groups, including the Virginia Institute of Marine Science and the Department of the Navy have also tagged a smaller number of Atlantic Sturgeon in the region with compatible transmitters. As a consequence, this project was able to leverage prior tagging efforts for the species to document the presence of tagged fish within specific project locations, as identified by VDOT. We are able, therefore, to infer the temporal and spatial distributions of Atlantic Sturgeon in the James River based on this subsample of tagged and telemetered fish.

Project Design

The goal of this project was to use acoustic telemetry (VEMCO products) to document temporal and spatial patterns of occurrence and movement by tagged, adult and subadult Atlantic Sturgeon within the VDOT-delineated inventory corridor for the Hampton Roads Crossing Project (Figure

1) from June 2018 through March 2019. Seven VEMCO VR2W acoustic receivers maintained by VCU, complemented by two compatible receivers maintained by the Navy (Figure 1) were placed at specific locations within the project area based on several factors (water depth, substrate, transmitter detection radius) in order to accomplish the following project objectives:

- Create and maintain an acoustic ‘gate’ in the vicinity of the HRBT to document the timing and duration of migration activities (ingress and egress) by ATS adults through the project area;

- Evaluate the possible use of the HRBT inventory corridor as foraging or staging habitat by juvenile and sub-adult ATS, including the identification of possible critical habitat or periods of residence within the project area;

Acoustic tag detection range varies based on water conditions, with more wind and fetch decreasing the detection range. Based on preliminary testing conducted on-site in 2017, we conservatively estimated detection ranges at 500 m to account for conditions (e.g. high winds) that may degrade the effective detection radius (Figure 1). Under ideal conditions, typical receiver detection ranges are over 1 km. Detection ranges were verified by getting the same individual “ping” detection on multiple receivers at the same time. Multiple detections of the same coded ping can inflate presence data by counting the same fish at different locations at the same time. By analyzing the detection arrival time of the same ping at different locations, we determined the receiver in closest proximity to each tag (fish) and that detection was assigned to that specific receiver. VEMCO receivers were deployed during the period June 2018 through March 2019 in georeferenced locations on the river substrate outside of the maintained shipping channel and were secured to anchors with drag-lines for recovery. No lines or surface floats marking receiver locations interfered with surface vessel traffic; receiver profiles were < 0.75 m above the river bottom. The Navy receivers were suspended from U.S. Coast Guard navigation buoys. The relatively large number (>200) of previously tagged and at-liberty adult and sub-adult ATS from the James River population were deemed sufficient to meet project objectives without the need to tag additional fish within the project area. We attempted to tag more juvenile ATS during the study period but high water conditions hindered juvenile sampling activities. Receivers were recovered, maintained, and downloaded approximately every 4-5 weeks during the project period but recovery intervals during summer months (higher rates of biofouling) were shorter (Figure 2). Coded data documenting sturgeon occurrences within the array were incorporated into a GIS-based analysis (ArcGIS ver. 10.5.1) to determine temporal and geospatial patterns of sturgeon distributions and habitat associations for adult and sub-adult fish within the project area. VCU secured necessary permits and permission to use relevant data from receivers or tags not owned by VCU and we gratefully acknowledge the cooperation of VIMS (Dr. Eric Hilton), the Department of the Navy (Carter Watterson), and the Virginia Department of Game and Inland Fisheries, which maintains the James River Passive Array.

Results

Acoustic Telemetry

During the Phase II study, 24 individual subadult and 94 individual adult ATS were detected within the project area. There were no juvenile ATS tagged by VCU during the study period; however, approximately 300 early stage (putative young-of-the-year) juveniles were captured 100 km upstream of the study area during the Winter of 2018. There were a total of 1893 unique tag detections, with subadults and adults accounting for 301 and 1592 detections, respectively (Table 1, Figure 3). It should be noted that receivers 1 and 6 did have ATS detections but the fish were closer to other receivers, and we so assigned. Receiver 9 did not have any detections during the project period. As in the earlier Phase I study (2017-2018), the vast majority of ATS detections (95%) were recorded by receivers 4 and 5 (Figure 3). Atlantic Sturgeon tend to occupy relatively shallow areas while feeding but occupy the relatively deeper channel during migration. Because the vast majority of the detections were in the channel (>15 m depth) and not in shallow or fringing habitats (<3 m depth), we conclude that most ATS are moving quickly through the study corridor and not lingering to feed or stage (Figures 3 & 4).

