APPENDIX - R
MARINE MAMMAL IMPACT ASSESSMENT

I-64 Hampton Roads Bridge-Tunnel Expansion Project

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Hampton-Norfolk, Virginia
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R.1 LOCATION AND DESCRIPTION OF PROJECT AREA

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 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.

The design is divided into five segments as follows:

- Segment 1a (Hampton) begins at the northern terminus of the Project in Hampton and ends at the north end of the north approach slabs for the north tunnel approach trestle bridges. This segment has two interchanges and also includes improvements along Mallory Street to accommodate the bridge replacement over I-64. This segment covers approximately 1.2 miles along I-64.
- Segment 1b (North Trestle Bridges) includes the new and replacement north tunnel approach trestle bridges, including any approach slabs. This segment covers approximately 0.6 miles along I-64.
- Segment 2 (Tunnel) includes the new bored tunnels, the tunnel approach structures, buildings, the North Island improvements for tunnel facilities and South Island improvements. This segment covers approximately 1.8 miles along I-64.
- Segment 3a (South Trestle Bridges) includes the new south tunnel approach trestles and any bridge elements that interface with the South Island to the south end of the south abutments at Willoughby Spit. This segment covers approximately 1.2 miles along I-64.
- Segment 3b (Willoughby Spit) continues from the south end of the south approach slabs for the South Trestle Bridges and ends at the north end of the north approach slabs for the Willoughby Trestle Bridges. This segment includes a modified interchange connection to Bayville Street, and has a truck inspection station for the westbound tunnels. This segment covers approximately 0.6 miles along I-64.
- Segment 3c (Willoughby Trestle Bridges) includes the entire structures over Willoughby Bay, from the north end of the north approach slabs on Willoughby Spit to the south end of south approach slabs near the 4th View Street interchange. This segment covers approximately 1.0 miles along I-64.
- Segment 3d (4th View Street Interchange) continues from the Willoughby Trestle Bridges south, leading to the north end of the north approach slabs of I-64 bridges over Mason

Creek Road along mainline I-64. This segment covers approximately 1.0 miles along I-64.

- Segment 4a (Norfolk-Navy) goes from the I-64 north end of the north approach slabs at Mason Creek Road to the north end of the north approach slabs at New Gate/Patrol Road. There are three interchange ramps in this segment: westbound I-64 exit ramp to Bay Avenue, eastbound I-64 entrance ramp from Ocean Avenue, and westbound I-64 entrance ramp from Granby Street. The ramps in this segment are all on structure. This segment covers approximately 1.5 miles along I-64.
- Segment 5a (I-564 Interchange) starts from the north end of the north approach slab of the New Gate/Patrol Road Bridge to the southern Project Limit. This segment runs along the Navy property and includes an entrance ramp from Patrol Road, access ramps to and from the existing I-64 Express Lanes, ramps to and from I-564, and an eastbound I-64 entrance ramp from Little Creek Road. This segment covers approximately 1.2 miles along I-64.

Table R-1: HRBT Expansion Project Design Segments

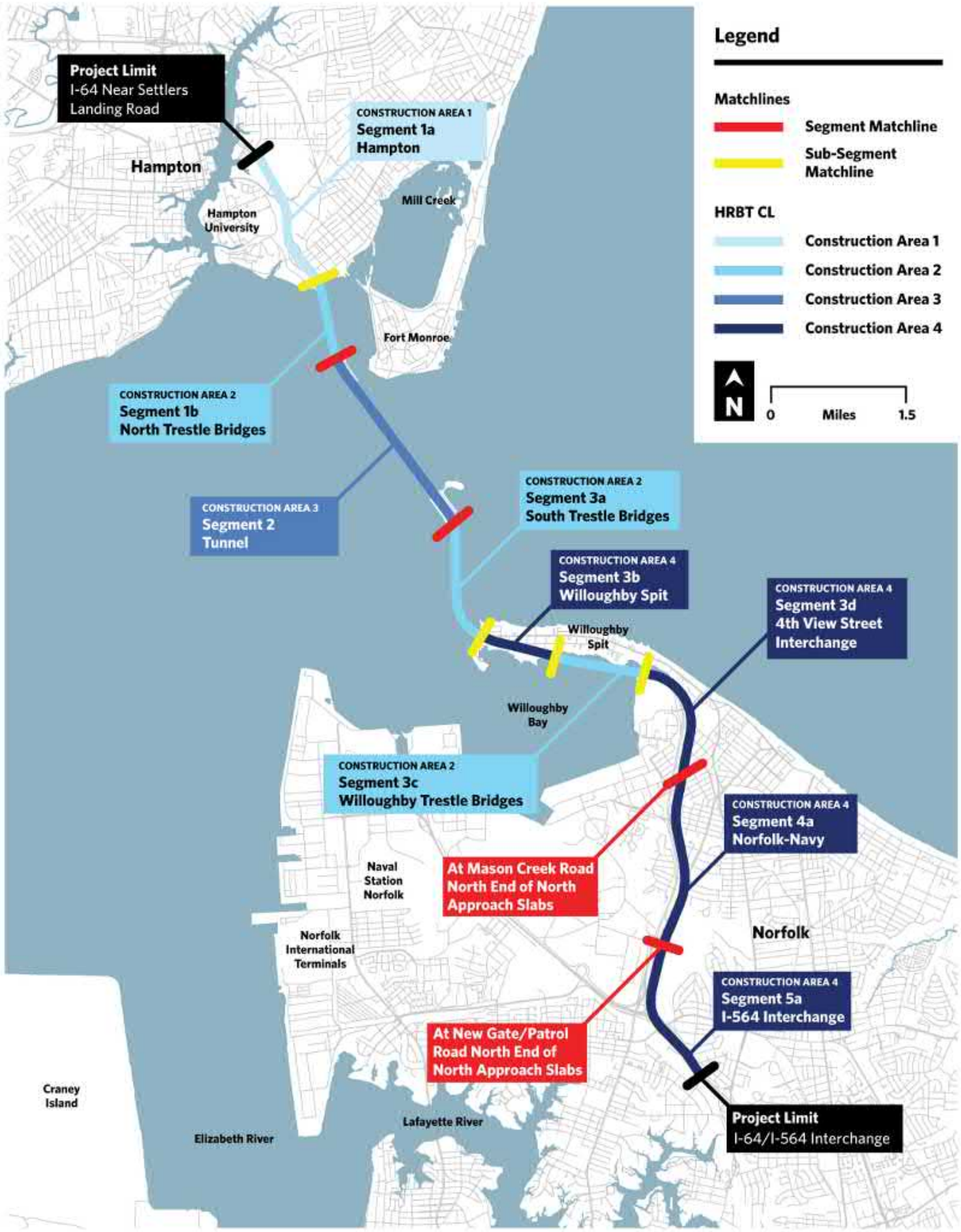
Design Segment	Construction Area
Segment 1a (Hampton)	Area 1
Segment 1b (North Trestle Bridges)	Area 2
Segment 2 (Tunnel)	Area 3
Segment 3a (South Trestle Bridges)	Area 2
Segment 3b (Willoughby Spit)	Area 4
Segment 3c (Willoughby Trestle Bridges)	Area 2
Segment 3d (4th View Street Interchange)	Area 4
Segment 4a (Norfolk-Navy)	Area 4
Segment 5a (I-564 Interchange)	Area 4

Proposed marine construction activities that have potential to affect marine mammals will occur at the following locations in Areas 2 and 3:

- North Trestle Bridges (Segment 1b)
- Tunnel - North Island and South Island (Segment 2a)
- South Trestle Bridges (Segment 3a)
- Willoughby Bay Trestle Bridges (Segment 3c)

Figure R-1: Hampton Roads Bridge Tunnel (HRBT) Expansion Project Location

Figure R-2: Hampton Roads Bridge-Tunnel (HRBT) Expansion Project Design Segments and Key Map



R.2 MARINE MAMMALS IN THE PROJECT AREA

The National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) regulations governing the issuance of Incidental Harassment Applications (IHA) and Letter of Authorizations (LOA) permitting the incidental take of marine mammals under certain circumstances are codified in 50 CFR Part 216, Subpart I (Sections 216.101–216.108). The Marine Mammal Protection Act (MMPA) defines "take" to mean "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 United States Code [USC] Chapter 31, Section 1362 (13)). The NMFS application for IHAs and LOAs requires applicants to determine the number and species of marine mammals that are expected to be incidentally harassed by an action and the nature of the harassment (Level A or Level B).

Although 40 species of marine mammals under NMFS jurisdiction have been documented to occur within the waters of the mid-Atlantic region of the western North Atlantic Ocean, only 8 (six cetacean and two pinniped species) occur on a regular or rare basis in the Chesapeake Bay (Department of the Navy [DoN] 2008) (Table R-1). The remaining marine mammal species are considered extralimital to the Project area.

Marine mammal species occurrence in the Project area was determined using the Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations (OBIS SEAMAP) database (Halpin et al. 2006; OBIS SEAMAP 2019); the United States (U.S.) Navy's Virginia Capes Marine Resource Assessments (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 database (VDOT 2019); the U.S. Navy's Marine Species Monitoring Program Website (DoN 2019); NMFS ESA Section 7 Mapper (NMFS Greater Atlantic Regional Fisheries Office [GARFO] 2019); Bureau of Ocean Energy Management (BOEM) Atlantic OCS Proposed Geological and Geophysical Activities, Mid-Atlantic and South Atlantic Planning Areas Final Programmatic EIS (BOEM 2014); and current USFWS Information for Planning and Consultation (IPaC) (USFWS 2019) Trust Resources Report.

