BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648-XA122]

Take of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Hampton Roads Bridge-Tunnel Expansion Project, Hampton-Norfolk, Virginia

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; issuance of an incidental harassment authorization.

SUMMARY: In accordance with the regulations implementing the Marine Mammal Protection Act (MMPA) as amended, notification is hereby given that NMFS has issued an incidental harassment authorization (IHA) to the Hampton Roads Connector Partners (HRCP) to incidentally harass, by Level A and Level B harassment, marine mammals during pile driving and removal activities associated with the Hampton Roads Bridge-Tunnel (HRBT) Expansion Project, Hampton-Norfolk, Virginia.

DATES: This Authorization is effective for one year from July 10, 2020 to July 9, 2021.

FOR FURTHER INFORMATION CONTACT: Stephanie Egger, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*. In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

The MMPA prohibits the "take" of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq*.) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed incidental take authorization may be provided to the public for review. Under the MMPA, ''take'' is defined as meaning to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other "means of effecting the least practicable adverse impact" on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stocks for taking for certain subsistence uses (referred to in shorthand as "mitigation"); and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth. The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

Summary of Request

On September 18, 2019, NMFS received a request from the HRCP for an IHA to take marine mammals incidental to impact and vibratory pile driving activities associated with the HRBT, in Hampton and Norfolk, Virginia for one year from the date of issuance. The application was deemed adequate and complete on February 4, 2020. The HRCP request is for take of a small number of five species of marine mammals by Level A and B harassment. Neither the HRCP nor NMFS expects injury, serious injury or mortality to result from this activity and, therefore, an IHA is appropriate. The planned activities are part of a larger project and the applicant has requested rulemaking and a letter of authorization for the other components of this project.

Description of Specified Activity

Overview

The HRCP is working with the Virginia Department of Transportation (VDOT) and Federal and state agencies to advance the design, approvals, and multi-year construction of the Interstate (I)-64 HRBT Expansion project. The overall project will widen I-64 for approximately 15.93 kilometer (km) (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 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. The planned activities below are part of the overall project (see the application for additional details on the overall project). Only the activities relevant to the IHA requested by HRCP are discussed below. This includes the following components:

- TBM Platform at the South Island;
- Conveyor Trestle at the South Island;
- Temporary trestles for jet grouting at the South Island;
- Temporary trestle for bridge construction at the North Shore;
- Mooring piles at the South Trestle (located at the South Island), North Island, and Willoughby Bay; and
- Installation and removal of piles for test pile program.

Pile installation methods will include impact and vibratory driving, jetting, and drilling with a down-the-hole (DTH) hammer. Pile removal techniques for temporary piles will include vibratory pile removal or cutting below the mud line. Installation of steel pipe piles could be 24-, 36-, or 42-inches (in) in diameter to support temporary work trestles, platforms, and moorings. Test piles would consist of 30-in square concrete or 54-in concrete cylinder piles. Only load test piles will be removed under this IHA. In-water pile installation using impact and vibratory driving, and drilling with a DTH hammer, and pile removal using a vibratory hammer, have the potential to harass marine mammals acoustically and could result in incidental takes of individual marine mammals. Jetting is not likely to result in take.

Dates and Duration

Work could occur at any point during the year, and will occur during the day. Pile installation may extend into evening or nighttime hours as needed to accommodate pile installation requirements (*e.g.*, once pile driving begins – a pile will be driven to design tip elevation). The overall number of anticipated days of pile installation is 312, based on a 6-day work week for one year. Pile installation can occur at variable rates, from a few minutes to several hours per pile. The HRCP anticipate that 1 to 10 piles could be installed per day. In order to account for inefficiencies and delays, the HRCP have estimated an average installation rate of six piles per day for most components.

Specific Geographic Region

The HRBT is located in the waterway of Hampton Roads adjacent to the existing bridge and island structures of the HRBT in Virginia. Hampton Roads is located at the confluence of the James River, the Elizabeth River, the Nansemond River, Willoughby Bay, and the Chesapeake Bay (Figure 1). Hampton Roads is a wide marine channel that provides access to the Port of Virginia and several other deep water anchorages upstream of the project area (VDOT and Federal Highway Administration (FHWA) 2016). Navigational channels are maintained by the U. S. Army Corps of Engineers within Hampton Roads to provide transit to the many ports in the region.