The number of tag detections can be biased by many factors. Tag burst frequency varies for each type of tag and most ATS adult tags used in this study burst every 90 to 180 seconds. In contrast, most juvenile ATS tags used in this study burst every 15 to 45 seconds. When the density of tagged animals in a specific location are high, the probability of tag signal 'collisions' increase. Tag collisions occur when the burst sequence of two or more individual tags overlap and the receivers cannot, therefore, discern individual tag codes. One way to account for this potential bias is to standardize residency by a specific timeframe. In other words, regardless of whether a tagged animal has 1 or 15 pings on a receiver during a 1-hour timeframe, that specific fish is considered to be at that receiver for that one hour. The 1-hour timeframe correction has worked well in the James River to document staging (lingering) *versus* rapid transit areas, and was applied in this study. In addition, with the receivers deployed for this study being so close together, a fish could be detected on two or more receivers during the same 1-hour time period. This means a single ATS could be counted on multiple receivers during the same 1-hour time period and that would incorrectly inflate any measure of its occurrence in that location. To adjust for this, a fish was assigned to the receiver that had the most detections of that fish during the 1-hour timeframe. In the case of equal detections at two adjacent receivers during the same 1-hour period, the fish was assigned to both receivers for 0.5 hours.

Subadults

The subadult life stage describes ATS that have left their natal river at least once, but are not yet sexually mature. These fish tend to spend Spring through Fall in various estuaries and overwinter in the ocean. The subadults that spend the Spring-Fall period in the James River tend to be between ages 3 and 8 and have been documented upstream of rkm 120 (VCU unpublished data). Catch and telemetry data from previous years and other studies show that subadult ATS tend to enter the James River in March/May and leave in October/November. During riverine residence, subadults prefer low-flow muddy areas with a high abundance of benthic macroinvertebrates. These habitats are typically in broad, wide areas upstream and not in constrained channels like the HRBT study area.

A total of 24 unique, tagged subadults were detected in the project array during Phase II. Telemetered subadults were documented within the project area on 30 days (11%) of the 274-day study period. Similar to the previous year (VDOT Phase I report), there was a peak of subadult activity during October/November (Figure 5). This peak of activity coincides with previously documented (VCU unpublished data) seasonal egress migrations out of the James River. The ingress migration for these fish was earlier in the year, during April and May. Similar to the previous year, receivers 4 and 5 had considerably more detections compared to the rest of the array (Table 1). The number of hours spent by individual subadults within the project area ranged between 1 and 8 hours and averaged 3 hours (Figure 6). Subadult ATS may spend long periods (several months) within very small (several kilometers) reaches of the tidal James River throughout the year. The VDOT array data demonstraate that the typical subadult ATS will only spend 6 hours of the entire year within the study area, suggesting that most subadult ATS move quickly through the study area to reach preferred feeding habitats elsewhere. Data from a new receiver array deployed recently by VCU and USACE in the lower Chesapeake Bay (Figure 7) suggest that many subadults spend most of the winter in the lower Chesapeake Bay beyond the HRBT.

Adults

VCU biologists have extensively studied, and are considered experts in, adult ATS migratory patterns. ATS adults spend most of the year in the ocean and only return to rivers to spawn. There are two, genetically distinct ATS spawning groups in the James River: a Spring cohort and a Fall cohort. The Spring group spawns in early May, while the Fall group spawns in late September. Spawning adults tend to migrate from the ocean to upstream staging areas (above rkm 40 in the James) quickly and stay in staging areas until water temperatures are suitable for spawning. Once spawning has occurred, adult ATS out-migrate quickly (up to 100+ km/d) until the next spawning season.

During this study period, 94 unique, tagged adult ATS were detected in the project area: one fish identified with the Spring group and 93 fish from the Fall group (Figure 8). Most of the project days when only one fish was detected it was ID26743 that staged in the lower Chesapeake Bay within range of project receiver 4. The small pulse of detections in the beginning of the project coincides with the last stages of egress by Spring adults and ingress by a few Fall adults that staged in the lower reaches of the James River. Fall spawning adults typically stage prior to spawning in the lower James River between rkm 25 and rkm 50. 2018 was an extremely wet year so many adults staged in the lower Chesapeake Bay and did not move upstream until water temperatures decreased to an appropriate level in mid-August. Post-spawn adults started to leave the river in mid-September. Some male ATS stayed in the upper river for several more weeks and left in late October. As expected, adults moved through the study area quickly and stayed primarily within the navigation channel. Tagged adult ATS resided within the project array between 1 and 182 hours (mean=6 hours; Figure 9). A single fish spent 182 hours within the array (Figure 9) while lingering within range of project receivers 4 and 5. Data from this study are consistent with findings of previous ATS research on the James River population, including phase I of the current VDOT study (2017-2918).