Based on an up-to-date literature review and the Project Final Supplemental Environmental Impact Statement and Environmental Assessment Re-Evaluation (VDOT and Federal Highway Administration (FHWA 2017, 2018) (Table R-2:), the following marine mammal species may occur or are expected or likely to occur near the Project area and are therefore considered in this assessment:

- Fin whale (***Balaenoptera physalus***),
- Humpback whale (***Megaptera novaeangliae***),
- Common minke whale (***Balaenoptera acutorostrata acutorostrata***),
- North Atlantic right whale (***Eubalaena glacialis***),
- Common bottlenose dolphin (***Tursiops truncatus***),
- Harbor porpoise (***Phocoena phocoena***),
- Harbor seal (***Phoca vitulina***), and
- Gray seal (***Halichoerus grypus atlantica***)

Five of the eight species addressed are considered regular inhabitants at least seasonally and have been documented within the Project area; the remaining three species are considered rare (Table R 1). The eight species represent two taxonomic orders: (1) the Cetacea (consisting of 4 whale, 1 dolphin, and 1 porpoise species), and (2) the Pinnipedia (consisting of 2 true seals: the harbor seal and gray seal). Of these, the North Atlantic right whale and fin whale are listed as endangered under the ESA of 1973 (35 Federal Register [FR] 12222; 73 FR 12024). The status, estimated stock abundance, and general and seasonal distribution and occurrence of all 8 species in the Project area are discussed in more detail in Table R-2: and the following Section R.2

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Table R-2: Marine Mammals Known to Occur in or near the Hampton Roads Bridge-Tunnel Project Area

Species/Stock	ESA/ MMPA Status; Strategic (Y or N)[1]	Estimated Stock Abundance[2]	Stock Status Factors (UMEs[3], spills, etc.)	Seasonal Occurrence in Project Area	Occurrence in the Project Area[4]
Fin Whale (*Balaenoptera physalus*) Western North Atlantic	E/D; Y	1,618		Fall–Winter	Rare
Humpback Whale (*Megaptera novaeangliae*) Gulf of Maine	NL; N	896	UME	Year-Round	Regular
Common Minke Whale (*Balaenoptera acutorostrata acutorostrata*) Canadian East Coast	NL; N	2,591	UME	Spring–Fall	Rare
North Atlantic Right Whale (*Eubalaena glacialis*) Western	E/D; Y	451	UME	Winter–Spring	Rare
Bottlenose Dolphin (*Tursiops truncatus*) Western North Atlantic Offshore	NL; N	77,532		Spring–Fall	Rare
Bottlenose Dolphin (*Tursiops truncatus*) Western North Atlantic Northern Migratory Coastal	NL/D; Y	6,639		Spring–Fall	Regular
Bottlenose Dolphin (*Tursiops truncatus*) Western North Atlantic Southern Migratory Coastal	NL/D; Y	3,751		Spring–Fall	Regular

Species/Stock	ESA/ MMPA Status; Strategic (Y or N)[1]	Estimated Stock Abundance[2]	Stock Status Factors (UMEs[3], spills, etc.)	Seasonal Occurrence in Project Area	Occurrence in the Project Area[4]
Bottlenose Dolphin (*Tursiops truncatus*) Northern North Carolina Estuarine System	NL/D; N	823		Summer–Fall	Regular
Harbor Porpoise (*Phocoena phocoena*) Gulf of Maine-Bay of Fundy	NL; N	79,883		Winter–Spring	Regular
Harbor Seal (*Phoca vitulina*) Western North Atlantic	NL; N	75,834	UME	Winter–Spring	Regular
Gray Seal (*Halichoerus grypus atlantica*) Western North Atlantic	NL; N	27,131	UME	Winter–Spring	Regular

[1]Endangered Species Act (ESA) status: Endangered (E), / Marine Mammal Protection Act (MMPA) status: Depleted (D). NL = not listed, indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds Potential Biological Removal or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

[2]Stocks and stock sizes were taken from the latest stock assessment report from NOAA Fisheries at https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments

[3]UME = Unusual Mortality Event: https://www.fisheries.noaa.gov/national/marine-life-distress/active-and-closed-unusual-mortality-events

[4]Regular = A species that occurs as a regular or normal part of the fauna of the area, regardless of how abundant or common it is; Rare = A species that only occurs in the area sporadically (DoN 2009).

R.3 SPECIES STATUS AND DISTRIBUTION

The U.S. Navy, the Virginia Aquarium and Marine Science Center, and the University of Maryland's Center for Environmental Science have conducted recent studies and/or monitoring surveys in the Chesapeake Bay mid-Atlantic waters, addressing marine mammals within or near the Project area and are described below. Additional studies addressing particular species, focusing on recent data and reports, are referenced under each species section.

The U.S. Navy's Marine Species Monitoring Program, in support of Atlantic Fleet Training and Testing Marine Mammal Protection Act requirements (50 CFR Part 218), has been conducting marine mammal monitoring in the U.S. Navy Ranges, specifically in the Atlantic Ocean, since 2009. The U.S. Navy routinely conducts training and testing activities in the Virginia Capes Operating Area off the mid-Atlantic which lies east of the mouth of the Chesapeake Bay. The U.S. Navy has conducted the following marine mammal monitoring studies in the Chesapeake Bay area

Occurrence, Distribution, and Density of Marine Mammals Near Naval Station Norfolk and Virginia Beach - 2012 through 2015 (Engelhaupt et al. 2014, 2015, 2016)

- NAS Patuxent River Marine Species Surveys – 2015 through 2017 (Richlen et al. 2016, 2017, 2018)
- Haul-Out Counts and Photo-Identification of Pinnipeds in Virginia – 2014 through 2019 (Rees et al. 2016; Jones et al. 2018)
- Mid-Atlantic Humpback Whale Monitoring – 2015 through 2020 (Aschettino et al. 2015, 2016, 2017, 2018, 2019)
- Pinniped Tagging and Tracking in Southeast Virginia – 2017 through 2019 (Ampela et al. 2019)
- Behavioral Response of Humpback Whales to Vessel Traffic – 2019 through 2020

The Virginia Aquarium and Marine Science Center has been conducting research on marine mammals off of Virginia since 1987 and holds permits from state and federal authorities for all activities related to marine mammal stranding response and research. The Virginia Aquarium and Marine Science Center has conducted the following marine mammal monitoring studies in the Chesapeake Bay:

- Aerial Survey Baseline Monitoring in the Continental Shelf Region of the VACAPES OPAREA – 2012 through 2016 (Mallette et al. 2014, 2016b, 2017). Project covered the areas of the Chesapeake Bay mouth.
- Since 1991, the Stranding Response Team has been responsible for rendering aid to over 8.000 marine mammals and sea turtles that come ashore in Virginia (Swingle et al. 2007, 2010, 2011, 2012, 2013, 2014, 2015, 2018; Barco 2013; Barco and Swingle 2014; Costidis et al. 2017, 2019).

The University of Maryland's Center for Environmental Science, Chesapeake Biological Laboratory documents movements of bottlenose dolphin in the Chesapeake Bay. In its third year, the dolphin tracker, the Chesapeake DolphinWatch (DolphinWatch 2019), marks the location of dolphin sightings on a map of the Chesapeake and its tributaries. Since 2017, over 2,000 sightings in the Chesapeake Bay have been recorded.

R.3.1 SPECIES NOT EXPECTED TO BE INCIDENTALLY TAKEN.

R.3.1.1 FIN WHALE

Fin whales in the North Atlantic belong to the western North Atlantic stock (Hayes et al. 2019). The fin whale is listed as endangered under the ESA and is considered a strategic stock although no critical habitat is designated. The fin whale is Marine Mammal Protection Act (MMPA) depleted throughout its range. 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. 2019) (Error! Reference source not found.). NMFS initiated a 5-year review of the fin whale in January 2018 to determine whether a reclassification or delisting may be warranted (83 FR 4032; NMFS 2019d). In February 2019, the review indicated that, based on the best available scientific and commercial information, the fin whale should be downlisted from endangered to threatened; however, this downlisting has not occurred and is recommended for future action (NMFS 2019d).

Fin whales are typically found in waters of the Atlantic Exclusive Economic Zone, from Cape Hatteras, North Carolina, northward to Maine (Hayes et al. 2019). 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. 2019). Fin whales are in the mid-ocean near the Mid-Atlantic ridge 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; DoN 2009; Hyrenbach et al. 2012; Barco 2013; Mallette et al. 2016a, b; Aschettino et al. 2018; Engelhaupt et al. 2017, 2018; Cotter 2019), and in the Chesapeake Bay (Bailey 1948; CETAP 1981, 1982; Morgan et al. 2002; Barco 2013; Aschettino et al. 2018); however, they are not likely to occur in the Project area. Although chances of fin whales being as far in the Bay as the HRBT are rare, sightings around the Chesapeake Bay Bridge Tunnel have occurred during the winter months (CETAP 1981, 1982; Barco 2013; Aschettino et al. 2018).

Based on stranding data, fin whales could potentially be present in the Project Area. 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 HRBT Project area have occurred in: February 2012, a dead fin whale washed ashore on Oceanview Beach in Norfolk (Swingle et al. 2013); December 2017, a live fin whale stranded on a shoal in Newport News and died at the site (Swingle et al. 2018); February 2014, a dead fin whale stranded on a sand bar in Pocomoke Sound near Great Fox Island, Accomack (Swingle et al. 2015); and, March 2007, a dead fin whale near Craney Island, in the Elizabeth River, in Norfolk (Barco 2013). However, only stranded fin whales have been documented in the Project a; no free-swimming fin whales have been observed. Therefore, this species is not likely to occur in the Project area and is not discussed further.

R.3.1.2 COMMON MINKE WHALE

In the North Atlantic Ocean, there are four recognized populations of common minke whales (minke whales): Canadian East Coast, west Greenland, central North Atlantic, and northeastern North Atlantic (Hayes et al. 2019). The stock that inhabits waters within the Project area off the U.S. eastern coast is the Canadian East Coast stock, distributed from the Davis Strait (45°W) to the Gulf of Mexico (BOEM 2014; Hayes et al. 2019). The minke whale ranges widely within the U.S. Atlantic Exclusive Economic Zone typically in continental shelf waters (CETAP 1982; Hayes et al. 2019). The Canadian East Coast stock is thought to winter in the West Indies, and in the mid-ocean south and east of Bermuda (Hayes et al. 2019). During summer months, the stock migrates north to New England and Canadian waters (Hayes et al. 2019). The minke whale is not listed as endangered under the ESA and no critical habitat is designated. The most recent estimate of abundance is 2,591 individuals in the Canadian East Coast stock while the minimum population estimate is 1,425 (Hayes et al. 2019) (Table R-2:).

Minke whales have been seen off Virginia (CETAP 1981, 1982; Hyrenbach et al. 2012; Barco 2013; Mallette et al. 2016a, b; McLellan 2017; Engelhaupt et al. 2017, 2018; Cotter 2019), near the CBBT (Aschettino et al. 2018) and in the Project area although the sightings in the Project area are known from strandings (Jensen and Silber 2003; Barco 2013; DoN 2009). In August 1994, a ship strike incident involved a minke whale in Hampton Roads (Jensen and Silber 2003; Barco 2013). It was reported that the animal was struck offshore and was carried inshore on the bow of a ship (DoN 2009). Twelve strandings of minke whales have occurred in Virginia waters from 1988-2016 (Costidis et al.

2017). One minke whale stranded in both 2017 and 2018 (Swingle et al. 2018; Costidis et al. 2019). Therefore, minke whales are not expected in the Project area and are not discussed further.

R.3.1.1 NORTH ATLANTIC RIGHT WHALE

North Atlantic right whales are listed as endangered under the ESA (Table R-2:), 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. 2019; 71 FR 77704; 73 FR 12024). 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. 2019). North Atlantic right whales inhabit the Atlantic Ocean and belong to the Western stock (formerly the Western North Atlantic stock) (Hayes et al. 2019). The most recent estimate of abundance is 451 individuals in the Western stock while the minimum population estimate is 4(Hayes et al. 2019). Based off the North Atlantic Right Whale Consortium 2018 Annual Report Card, the best estimate for the end of 2017 is 411 North Atlantic right whales (Pettis et al. 2018). In 2017, a total of 17 North Atlantic right whales were confirmed dead stranded (12 in Canada; 5 in the U.S.) and in 2018, three whales stranded in the U.S; these deaths declared an UME (NOAA Fisheries 2019). Despite recovery efforts, North Atlantic right whales face a high risk of extinction into the foreseeable future (NMFS 2012b).

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 nm2 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 Project area.

The Western stock primarily inhabits coastal waters from southeastern U.S. (Florida) to New England north to the Canadian Bay of Fundy, Scotian Shelf, and Gulf of St. Lawrence (Hayes et al. 2019). Research suggests that there are seven major habitats or congregation areas for this stock (Hayes et al. 2019): (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. 2019). 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. 2019). 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.

Based on sighting data and passive acoustic studies, the North Atlantic right whale could occur off Virginia year-round (DoN 2009; 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. 2016a, b, 2017, 2018a; Palka et al. 2017; Cotter 2019). North Atlantic right whales are known to frequent the coastal waters of the mouth of the Chesapeake Bay (Knowlton et al. 2002) 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 Project area 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 Project 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 Project area; therefore, would not be exposed to any effects of bridge construction and is not discussed further.

R.3.2 SPECIES WITH THE POTENTIAL TO BE INCIDENTALLY TAKEN

R.3.2.1 HUMPBACK WHALE

Humpback whales that occur off the western North Atlantic belong to the Gulf of Maine Stock from the West Indies Distinct Population Segment (DPS) and consist of four separate discrete subpopulations that use four discrete feeding areas: the Gulf of Maine, Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland (Katona and Beard 1990; Bettridge et al. 2015; Hayes et al. 2019). The humpback whales that could potentially occur in the Project area are from Gulf of Maine stock, formerly known as the Western North Atlantic stock (Hayes et al. 2019). Humpback whales that belong to the West Indies DPS are not listed as endangered under the ESA and no critical habitat is designated. The most recent estimate of abundance is 896 individuals in the Gulf of Maine stock while the minimum population estimate is 896 (Hayes et al. 2019) (Table R-2:).

The Gulf of Maine Stock humpback whales have a wide range in the western Northern Atlantic, typically in continental shelf and oceanic island waters (Hayes et al. 2019). Some individuals are found year-round in the Gulf of Maine (Robbins 2007; Hayes et al. 2019), while others use the mid-Atlantic region to over-winter (Barco et al. 2002; Aschettino et al. 2018). It is thought that others migrate to the West Indies during the winter to mate and calve (Hayes et al. 2019). During summer months, the stock migrates north to New England and Canadian waters (Hayes et al. 2019).

The Project area is not within normal humpback whale feeding or migration areas; however, they could occur in the Project area in relatively small numbers seasonally during migrations. Sightings have been reported off Virginia during the fall and winter (CETAP 1981, 1982; Swingle et al. 1993; Barco et al. 2002; McLellan 2011a; Engelhaupt et al. 2014, 2015, 2016, 2017, 2018; Aschettino et al. 2015, 2016, 2017, 2018, 2019; Mallette et al. 2016a, b, 2017, 2018a, b; McAlarney et al. 2017, 2018) and most recently, the spring (pers. comm. Jessica Aschettino, HDR Inc., May 2019; Cotter 2019). Humpback whales are known to frequent the coastal waters of the mouth of the Chesapeake Bay during the winter months (Aschettino et al. 2015, 2016, 2017a, b, 2018; Movebank 2019), and on the rare occasion, inshore of the CBBT (Perkins and Beamish 1979; Aschettino et al. 2018; Movebank 2019). Humpback whales could use the Chesapeake Bay area year-round based off sighting and stranding data (DoN 2009; Aschettino et al. 2015, 2016, 2017, 2018, 2019). Baseline occurrence and behavior data for humpback whales in the Hampton Roads mid-Atlantic region was collected via satellite tags; these data show site fidelity to the Chesapeake Bay area (Aschettino et al. 2018) and movement in and around the HRBT Project area (Movebank 2019).

Thirty-seven humpback whale strandings have occurred in Virginia from 1988-2016 (Costidis et al. 2017). Humpback whale strandings or entanglements have been recorded in every month of the year with April has having the highest number of strandings (Costidis et al. 2017). Twenty-seven of the 37 strandings occurred on ocean-facing beaches; however some have occurred within the lower Chesapeake Bay (Barco 2013; Costidis et al. 2017). In Virginia during 2017, eight humpback whales stranded and in 2018, five humpback whales stranded (Swingle et al. 2018; Costidis et al. 2019). A documented stranding occurred near the Project area in February 2017, where a dead humpback whale stranded in Hampton, just east of the HRBT (Swingle et al. 2018). In 2017, due to elevated humpback whale mortalities that have occurred along the coast since 2016, from Maine to Florida, an UME was declared for humpback whales in the North Atlantic (NOAA Fisheries 2019a). From 2016 to May 2019, Virginia had the highest number of strandings along the western Atlantic coast from Maine to Florida (NOAA Fisheries 2019a). Therefore, humpback whales could occur near the Project area.

R.3.2.2 COMMON BOTTLENOSE DOLPHIN

Common bottlenose dolphins (bottlenose dolphin) occur in U.S. Atlantic waters year-round. Some stocks occupy the same range all year, while some coastal migratory stocks move seasonally along the coast (Hayes et al. 2019). These different stocks can overlap spatially with other distinct groups of bottlenose dolphins (Torres et al. 2003; Hayes et al. 2019). Bottlenose dolphins occupy a variety of habitats and can be found on the outer continental shelf and slope, as well as close to shore and in inshore waters, including bays, sounds and estuaries; however, highest densities tend to occur within inner shelf areas (Wells and Scott 1999; Hamazaki 2002; Hayes et al. 2019).

The population structure of bottlenose dolphins off Virginia is complex with an offshore stock (Western North Atlantic Offshore Stock) located near the continental shelf edge and multiple migratory (Western North Atlantic Northern Migratory Coastal Stock and Western North Atlantic Southern Migratory Coastal Stock), and resident coastal stocks close to shore and in estuarine waters (Northern North Carolina Estuarine System Stock) (Hayes et al. 2019). Bottlenose dolphins that inhabit the waters surrounding the Project area, in the Chesapeake Bay and off Virginia, could belong to these offshore, migratory, and resident stocks. Bottlenose dolphins are not listed under the ESA, but the Northern Coastal Migratory, Western North Atlantic Southern Migratory Coastal, and Northern North Carolina Estuarine System stocks are listed as depleted under the MMPA (Hayes et al. 2019).

The most recent abundance estimate for the Western North Atlantic Northern Migratory Coastal stock is 6,639, with a minimum population estimate of 4,759 individuals; the best abundance estimate for the Western North Atlantic Southern Migratory Coastal Stock is 3,751 with a minimum of 2,353 individuals (Hayes et al. 2019) (Table R-2:). The most recent abundance estimate for the Northern North Carolina Estuarine System stock is 823, the minimum abundance estimate is 782 (Hayes et al. 2019). The best population estimate for the Western North Atlantic Offshore Stock is 77,532 with a minimum estimate of 56,053 (Hayes et al. 2019).

Bottlenose dolphins are consistently seen in Virginia waters from May through October (Barco et al. 1999; Costidis et al. 2017; Cotter 2019) and are regularly sighted from early spring through late fall with sightings and stranding events in Virginia waters all months of the year (Swingle et al. 2010, 2011, 2012, 2013, 2014; DolphinWatch 2019). Sightings have been reported off Virginia and near the Project Area during the summer, fall and winter (CETAP 1981, 1982; Hohn 1997; Torres et al. 2005; Northeast Fisheries Science Center and Southeast Fisheries Science Center and Southeast Fisheries Science Center 2012, 2016; Barco 2013, 2014; Garrison 2013; DiMatteo 2014; Roberts et al. 2016; Engelhaupt et al. 2014, 2015, 2016, 2017, 2018; Palka et al. 2017; Mallette et al. 2016a, b, 2017, 2018a, b; McAlarney et al. 2017, 2018; DolphinWatch 2019). Strandings of bottlenose dolphins are quite high in Virginia; from 2006 to 2016, an average of 66 individuals stranded each year (Costidis et al. 2017). In 2013, a historic total of 427 strandings occurred which marked the start of a mid-Atlantic Bottlenose Dolphin UME (Costidis et al. 2017; Swingle et al. 2018) that ended in March of 2015. In Virginia, in 2017, 67 bottlenose dolphin strandings occurred and in 2018, 76 bottlenose dolphin strandings were recorded (Swingle et al. 2018; Costidis et al. 2019). There are many documented strandings in and around the Project area (Barco 2013; Swingle et al. 2018; Costidis et al. 2019). Therefore, bottlenose dolphins are expected to occur in the Project area.