Conclusions

The data available for this report (approximately nine months of continuous receiver deployment in 2018 and 2019) provide no evidence that the project area (HRBT Inventory Corridor) includes important staging or feeding habitats for sub-adult or adult ATS in the James River. Analysis of telemetry data suggests that residence (linger) times by individual adult and sub-adult Atlantic sturgeon within the project area are short, on the order of hours, rather than days or weeks. Generally, short linger-times should correlate with a lower risk of adverse impacts during construction activities. However, the project area includes the only pathway (i.e., a 'bottleneck') for ATS ingress or egress between the Bay and the James River. As a consequence, the area remains critically important as a migration corridor, especially during Spring and late Fall/early Winter months, for adult and subadult ATS from both spawning cohorts. There also remains the unlikely potential that juvenile ATS may overwinter in the study area; additional data would be needed to evaluate this possibility. No tagged, juvenile ATS were at-large in the James during the study period; however, VCU is currently catching early juvenile ATS, presumably from the 2018 James River cohort (Figure 10), and we will soon be able to place acoustic transmitters in these fish. Looking to the future, deployment of *real-time* acoustic receivers in the HRBT vicinity, as well as the capture and tagging of new ATS in the project area, would provide data useful to protection efforts for adult and subadult ATS during periods of migration ingress and egress through the project area.

Table 1. Number of Atlantic Sturgeon detections at HRBT project receivers for the period June 1, 2018

to March 1, 2019.

Receiver ID	Receiver Owner	Latitude	Longitude	Subadult Detections	Adult Detections	Total Detections
1	VCU	37.00888	-76.32449	0	0	0
2	VCU	37.00399	-76.32354	42	0	42
3	VCU	36.99902	-76.32065	21	22	43
4	Navy	36.99939	-76.31194	161	1051	1212
5	Navy	36.98805	-76.31108	77	507	584
6	VCU	36.98481	-76.30581	0	0	0
7	VCU	36.97937	-76.30263	0	10	10
8	VCU	36.97361	-76.30152	0	2	2
9	VCU	36.96738	-76.30264	0	0	0

Table 2. Overview of detections at each receiver separated by fish life-history stage. A single adult fish spent 182 hours within range of receiver 4*, which inflated the mean value for linger hours.

	Number of Fish Detected at Receiver		Total Hours at Receiver		Average Hours Fish Spent at Receiver	
Receiver ID	Subadults	Adults	Subadults	Adults	Subadults	Adults
1	0	0	0	0	0	0
2	5	0	7	0	1.4	0
3	6	6	8	8	1.3	1.3
4	17	67	42	346	2.4	5.1, 3*
5	13	82	20	191	1.5	2.3
6	0	0	0	0	0	0
7	0	7	0	8	0	1.1
8	0	1	0	2	0	2
9	0	0	0	0	0	0