R.3.2.3 HARBOR PORPOISE

The Gulf of Maine-Bay of Fundy stock of harbor porpoise inhabits waters off the U.S. eastern coast and thus the Project area (Hayes et al. 2019). These small coastal harbor porpoises generally inhabit shallow, coastal waters of the continental shelf but are occasionally seen in deeper waters (Gaskin 1984; Westgate et al. 1998; Hayes et al. 2019). During fall and spring, harbor porpoises are widely dispersed from New Jersey north to Maine and during winter, range from New Brunswick, Canada, to North Carolina (DoN 2009; Roberts et al. 2016; Hayes et al. 2019). Harbor porpoises are not listed as an endangered or threatened species, but are protected under the MMPA. No critical habitat has been designated. The most recent estimate of abundance is 79,883 individuals in the Gulf of Maine-Bay of Fundy stock while the minimum population estimate is 61,415 (Hayes et al. 2019) (Table R-2:).

The inland waters of Virginia are considered to be part of the normal habitat of the harbor porpoise (Polacheck et al. 1995; DoN 2009). Sightings have been reported off Virginia (DoN 2009; Hyrenbach et al. 2012) and they regularly occur in the Chesapeake Bay (Prescott and Fiorelli 1980; Polacheck et al. 1995; DoN 2009). A few sightings have occurred near the HRBT (pers. comm. Mark Cotter, HDR Inc., May 2019). There are documented sightings near the Project area during the spring and winter; most of these sightings are known from stranding data (Polacheck et al. 1995; Cox et al. 1998; Morgan et al. 2002; Swingle et al. 2007; Barco 2013). Harbor porpoise were the second-most marine mammal likely to strand in Virginia, with a total of 327 strandings and an average of 11 strandings per year from 1988 to 2016 (Costidis et al. 2017). There were five harbor porpoise strandings in Virginia in 2017 and one in 2018 (Costidis et al. 2019). There are documented strandings near the HRBT Project area that have occurred during the months of February, March, April, May and July (Barco 2013). Although not typically expected as far inshore as the HRBT, harbor porpoise could occur in the Project area.

R.3.2.4 HARBOR SEAL

Harbor seals (true seal or Phocid pinniped) that inhabit the U.S. eastern coast belong to Western North Atlantic stock. The stock ranges from New Jersey to Labrador, with scattered sightings and strandings reported as far south as Florida (Hayes et al. 2019). Distribution along the U.S. Atlantic coast has shifted in recent years (Johnston et al. 2015; DiGiovianni et al. 2018; Jones et al. 2018), with an increased number of harbor seals reported in southern New England and the mid-Atlantic region (Hayes et al. 2019). Harbor seals migrate to northern areas for mating and pupping in the spring and summer, and return to more southerly areas in the fall and winter (Ampela et al. 2019). Harbor seals are not listed as an endangered or threatened species but are protected under the MMPA. No critical habitat has been designated. The most recent harbor seal estimate of abundance is 75,834 individuals in the Western North Atlantic stock while the minimum population estimate is 66,884 (Hayes et al. 2019) (Table R-2:).

Sightings of harbor seals in Virginia were once considered very uncommon (Potter 1991; DoN 2009) but now occur regularly in the Chesapeake Bay (DoN 2009). The 2015 stock assessment report noted that a small group of harbor seals (<50) hauls out seasonally in the Chesapeake Bay, Virginia (Waring et al. 2016). Harbor seal presence in Virginia waters is seasonal, with individuals arriving during in January-February (winter) and extending into April-May (spring) (Costidis et al. 2017). Observations from the CBBT staff and local anglers, indicate harbor seals have been using the CBBT islands (Figure R-3) to haul out on for many years, but that the number of animals appears to be increasing (Jones et al. 2018). Smaller numbers of harbor seals have been known to occasionally haul out on the rocks near the HRBT (pers. comm., Danielle Jones, Naval Facilities Engineering Command Atlantic, April 2019) and at Hopewell up the James River (Blaylock 1985; DoN 2009). Sightings have been reported off Virginia and near the Project Area during the winter and spring (Barco 2013; Rees et al. 2016; Jones et al. 2018; Ampela et al. 2019).

Since 1991, harbor seals make up only 3% of the stranded marine mammals in Virginia (Costidis et al. 2017). In Virginia, four harbor seals stranded in 2017 and two in 2018 (Swingle et al. 2018; Costidis et al. 2019). A few documented strandings have occurred in or near the HRBT Project area: one in March 1991 near Wills Island, in the Elizabeth River, and the other in February 1998 off Hampton, in the James River (Barco 2013). Since July 2018, increased numbers of harbor seal and gray seal mortalities have occurred across Maine, New Hampshire and Massachusetts (NOAA Fisheries 2019c). This event has been declared a 2018-2019

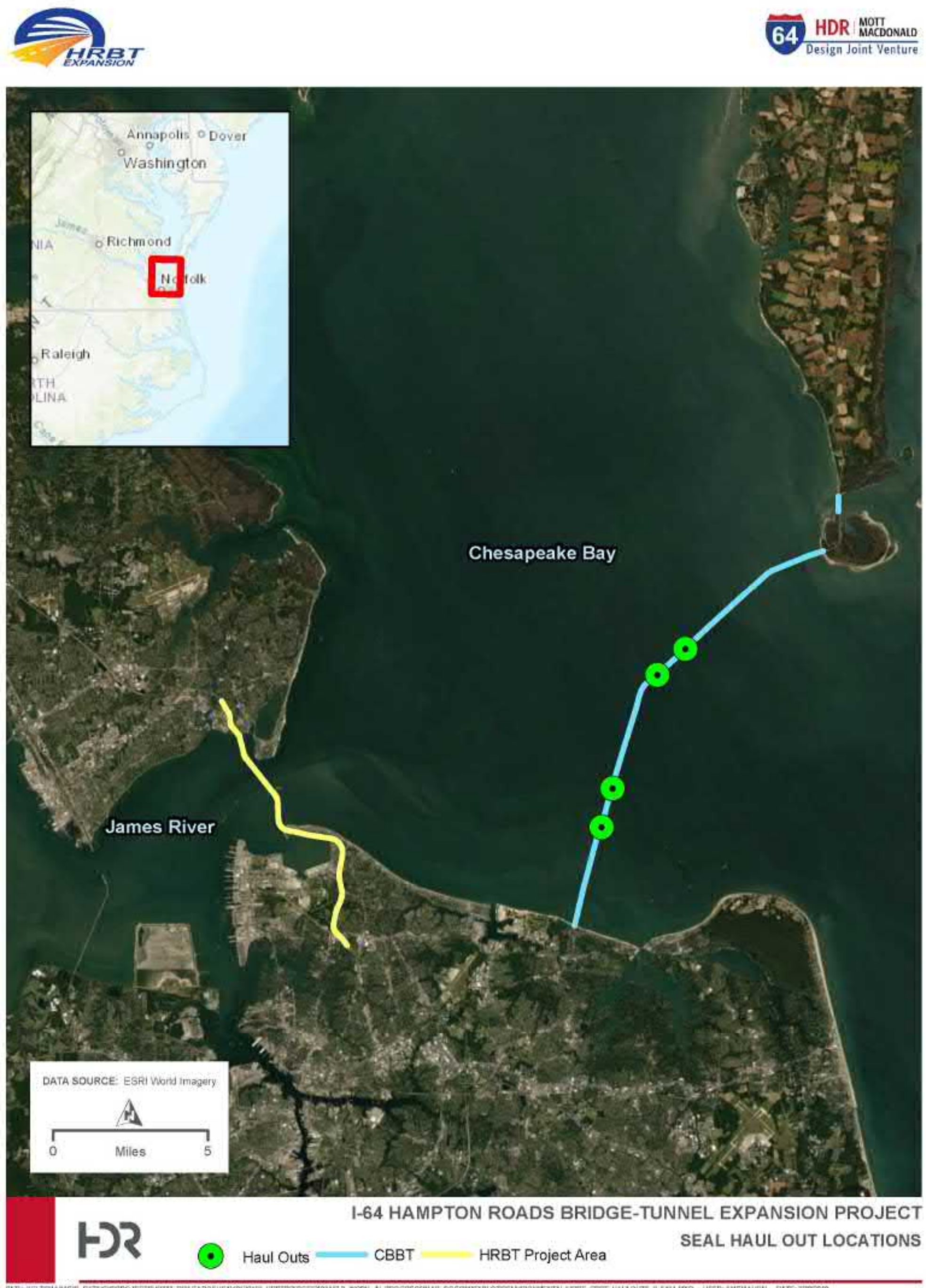
Pinniped UME along the Northeast Coast which encompasses all seal strandings from Maine to Virginia (NOAA Fisheries 2019c). Harbor seals could occur in the Project area.

R.3.2.5 GRAY SEAL

Gray seals (true seal or Phocid pinniped) that inhabit the U.S. eastern coast belong to the Western North Atlantic stock. The stock ranges from New Jersey to Labrador, with scattered sightings and strandings reported as far south as North Carolina (Hayes et al. 2019). Distribution along the U.S. Atlantic coast has shifted in recent years (Johnston et al. 2015; DiGiovianni et al. 2018; Jones et al. 2018), with an increased number of gray seals reported in southern New England and the mid-Atlantic region (Hayes et al. 2019). Gray seals are not listed as an endangered or threatened species but are protected under the MMPA. No critical habitat has been designated. Gray seal estimate of abundance is 27,131 individuals in the Western North Atlantic stock while the minimum population estimate is 23,158 (Hayes et al. 2019) (Table R-2:).

Gray seals are occasionally observed resting on the rocks around the portal islands of the CBBT from December through April alongside harbor seals, but are uncommon in Virginia and the Chesapeake Bay (Barco and Swingle 2014). Sightings of gray seals in Virginia waters are sporadic, occurring in winter and early spring; however, observations appear to be becoming more frequent (DoN 2009; Costidis et al. 2017). Surveys conducted by the U.S. Navy at the CBBT portal islands recorded one gray seal in the 2014/2015, two gray seals in 2015/2016, and two gray seals in 2016/2017 seasons (Rees et al. 2016; 83 FR 36522) (Figure R-3). Sightings have been reported off Virginia and near the Project area during the winter and spring (Barco 2013; Rees et al. 2016; Jones et al. 2018; Ampela et al. 2019). There are only 15 gray seal strandings documented in Virginia from 1988–2013 (Barco and Swingle 2014). In Virginia, four gray seals stranded in 2018 (Costidis et al. 2019). There is one documented gray seal stranding which occurred in June 2007 on the Chesapeake Bay side of Willoughby Spit (Barco 2013). Gray seals could occur in the Project area.

Figure R-3: Harbor Seal and Gray Seal Haulouts Located Nearest to the Project Area



R.4 POTENTIAL EFFECTS ON MARINE MAMMALS

Of the planned construction activities, noise from pile installation and removal of temporary piles has the potential to impact (harass) marine mammals that may occur near the construction activity and require consideration under the MMPA. Under Section 101(a)(5)(D) of the MMPA, the HRCP has requested an IHA for the non-lethal "take" by harassment of small numbers of marine mammals, incidental to in-water pile installation associated with early work that represents critical path (i.e., activities that directly affect the overall project schedule) and can begin during Spring-Summer 2020 (Table R-3:). HRCP has requested that the IHA issued be effective from April 2020 to March 2021, one calendar year from the start of pile installation

Table R-3: Pile installation and removal to be covered under an IHA

Project Component	Schedule (A)	Pile Size / Type	Number of Piles
Install TBM Platform	Receipt of JPA – Sep 2020	36-inch steel pipe	216
Install Conveyor Trestle at South Island	Receipt of JPA – Sep 2020	36-inch steel pipe	84
Install Jet Grouting Trestles	Receipt of JPA – Nov 2020	36-inch steel pipe	204
Install North Shore Work Trestle	Receipt of JPA – Dec 2020	36-inch steel pipe	194
Install North Trestle Mooring Piles	Receipt of JPA – Mar 2021	42-inch steel pipe	36
Install North Trestle Mooring Piles	Receipt of JPA – Mar 2021	24-inch steel pipe	30
Install North Trestle Concrete Production Test Piles	Receipt of JPA – July 2020	54-inch concrete cylinder	10
Install North Island Mooring Piles	Receipt of JPA – Mar 2021	42-inch steel pipe	80
Install Willoughby Bay Mooring Piles (B)	Receipt of JPA – Mar 2021	42-inch steel pipe	50
Install Willoughby Bay Mooring Piles (B) for Safe Haven	Receipt of JPA – Mar 2021	42-inch steel pipe	50
Install Willoughby Bay Mooring Piles (B)	Receipt of JPA – Mar 2021	24-inch steel pipe	18
Install Willoughby Bay Concrete Production Test Piles	Receipt of JPA – July 2020	54-inch concrete cylinder	15
Install South Trestle Mooring Piles	Receipt of JPA – Mar 2021	42-inch steel pipe	41
Install South Trestle Mooring Piles	Receipt of JPA – Mar 2021	24-inch steel pipe	18
Install South Trestle Concrete Production Test Piles	Receipt of JPA – July 2020	54-inch concrete cylinder	20
Install and Remove Concrete Test Piles (C)	Receipt of JPA – July 2020	54-inch concrete cylinder	4

Note(s):
(A) Receipt of USACE/VDEQ) Joint Permit Application (JPA) permit anticipated on or about April 2020;
(B) Includes Willoughby Bay South Mooring – additional Willoughby Bay mooring piles to be installed under an LOA; and; (C) Includes four concrete test piles at the North Trestle (1 pile), South Trestle (2 piles) and Willoughby Bay (1 pile) – additional test piles to be installed under an LOA.

Additional marine construction activities would be covered under a rulemaking and request for subsequent LOAs as construction will occur over multiple years. These construction activities are scheduled to begin in September 2020 and will continue through 2025. This approach would provide additional time to refine the details of the planned pile driving activities, without delaying the critical path work associated with tunnel construction. Effects of additional in-water and in-air construction activities are also assessed for potential impacts on marine mammals. These stressors include noise, habitat loss or alteration, prey availability and habitat, and sedimentation. The Project is not expected to lead to any increases in marine vessel traffic in the region; therefore, ship strikes were not evaluated.

R.4.1 IN AIR AND UNDERWATER SOUND DESCRIPTORS

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water. Sound is generally characterized by several variables, including frequency and intensity. Frequency describes the sound's pitch and is measured in Hertz (Hz), while intensity describes the sound's loudness and is measured in decibels (dB). Decibels are measured using a logarithmic scale.

The method commonly used to quantify airborne sounds consists of evaluating all frequencies of a sound according to a weighting system, reflecting the fact that human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies.

This is called A-weighting, and the decibel level measured is called the A-weighted decibels (dBA) sound level. A filtering method to reflect the hearing of marine mammals such as whales has not been developed for regulatory purposes; therefore, sound levels underwater are not weighted and measure the entire frequency range of interest. In the case of marine construction work, the frequency range of interest is 10 to 10,000 Hz.

Underwater sounds are described by a number of terms that are commonly used and specific to this field of study (Table R-4:). Two common descriptors are the instantaneous peak sound pressure level (SPL) and the root-mean-square (rms) SPL during the pulse or over a defined averaging period. The peak sound pressure is the instantaneous maximum or minimum overpressure observed during each pulse or sound event and is presented in Pascals (Pa) or dB referenced to a pressure of 1 microPascal (dB re 1 μPa). The rms level is the square root of the energy divided by a defined time period. All in-water sound levels throughout this report are presented in dB re 1 μPa rms unless otherwise specified.

Transmission loss is the accumulated decrease in acoustic intensity as an acoustic pressure wave propagates outwards from a source such as a pile during installation. The intensity of the sound at its source is reduced because it spreads as it moves away from the source. Cylindrical spreading occurs when sound energy spreads outward in a cylindrical fashion bounded by the bottom sediment and water surface, such as shallow water, resulting in a 3-dB reduction per doubling of distance. Spherical spreading occurs when the source encounters little to no refraction or reflection from boundaries (e.g., bottom, surface), such as in deep water, resulting in a 6-dB reduction per doubling of distance.

Table R-4: Definitions of Some Common Acoustical Terms

Term	Definition
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for water is 1 microPascal (μPa) and for air is 20 μPa (approximate threshold of human audibility).
Sound Pressure Level (SPL)	Sound pressure is the force per unit area, usually expressed in microPascals (or 20 microNewtons per square meter [m^2]), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 m^2. The SPL is expressed in decibels as 20 times the logarithm to the base 10 of the ratio of the pressure exerted by the sound to a reference sound pressure. SPL is the quantity that is directly measured by a sound level meter.
Frequency (Hz)	Frequency is expressed in terms of oscillations, or cycles, per second. Cycles per second are commonly referred to as Hz. Typical human hearing ranges from 20 Hz to 20,000 Hz
Sound exposure Level (SEL)	The time integral of frequency-weighted squared instantaneous sound pressures. Proportionally equivalent to the time integral of the pressure squared. Sound energy associated with a pile driving pulse, or series of pulses, is characterized by the SEL. SEL is the constant sound level in one second, which has the same amount of acoustic energy as the original time-varying sound (i.e., the total energy of an event). SEL is calculated by summing the cumulative pressure squared over the time of the event (1μPa2-sec).
Peak Sound Pressure (unweighted) (dB re 1 μPa)	Peak SPL is based on the largest absolute value of the instantaneous sound pressure over the frequency range from 20 Hz to 20,000 Hz. This pressure is expressed in this report as dB re 1 μPa.
Root-Mean-Square (rms) dB re 1 μPa	The rms level is the square root of the energy divided by a defined time period. For pulses, the rms has been defined as the average of the squared pressures over the time that comprises that portion of waveform containing 90 percent of the sound energy for one impact pile installation impulse.
Ambient Noise Level	The ambient noise level is the background sound level, which is a composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Transmission Loss (TL)	TL underwater is the accumulated decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water chemistry, water depth, bottom composition and topography, and underwater objects in the area.

R.4.2 DESCRIPTION OF NOISE SOURCES

The Project would temporarily increase existing in-air and underwater acoustic levels of the James River in the Chesapeake Bay, which is part of a high-use industrial area with frequent marine vessel traffic and associated activities. The soundscape in the vicinity of the Project would include existing ambient sound, plus construction noise from the Project. The Project may affect marine mammals by generating noise associated with installation of piles using vibratory hammers, impact hammers, and down-the-hole hammers. Other activities associated with the Project (e.g., upland and above-water construction, vessel movements, and placement of fill) do not produce in-air or underwater noise levels expected to exceed Level A or Level B harassment levels for any marine mammal hearing group.

R.4.2.1 AMBIENT SOUND

Ambient (or background) sound is composed of sound from many sources and from multiple locations (Richardson et al. 1995). In general, ambient sound levels in the marine environment are variable over time due to a number of biological, physical, and anthropogenic (e.g., manmade) sources. Ambient noise can vary with location, time of day, tide, weather, season, and frequency on scales ranging from a second to a year. Underwater sound types in the Project area include physical noise, biological noise, and anthropogenic noise. Physical noise includes noise from waves at the water surface, rain, and currents; moving rocks, sediment, and silt; and atmospheric noise. Biological sound includes vocalizations and other sounds produced by marine mammals, fishes, seabirds, and invertebrates. Anthropogenic noise includes noise from vessels (small and large), shore-based processing plants, marine fueling facilities, ferry and barge cargo loading/unloading operations, maintenance dredging, aircraft overflights, construction noise, and other sources, which produce varying noise levels and frequency ranges (Table R-5:).