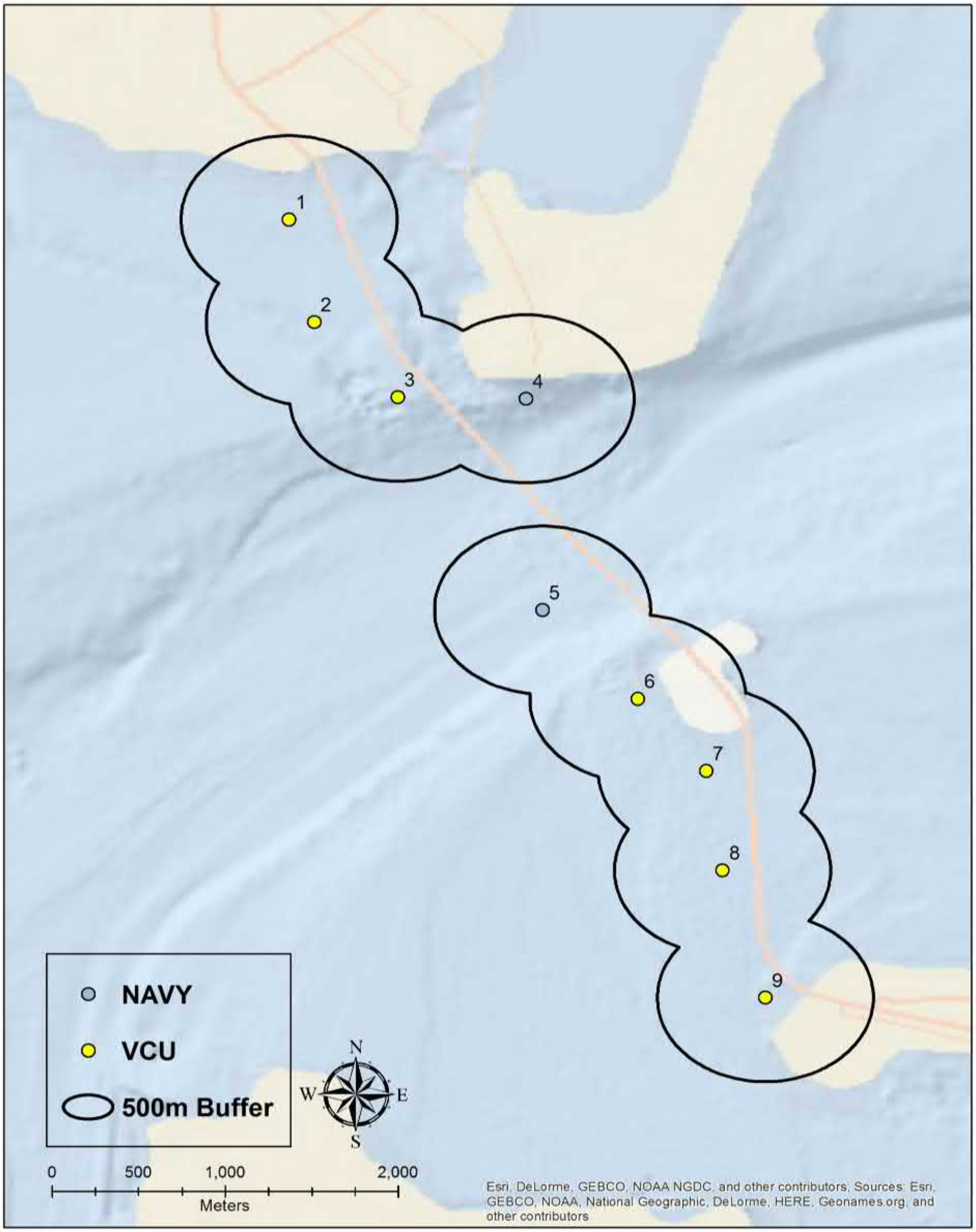

Figure 1. Map of receiver array with conservative 500-m detection radii. The 500 m range is the detection

range during the most adverse conditions. Typically the detection range is over 1 km, which closes the gap

between receivers 3, 4, and 5.

Figure 2. Picture showing biofoul and why the receivers needed to be downloaded so frequently. Most of the

year there was little biofoul but during the summer (August 2017 pictured above) there was biofoul accumulation,

which can decrease the tag detection range if not removed regularly.