Table R-5: Representative Noise Levels of Anthropogenic Sources of Noise Commonly Encountered in Marine Environments

Noise Source	Frequency Range (Hz)	Underwater Noise Level (dB rms re 1 μPa)	Reference
Small Vessels	250–1,000	151 dB at 1 meter	**Richardson et al. 1995**
Tug Docking Gravel Barge	200–1,000	149 dB at 100 meters	**Blackwell and Greene 2002**
Container/Cruise Ship	100–500	180 dB at 1 meter	**Richardson et al. 1995**
Dredging Operations	**50–3,000**	**120–140 dB at 500 meters; 156.9 dB at 30 meters**	**URS 2007; SFS 2009**

Note: dB = decibels; rms re 1 μPa = root mean square referenced to 1 microPascal, SFS = Scientific Fishery Systems, Inc.; URS = URS Corporation

Ongoing vessel activities throughout the James River in the Chesapeake Bay, land-based industrial and commercial activities, Military usage (training, testing, and in-water construction activities), and regular aircraft operations result in elevated in-air and underwater sound conditions in the Project area that increase with proximity to the component sites. Sound levels likely vary seasonally, with elevated levels during summer, when the tourism and fishing industries are at their peaks.

The underwater ambient sound levels along the mid-Atlantic Corridor were recorded: at the 10-meter (33-foot) measurement site were dominated by sounds below 30 Hz and above 1,000 Hz, while at the 200-meter (650-foot) measurement site, the ambient levels were dominated by sounds above 500 Hz (DoN 2017). DoN (2017) provides a snapshot of background noise measured prior to impact driving of 61-centimeter (24-inch) square concrete piles and vibratory driving of timber piles approximately 8-inches at the tip in 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 to 132), respectively. Based on these measurements, an average ambient noise level of 122.0 dB will be used for the HRBT

R.4.2.2 UNDERWATER NOISE LEVELS

The Project includes vibratory and impact pile installation of steel pipe piles and removal of steel pipe piles. Sound source levels (SSLs) for each type of activity were estimated using empirical measurements from similar projects in Norfolk and Little Creek (Craney Island), elsewhere in Virginia, or outside of Virginia (California, Florida, Washington, Alaska). SSLs are provided in Table R-6:

Table R-6: Estimates of Underwater Sound Source Levels Generated during Vibratory and Impact Pile Installation, Down-the-Hole Drilling Installation, and Vibratory Pile Removal

Method and Pile Type	Sound Source Level at 10 meters			Literature Source
Vibratory Hammer	**dB rms**			
42-inch steel pile	168			City and Borough of Sitka Department of Public Works 2017
36-inch steel pile	167			DoN 2015
24-inch steel pile	161			Caltrans 2015
Down-the-hole Hammer	166			Denes et al. 2016, Table 72
Impact Hammer	**dB rms**	**dB SEL**	**dB peak**	
36-inch steel pile	193	183	210	Chesapeake Tunnel Joint Venture 2018

Method and Pile Type	Sound Source Level at 10 meters			Literature Source
54-inch cylinder concrete pile**	176	166	188	Caltrans 2015
30-inch square concrete pile**	176	166	188	Caltrans 2015

SEL = sound exposure level; dB peak = peak sound level; rms = root mean square; DoN = Department of the Navy.
****Sound source levels (SSLs) taken from 40-inch steel piles used in Alameda, California.***
*****SSLs taken from 24-inch square concrete piles, no project specific info provided - SPLs are likely an average of multiple measurements taken for the 24-inch size pile.***

R.4.2.3 IN-AIR NOISE LEVELS

The largest pile size for the Project is 54-inch concrete piles, but measurements of in-air noise associated with installation of this pile size are limited. In-air noise levels during impact installation of 24-inch concrete piles at Naval Station Norfolk and Joint Expeditionary Base-Little Creek and Craney Island averaged 88 dBA as measured at 50 feet (15 meters) (DoN 2017). Ambient noise levels were also measured at Naval Station Norfolk during breaks in pile driving activity. The L_{max} (maximum sound pressure level) ranged from 76 to 85 dB and the L_{eq} (averaged cumulative sound pressure level) ranged from 66 to 81 dB.

Though 54-inch concrete piles are the largest pile size anticipated to be used during the Project, they do not produce the loudest in-air noise. In-air noise levels from impact installation of 36-inch steel piles were measured during the Naval Base Kitsap at Bangor EHW-2 Project (DoN 2015). In-air noise levels during impact installation were 109 dB (unweighted) re 20 μPa as measured at 15 meters (50 feet).

For the purposes of this analysis, we have adopted 109 dB as the expected background, or ambient, in-air sound levels in Norfolk. To determine the distance in-air construction noise will travel before it attenuates to the ambient sound level, the following equation is used:

$$D = Do * 10((\text{Construction Noise} – \text{Ambient Sound Level})/\alpha)$$

where D is the distance from the noise source, Do is the reference measurement distance (50 feet [15 meters] in this case), and α is the transmission loss per doubling of distance (estimated at 20 dBA for hard site conditions [over water]).

R.4.3 APPLICABLE NOISE CRITERIA

NMFS published updated Technical Guidance in April 2018 that identifies the received levels, or thresholds, above which individual marine mammals are predicted to experience changes in their hearing sensitivity (either temporary or permanent) for underwater anthropogenic noise sources (i.e., Level A harassment; NMFS 2018). The 2018 technical guidance does not address

Level B harassment thresholds. To assess Level B harassment levels, NMFS continues to use its interim criteria.

Level A harassment is defined as “any act of pursuit, torment, or annoyance which has the potential to ***injure*** a marine mammal or marine mammal stock in the wild”. Level B harassment is defined as “any act of pursuit, torment, or annoyance which has the potential to ***disturb*** a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to migration, breathing, nursing, breeding, feeding or sheltering, but which ***does not*** have the potential to injure a marine mammal or marine mammal stock in the wild.”

R.4.3.1 LEVEL A HARASSMENT

For underwater noise exposure, this assessment uses the 2018 Technical Guidance for assessing Level A harassment (NMFS 2018). Received levels, or thresholds, above which individual marine mammals are predicted to experience permanent changes in their hearing sensitivity (or a permanent threshold shift [PTS]) due to underwater anthropogenic sound sources have also been weighted by functional hearing groups as defined in the Technical Guidance (Table R-7:**;** NMFS 2018). Under the 2018 Technical Guidance, these levels are considered thresholds for Level A (injury) harassment. Calculation of Level A harassment isopleth distances based on PTS onset acoustic thresholds requires information on characteristics of the sound and the local environment.

Table R-7: Summary of Permanent Threshold Shift Onset Acoustic Thresholds for Assessing Level A Harassment of Marine Mammals from Exposure to Noise from Continuous and Pulsed Underwater Sound Sources

Functional Hearing Group Frequency Range Species Groups	Impulsive (Impact Hammer)	Non-Impulsive (Vibratory Hammer and DTH Drilling)
Low-Frequency (LF) Cetaceans ***7 Hz to 35 kHz*** **Humpback whale**	*L*pk,flat: 219 dB *L*E, LF, 24h: 183 dB	*L*E, LF, 24h: 199 dB
Mid-Frequency (MF) Cetaceans ***150 Hz to 160 kHz*** **Bottlenose dolphin**	*L*pk,flat: 230 dB *L*E, MF, 24h: 185 dB	*L*E, MF, 24h: 198 dB
High-Frequency (HF) Cetaceans ***275 Hz to 160 kHz*** **Harbor porpoise**	*L*pk,flat: 202 dB *L*E, HF, 24h: 155 dB	*L*E, HF, 24h: 173 dB
Phocid Pinnipeds (PW) Underwater ***50 Hz to 86 kHz*** **Harbor seal, gray seal**	***L*pk,flat: 218 dB** ***L*E, PW, 24h: 185 dB**	*L*E, PW, 24h: 201 dB

$L_{pk,flat}$ = Peak sound pressure level (unweighted); $L_{E,24h}$ = Sound exposure level, cumulative 24 hours; Hz = Hertz; kHz = kilohertz; DTH = down-the-hole.
Source: NMFS 2018.

R.4.3.2 LEVEL B HARASSMENT

For impulse sounds (e.g., impact pile installation), the Level B harassment threshold is set at an SPL value of 160 dB re 1 µPa rms (Table R-8:). For non-pulsed and continuous sounds (e.g., vibratory pile installation), the Level B harassment threshold is set at an SPL of 120 dB re 1 µPa rms. The 120 dB threshold may be slightly adjusted if background noise levels are at or above this level. Underwater sound levels were assumed to be 122 dB rms for this evaluation based on site-specific acoustic measurements as discussed in Section 4.2.1 (Table R-7).

For airborne noise exposure of hauled-out pinnipeds, NMFS uses criteria for Level B harassment of 90 dB re 20 µPa for harbor seals and 100 dB re 20 µPa for all other pinnipeds. These criteria do not differentiate among sound types.