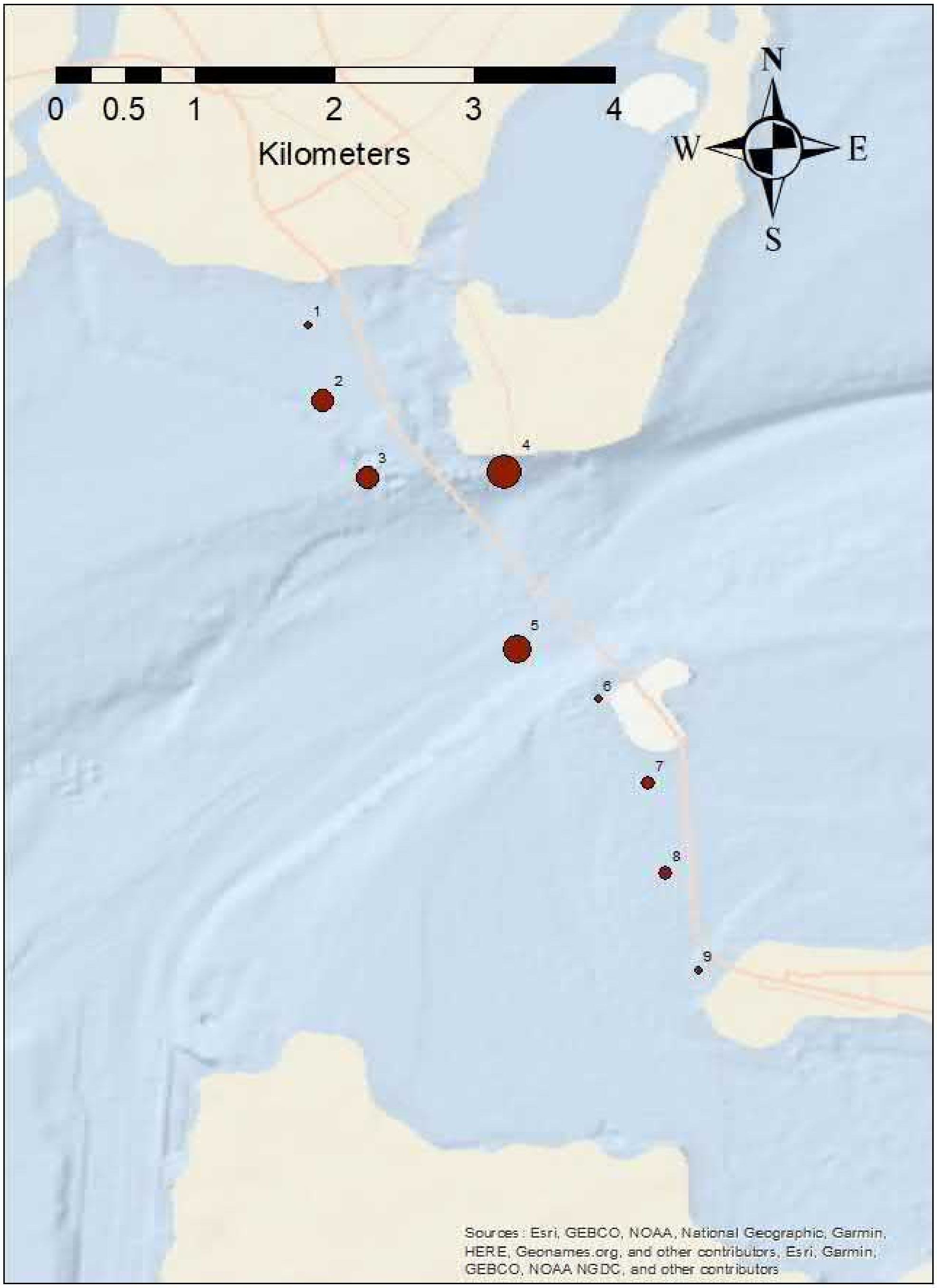

Figure 3. Relative number of unique ATS detections per receiver, based on the size of the circle, within the

project area.

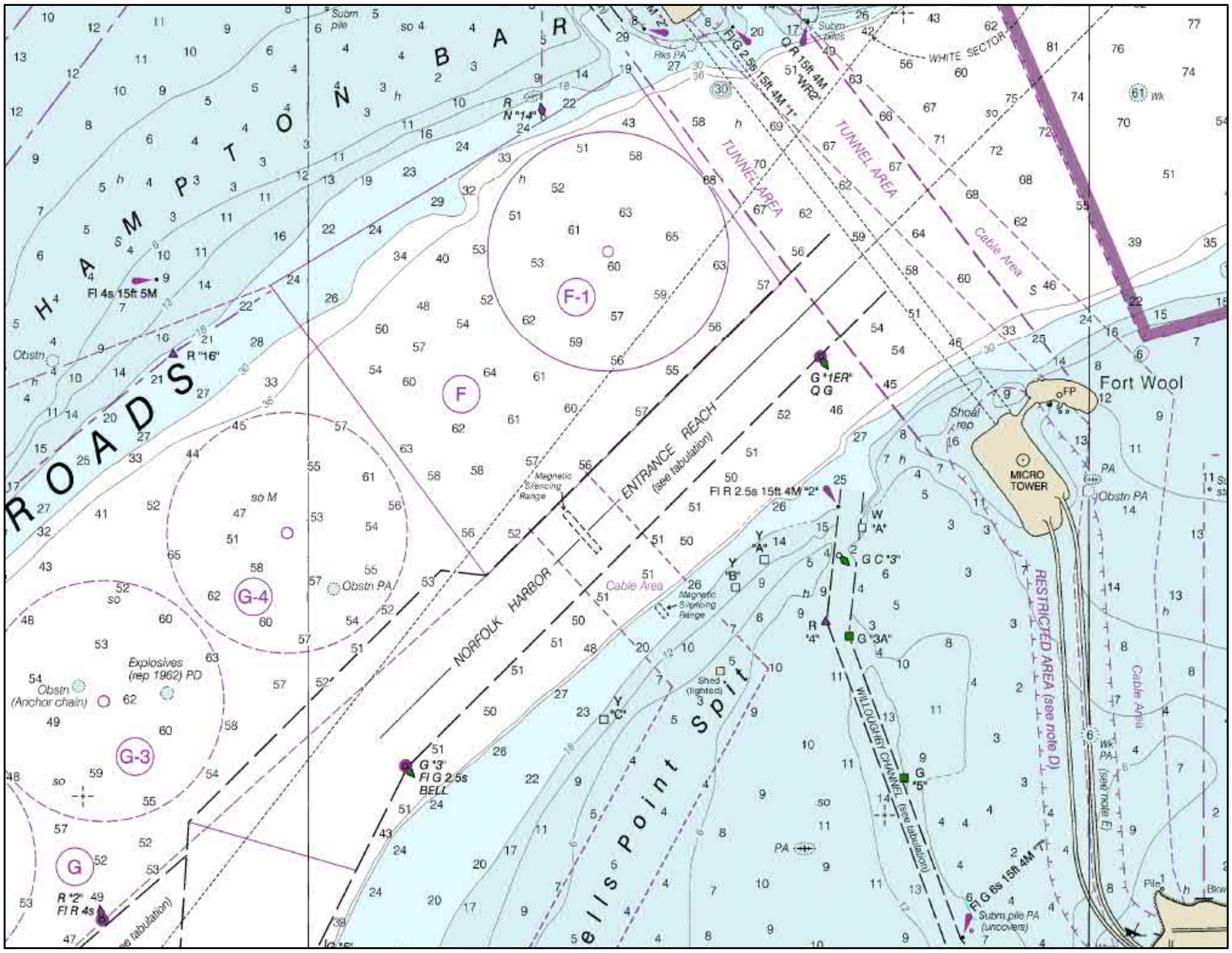

Figure 4. NOAA bathymetry map showing the navigation channel where most ATS detections occurred during

The project period.

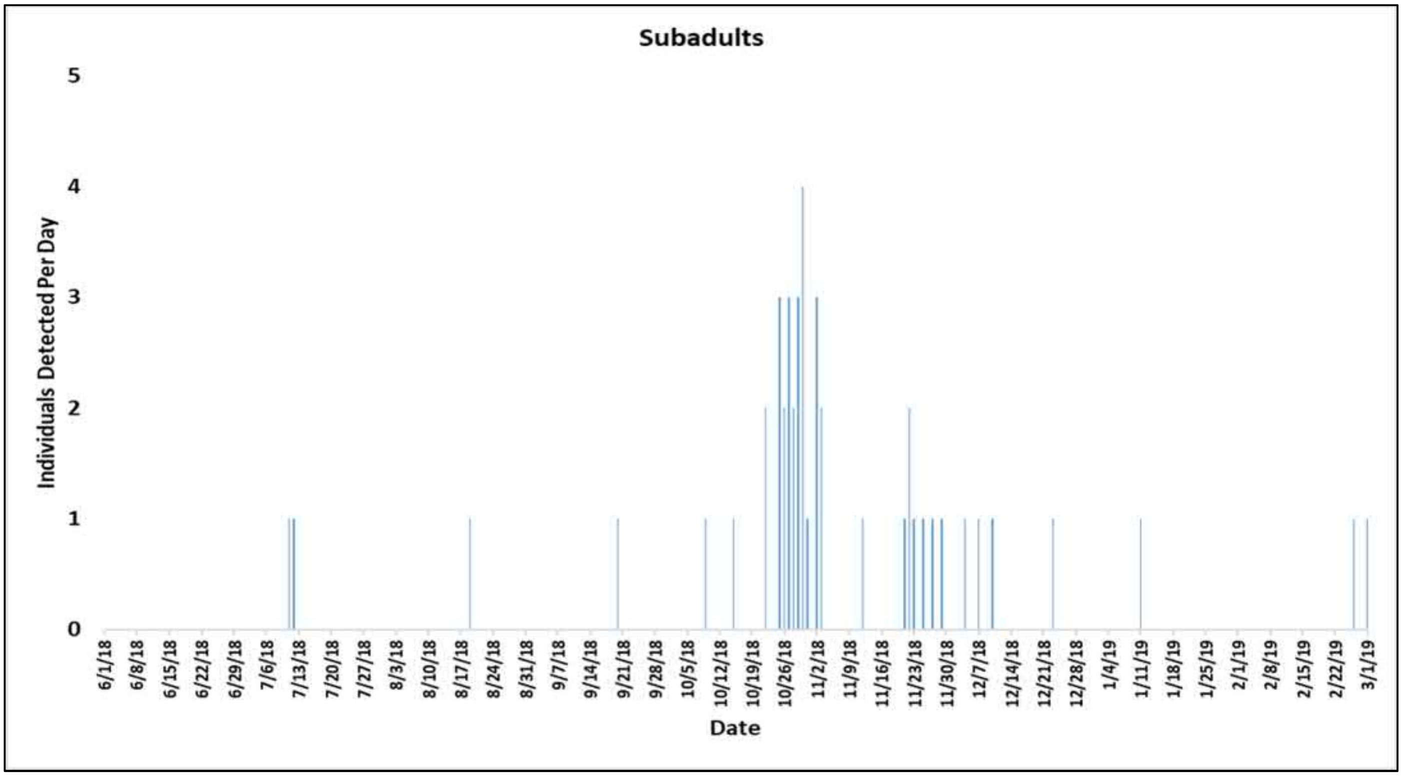

Figure 5. Column chart showing the number of subadult ATS detected in the study area per day throughout the

Phase II project period. The detection peak during late October/early November coincides with subadult egress

migration from the James River to the lower Chesapeake Bay and Atlantic Ocean.