Table R-8: Summary of Level B Harassment Thresholds of Marine Mammals from Exposure to Noise from Continuous and Pulsed Underwater Sound Sources

Functional Hearing Group Frequency Range Species Groups	Impulsive (Impact Hammer) RMS SPL dB re 1 µPa	Typical Non-Impulsive (Vibratory Hammer and DTH Drilling) RMS SPL dB re 1 µPa	Threshold for this Project Based on Site-specific Acoustic Measurements
Low-Frequency (LF) Cetaceans ***7 Hz to 35 kHz*** **Humpback whale**	160 dB	120 dB	**122 dB**
Mid-Frequency (MF) Cetaceans ***150 Hz to 160 kHz*** **Bottlenose dolphin**	160 dB	120 dB	**122 dB**
High-Frequency (HF) Cetaceans ***275 Hz to 160 kHz*** **Harbor porpoise**	160 dB	120 dB	**122 dB**
Phocid Pinnipeds (PW) Underwater ***50 Hz to 86 kHz*** **Harbor seal, gray seal**	**160 dB**	**120 dB**	**122 dB**

RMS SPL = Sound Pressure Level Root Mean Squared
dB re 1 µPa = decibel reference level 1 microPascal

R.4.4 DISTANCES TO SOUND THRESHOLDS

R.4.4.1 UNDERWATER NOISE

Vibratory and impact pile installation will generate underwater noise that could potentially disturb marine mammals in the Project area. Ambient underwater sound levels were assumed to be 122 dB rms for this evaluation. The SSLs for pile installation were estimated by using the results of measurements from the best available and most relevant sound source verification studies. NMFS typically recommends a default practical spreading loss coefficient of 15 as described by Davidson (2004) and Thomsen et al. (2006) when site-specific empirical data are unavailable. Using a TL coefficient of 15 produces conservative estimates of harassment thresholds for the Project.

R.4.4.2 LEVEL A AND LEVEL B HARASSMENT

Sound propagation and the distances to the sound isopleths defined by NMFS for Level A harassment of marine mammals under the 2018 Technical Guidance were estimated using the User Spreadsheet developed by NMFS for this purpose (NMFS 2018). The method uses estimates of SPL and duration of the activity to calculate the threshold distances at which a marine mammal exposed to those values would experience a PTS. Differences in hearing abilities among marine mammals are accounted for by use of weighting factor adjustments for the five functional hearing groups (NMFS 2016). Pulse duration from the SSV studies used for source level estimates are unknown. All necessary parameters were available for the SEL_{cum} (cumulative sound exposure level) method for calculating isopleths, and therefore this method was selected to calculate Level A isopleth distances for impact installation and SPL rms was used for vibratory installation and down-the-hole drilling. The SEL_{cum} method resulted in isopleths that were larger than those calculated using the peak SPL method, and therefore the SEL_{cum} isopleths were selected for the entire Project.

Sound propagation and distances to the sound isopleths defined by NMFS for Level B harassment of marine mammals were estimated using the practical spreading loss model. The source levels for pile installation were estimated using the results of measurements from the best available and most relevant sound source verification studies.

The attenuation of underwater noise (transmission loss) is estimated using the practical spreading loss model. The formula for transmission loss (TL) is:

$$TL = X \log10 (R/D)$$

Where R is the distance from the source, D is the distance of the known or measured noise level, and X is the TL coefficient. NMFS typically recommends a TL coefficient of 15 dB per tenfold increase in distance when site-specific empirical data are unavailable (i.e., 15 log10 in this case). This model, based on the default practical spreading loss assumption and NMFS preferred TL coefficient, can be rearranged to estimate the distances to the Level B harassment thresholds as follows:

$$R = D * 10_{(TL/15)}$$

Where TL is the difference between the SSL and the Level B harassment threshold (122 dB or 160 dB). Distances to the Level B harassment isopleths vary by pile size and installation method.

The Level A and Level B harassment zones and results of the evaluation are provided in the MMPA IHA request.

R.4.4.3 IN-AIR NOISE

Pinnipeds can be affected by in-air noise when they are hauled out. Loud noises can cause hauled-out pinnipeds to panic back into the water, leading to disturbance and possible injury. For in-air sound exposure of hauled-out pinnipeds, NMFS uses criteria for Level B harassment of 90 dB re 20 µPa rms for harbor seals and 100 dB re 20 µPa rms for all other pinnipeds.

The spherical spreading model was used to estimate noise threshold distances from the maximum anticipated in-air noise source level. The equation uses ambient sound level with NMFS defined noise thresholds as follows:

$$D = D_o * 10^{((\text{Construction Noise} - \text{Noise Threshold})/\alpha)}$$

In the model,

- D = the distance from the noise source
- D_o = the reference measurement distance (15 meters in this case)
- α = 20 for hard ground or water, which assumes a 6 dBA reduction per doubling distance

Given the source level of 109 dBA chosen for in-air noise during impact pile installation of 36-inch steel piles, the calculated isopleths for in-air noise can be used for all pile sizes and types associated with the Project. Installation of smaller piles is generally assumed to produce lower sound levels than installation of larger piles. Based on this model, in-air noise from impact installation of 36-inch steel piles could extend up to 136 meters (446.2 feet) from the noise source over open water until it is no longer discernible above estimated ambient sound levels. The estimated distance to the in-air sound level threshold from pile installation of all pile types and sizes for the Project is 136 meters for harbor seals and gray seals (Table R-9:).

Table R-9: Distances (Meters) from Impact Installation to the Isopleth where In-air Sound will Attenuate to NMFS Thresholds for Harassment

Method, Pile Type	Harbor Seals and Gray Seals (90 dB)	Other Pinnipeds (100 dB)
Impact Hammer		
All Project piles	136	43

The estimates for distances that in-air noise could travel and exceed the harassment threshold for in-air disturbance fall far short of the distance to the nearest known pinniped haulouts on the CBBT Islands (17.2 kilometers (9.3 nautical miles)) (Figure R-3). Therefore, in-air noise is not considered further for Project pile installation, and no incidental take of marine mammals for in-air noise is requested.

R.4.5 ANTICIPATED IMPACT OF THE ACTIVITY

The following sections assess the anticipated impact of the proposed Project on the species and stocks of marine mammals occurring with the Project area. This assessment is based on a review of available data and studies focused on marine mammal responses to noise. This includes a summary on what is known about behavioral and physiological impacts to marine mammals from noise exposure. Extensive reviews on the subject of marine mammals and noise can be found in numerous documents (e.g., Richardson et al. 1995; National Research Council (NRC) 2003; Southall et al. 2007).

The ability to hear and transmit sound (echolocation/vocalization) is vital for marine mammals to perform several life functions. Marine mammals use sound to gather and understand information about their current environment, including detecting prey and predators. The distance and speed sound travels through the water depends highly on existing environmental conditions (sea floor topography and ambient noise levels) and characteristics of the sound (source levels and frequency; Richardson et al. 1995). Impacts to marine mammals can vary among species based on their sensitivity to sound and their ability to hear different frequencies. The Project may impact marine mammals behaviorally and physiologically from temporary increases in underwater and airborne noises during pile installation. The level of impact on marine mammals from pile installation will vary depending on the species of marine mammal, the distance between the marine mammal and the construction activity, the intensity and duration of the construction activity, and the environmental conditions.

Pile installation activities as outlined earlier have the potential to take marine mammals during pile installation and removal. Other activities are not expected to result in “take” as defined under the MMPA. In-water pile installation activities will temporarily increase the local underwater and airborne noise environment in the Project area. Research suggests that increased noise may impact marine mammals in several ways and that the likelihood of impacts depends on many factors such as behavioral and physiological changes.

Whales, seals, and porpoises are mobile species and are capable of avoiding the disturbance and pile installation associated with Project. Given the preference of whales in deeper waters than what is found in the Project area, and the Project area not within normal whale feeding or migration areas, their presence in the area is unlikely. Dolphins, porpoises, and seals may be found in the Project area and could potentially be displaced within the Level A and Level B harassment zones.

R.4.5.1 POTENTIAL ACOUSTIC IMPACTS

Behavioral and physiological impacts from noise exposure differ among species. Differences in response have also been documented between age and sex classes. Younger animals are often more sensitive to noise disturbance, and noise can therefore have a greater effect on them (NRC 2003).

Behavioral and physiological changes that may result from increased noise levels include changes in tolerance levels; masking of natural sounds; behavioral disturbances; and temporary or permanent hearing impairment, or non-auditory physical effects (Richardson et al. 1995).

Richardson et al. (1995) has suggested four zones (described below) to assess the potential effects of noise on marine mammals.

R.4.5.2 ZONE HEARING LOSS, DISCOMFORT, OR INJURYS

This is the area within which the received sound level is high enough to cause discomfort or tissue damage to auditory or other systems. Temporary or permanent reduction in hearing sensitivity may result from high received sound levels. An animal may experience temporary threshold shift (TTS) when hearing loss is temporary, or PTSwhen partial or full hearing loss is permanent. The level of hearing loss depends on the sound frequency, intensity, and duration. Marine mammals exposed to high received sound levels may also experience non-auditory physiological effects such as increased stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage. PTS and TTS may reduce an animal's ability to avoid predators, communicate with others, or forage effectively. TTS is not considered injurious and would constitute a Level B take. PTS is considered injurious and will constitute a Level A take. See section 3.2 for Level A and Level B take definitions.

Kastak and Schusterman (1995) tested in-air auditory thresholds by exposing a harbor seal inadvertently to broadband construction noise for 6 days, with intermittent exposure averaging 6 to 7 hours per day. When the harbor seal was tested immediately upon cessation of the noise, a TTS of 8 dB at 100 Hz was evident. Following 1 week of recovery, the harbor seal's hearing threshold was within 2 dB of its original level. Pure-tone sound detection thresholds were obtained in-water for harbor seals before and immediately following exposure to octave-band noise (Kastak et al. 1999). Test frequencies ranged from 100 Hz to 2 kilohertz (kHz), and octave-band sound exposure levels (SELs) were approximately 60 to 75 dB SEL. Each harbor seal was trained to dive into a noise field and remain stationed underwater during a noise-exposure period that lasted a total of 20 to 22 minutes. The average threshold shift relative to baseline thresholds for the harbor seals following noise exposure was 4.8 dB, and the average shift following the recovery period was 20.8 dB (Kastak et al. 1999).

Some species of odontocetes may have the ability to dampen hearing sensitivity in expectation of loud noise. Dampening has been observed in captive bottlenose dolphins (Nachtigall et al. 2016a), false killer whales (***Pseudorca crassidens***) (Nachtigall and Supin 2013), and, to a lesser degree, harbor porpoises (Nachtigall et al. 2016b). When animals were given a series of warning pips in advance of a louder noise, hearing threshold shifted. For false killer whales and bottlenose dolphins the magnitudes, durations, and timing of both threshold shift and recovery in relation to the warning and loud sounds indicated a conditioned dampening response rather than noise-induced threshold shift (Nachtigall and Supin 2013; Nachtigall et al. 2016a).