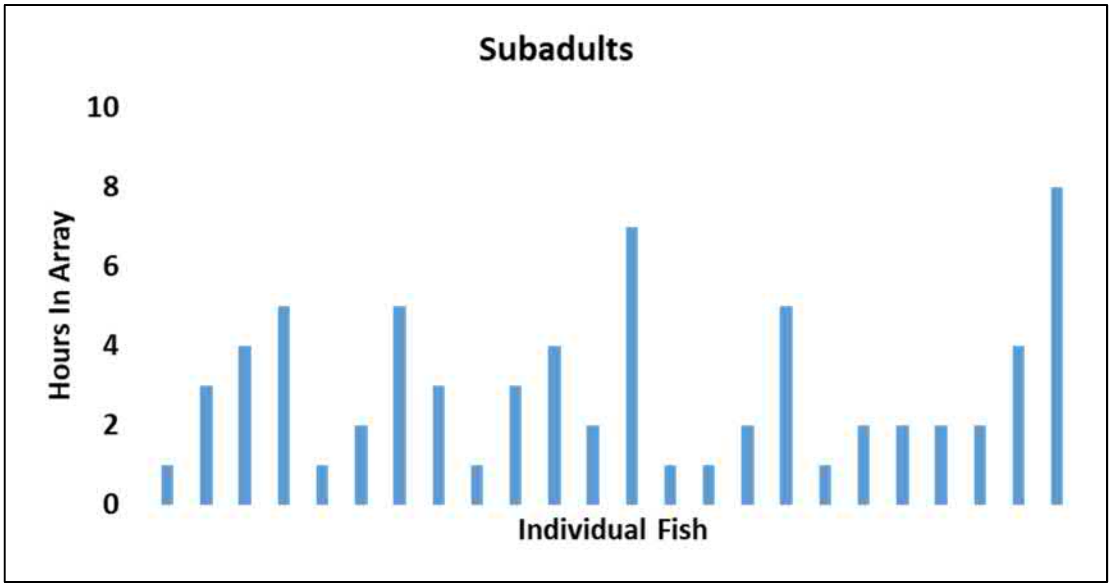

Figure 6. Column chart showing the hours each subadult ATS was detected in the study area between June 1st, 2018 and March 1st, 2019.

Figure 7. New VEMCO telemetry array in the lower Chesapeake Bay maintained by VCU and USACE.