Therefore, PTS and TTS as a result of the Project are not expected to occur in any marine mammal species, because no animal is anticipated to remain within the Level A zone for the amount of time it would take to accumulate the injury, and implementation of mitigation measures, such as ramp-up procedures and monitoring the harassment zones, will help avoid potential close approach of animals to activities that could result in Level A takes, Level B takes, or serious injury/mortality).

R.4.5.2.1 ZONE OF MASKING

This is the area within which noise is strong enough to interfere with the detection of other sounds, including communication calls, prey or predator sounds, and other environmental sounds. Masking is considered Level B harassment and is usually considered 160 dB for impact noise and 120 dB for continuous noise.

Marine mammal signals may be masked by increased noise levels or overlapping frequencies. Research has indicated that the majority of vibratory activity falls within 400 and 2,500 Hz (Blackwell 2005; URS 2007). Baleen whales produce sounds to communicate and possibly navigate in the frequency range from 10 Hz to 10 kHz, whereas toothed whales produce sounds for echolocation and to communicate in the frequency range from 1 to 150 kHz (Richardson et al. 1995; Madsen et al. 2006). Harbor seals produce social calls at 500 to 3,500 Hz and clicks from 8 to 150 kHz (reviewed in Richardson et al. 1995). Harbor porpoises produce acoustic signals in a very broad frequency range, <100 Hz to 160 kHz (Verboom and Kastelein 2004). To combat the effects of masking, animals may alter the frequency or loudness of their vocalizations or echolocation clicks. North Atlantic right whales (Parks et al. 2018) and killer whales (***Orcinus orca***) (Holt et al. 2009) have been observed to increase call amplitude when ambient sound levels are increased. Bottlenose dolphin recordings from the Florida Gulf coast showed an increase in call frequencies as a response to increased ambient noise levels (van Ginkel et al. 2017).

The Project is within an existing heavy use area with regular vessel activity, including recreational craft, local ferries, military vessels, and tourist cruises, and commercial fishing vessels. It is likely that marine mammals in the Project area have become habituated to increased noise levels. Implementation of the proposed mitigation measures, such as ramp-up procedures and monitoring the harassment zones, will reduce impacts on marine mammals, with any minor masking occurring near the sound source, if at all.

R.4.5.2.2 ZONE OF RESPONSIVENESS

This is the area within which marine mammals react behaviorally or physiologically from exposure to increased noise levels. The level of effect is dependent on the acoustical characteristics of the noise, current physical and behavioral state of the animals, ambient noise levels and environmental conditions, and context of the sound (e.g., if it sounds similar to a predator; Richardson et al. 1995; Southall et al. 2007). Behavioral effects that are temporary may indicate that the animal has simply heard a sound, and the effect may not be long-term (Southall et al. 2007). Behavioral and physiological effects described here will be considered Level B harassment.

Responses from marine mammals in the presence of pile installation activity might include a reduction of acoustic activity, a reduction in the number of individuals in the area, and avoidance of the area. Of these, temporary avoidance of the noise-impacted area is the most common response. Avoidance responses may be initially strong if the marine mammals move rapidly away from the source or weak if movement is only slightly deflected away from the source.

Noise from pile installation could potentially displace marine mammals from the immediate area of the activity; however, they would likely return after pile installation is completed, as demonstrated by a variety of studies on temporary displacement of marine mammals by industrial activity (reviewed in Richardson et al. 1995). Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory, impact, and down-the-hole pile installation, and have already been taken into account in the exposure analysis.

R.4.5.2.3 ZONE OF AUDIBILITY

This is the area within which the animal might hear the noise; it is the most extensive of the four zones. Marine mammals as a group have functional hearing ranges of 10 Hz to 180 kHz, with thresholds of best hearing near 40 dB (Ketten 1998; Southall et al. 2007). Marine mammals can typically be divided into five groups that have consistent patterns of hearing sensitivity: Low frequency (LF) cetaceans (humpback whale), mid-frequency (MF) cetaceans (bottlenose dolphin); HF cetaceans (harbor porpoise); phocid pinnipeds (harbor seal), and otariid pinnipeds (sea lion). Difficulties in human ability to determine the audibility of a particular noise for other species has so far precluded development of applicable criteria for the zone of audibility. This zone does not fall in the sound range of a “take” as defined by NMFS.

Repeated or sustained disruption of important behaviors (such as feeding, resting, traveling, and socializing) is more likely to have a demonstrable impact than a single exposure (Southall et al. 2007). However, it is likely that marine mammals exposed to repetitious construction sounds will become habituated, desensitized, and tolerant after initial exposure to these sounds (Southall et al. 2007).

Marine mammals residing in and transiting this area are routinely exposed to sounds louder than 120 dB, and continue to use this area; therefore, they do not appear to be harassed by these sounds, or they have become habituated.

R.4.5.3 HABITAT LOSS AND ALTERATION

Detectable effects of the Project on marine mammal habitat would be minor. The Project will occur within the same footprint as existing marine infrastructure. A relatively small area of new habitat loss will result from the Project. Furthermore, the nearshore and intertidal habitat where the Project will occur is an area of relatively high marine vessel and aircraft traffic. Most marine mammals do not generally use the area within the footprints of the Project components. Temporary, intermittent, and short-term habitat alteration may result from increased noise levels within the Level B harassment zones.

R.4.5.4 PREY AVAILABILITY AND HABITAT

Essential Fish Habitat (EFH) has been designated within the Project area for some species of fish (i.e., Black Sea Bass (***Centropristus striata***), Atlantic Herring, (***Clupea harengus***), King Mackerel (***Scomberomorus cavalla***), and Spanish Mackerel (***Scomberomorus maculatus***); NMFS GARFO 2019), which are common prey of marine mammals. Adverse effects on EFH are not expected. Fish populations in the Project area that serve as marine mammal prey could be temporarily affected by noise from in-water pile installation. The frequency range in which fish generally perceive underwater sounds is 50 to 2,000 Hz, with peak sensitivities below 800 Hz (Popper and Hastings 2009). Fish behavior or distribution may change, especially with strong and/or intermittent sounds that could potentially harm fish. High underwater SPLs have been documented to alter behavior; cause hearing loss; and injure or kill individual fish by causing serious internal injury (Hastings and Popper 2005). In general, impacts on marine mammal prey species are expected to be minor and temporary.

The area likely impacted by the Project is relatively small compared to the available habitat throughout other parts of the Chesapeake Bay. The most likely impact to fish from the Project would be temporary behavioral avoidance of the immediate area, although any behavioral avoidance of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat. Therefore, the impact on marine mammal prey during the Project is expected to be negligible.

R.4.5.5 SEDIMENTATION

Pile installation and removal may result in a small increase in sedimentation within a few feet of the piles. A small amount of sediment and drill tailings may be deposited in proximity to each pile. Minor and temporary increases in turbidity may result from this process, but the effects on fish and marine mammal prey would be negligible. Indirect effects to prey would be insignificant and discountable due to the temporary nature of the activity, and are expected to be undetectable to marine mammals.

R.4.5.6 VESSEL TRAFFIC

Project vessels at the construction site are projected to consist of 3 tug boats with a draft of 3 to 6 feet, 3 crew boats estimated draft of 3 feet or less, and varying amounts (0-50+) of unpowered barges with a draft of 4 to 10 feet that would be pushed by tug boats.

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 vessel strike by an amount that is too small to be meaningfully measured or detected. Therefore the operation of vessels at the construction site will result in an insignificant increased risk of vessel strike.

Barges and other vessels will be required to deliver the necessary equipment and materials to the Project and be used to construct the Project. All vessels larger than 65 feet will be required to travel at speeds less than 10 knots. Vessels traveling at 10 knots or less will minimize the risk of vessel collisions with marine mammals; therefore, no ship strikes are expected.

R.4.5.7 CONCLUSIONS REGARDING IMPACTS TO SPECIES OR STOCKS

Consideration of negligible impact is required for NMFS to authorize the incidental take of marine mammals. In 50 CFR § 216.103, NMFS defines negligible impact to be “an impact resulting from a specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stocks [of marine mammals] through effects on annual rates of recruitment or survival”. Based upon best available data regarding the marine mammal species (including density, status, and distribution) likely to occur in the Project area, incidental take is expected to result in only short-term changes in behavior, such as avoidance of the Project area, changes in swimming speed or direction, and changes in foraging behavior. Such impacts are unlikely to have any effect on recruitment or survival and; therefore, would have a negligible impact on the affected stocks of humpback whales, bottlenose dolphins, harbor porpoises, harbor seals, and gray seals. Implementation of mitigation measures is likely to minimize most potential adverse underwater impacts to individual marine mammals or stocks and their habitat from pile installation. Impacts to individual humpback whales bottlenose dolphin, harbor porpoises, harbor seals, and gray seals are expected to be small and of short duration. Nevertheless, some level of disturbance impact is unavoidable.

Requested Level B take of marine mammals would likely include multiple (estimated as daily) takes of the same individual(s), mainly dolphins, resulting in estimates of take (as percentage of the stock) that are high compared to actual take. Exposure to Level A noise is unlikely, since isopleths are relatively small, though small numbers of Level A take were requested. No lethal takes or serious injuries are anticipated.

Ongoing coordination with the agencies will continue throughout the process. HRCP will request an IHA for the non-lethal take by harassment of small numbers of marine mammals, incidental to in-water pile installation associated with early work that represents critical path (i.e., activities that directly affect the overall project schedule) to begin during Spring-Summer 2020. HRCP will request that the IHA issued be effective from April 2020 to March 2021, one calendar year from the start of pile installation. HRCP will request that the remaining pile installation components be authorized under a rulemaking and request for subsequent LOAs under a separate application for pile installation to continue through 2025.

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