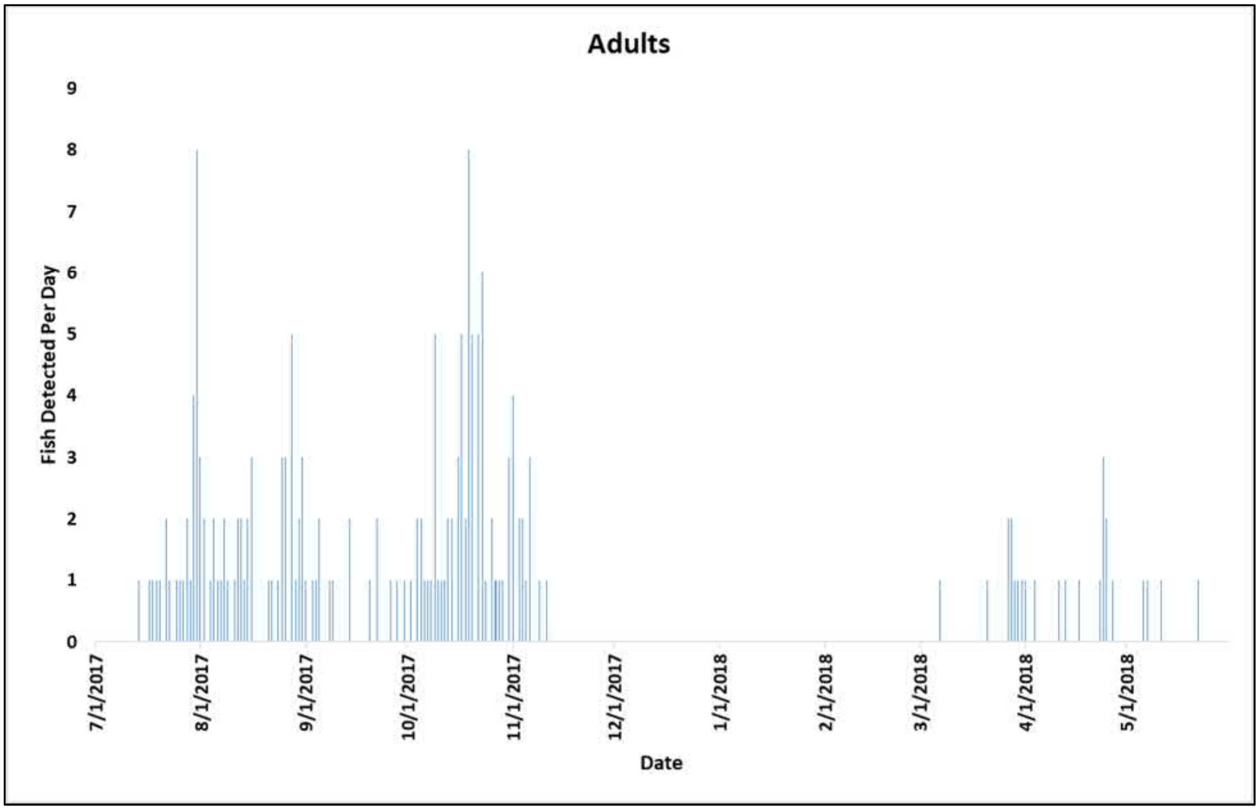

Figure 8. Column chart showing the number of adult ATS detected in the study area per day during the Phase II project period (exclusive of June 2018).

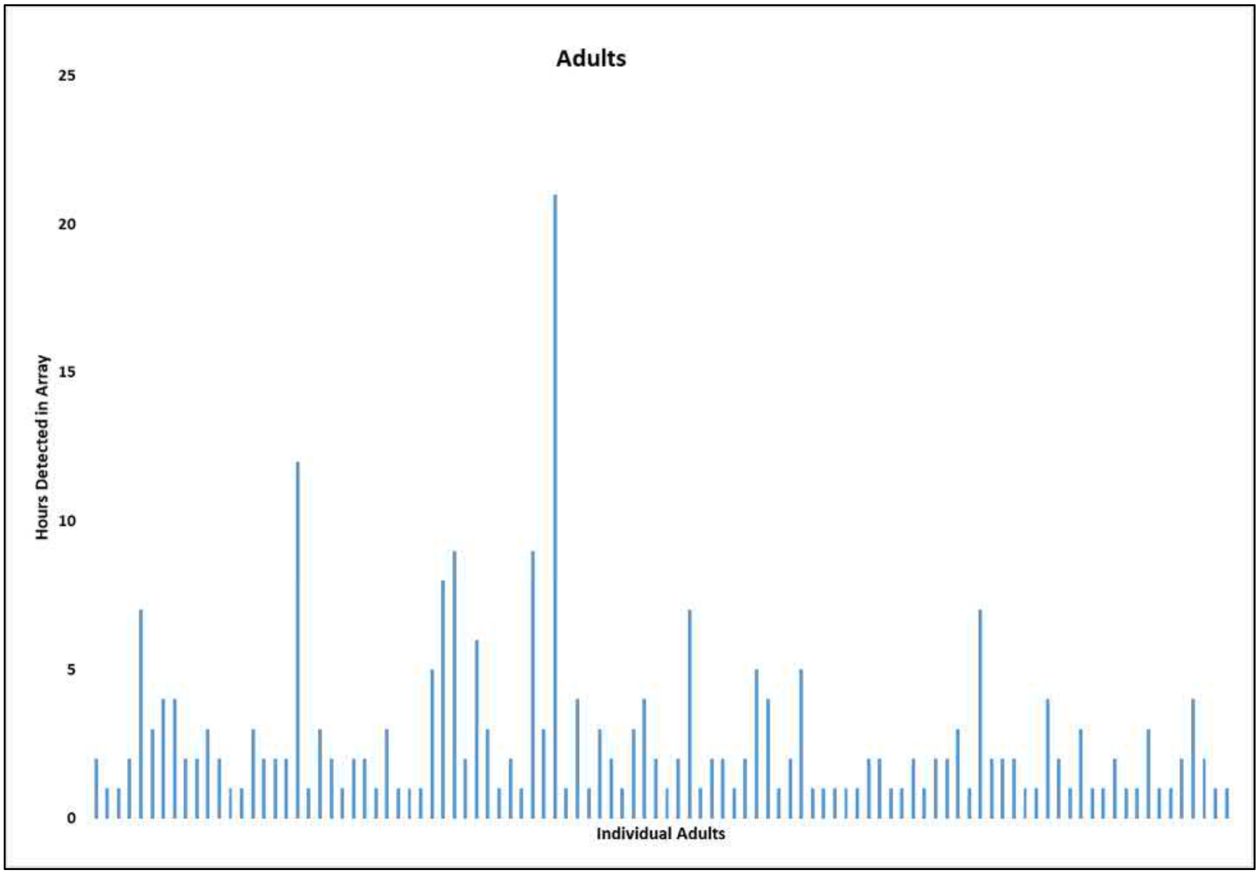

Figure 9. Column chart showing the hours each adult ATS was detected in the study area between July 1st, 2017 to May 30th, 2018 (earlier Phase I of this study).

Figure 10. Early juvenile ATS (James River presumptive Fall 2018 cohort) almost large enough to receive a telemetry tag. This juvenile was caught in early May of 2019 in the upper tidal James River.