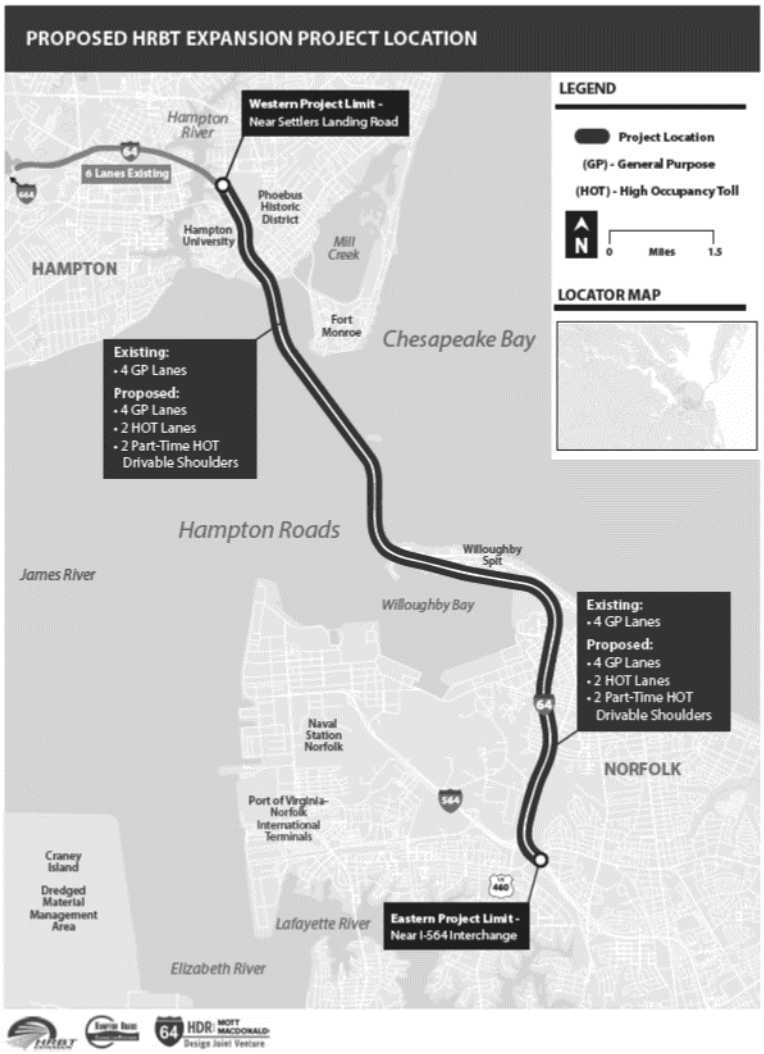

Figure 1. Project Area

Pile installation will occur in waters ranging in depth from less than 1 meter (m) (3.3 feet (ft)) near the shore to approximately 8 m (28 ft), depending on the structure and location. The majority of the piles will be in water depths of 3.6 – 4.6 m (12 – 15 ft).

Detailed Description of the Specific Activity

Three methods of pile installation are anticipated and expected to result in take of marine mammals. These include use of vibratory, impact, and DTH hammers. More than one installation method will be used within a day. Most piles will be installed using a combination of vibratory (ICE 416L or similar) and impact hammers (S35 or similar). Overall, steel pipe piles at the North Shore Work Trestle, Jet Grouting Trestle, and TBM Platform would be installed using the vibratory hammer approximately 80 percent of the time and impact hammer approximately 20 percent of the time, while all mooring piles and steel pipe piles at Conveyor Trestle would be installed using the vibratory hammer approximately 90 percent and the impact hammer approximately 10 percent of the time. Depending on the location, the pile will be advanced using vibratory methods and then impact driven to final tip elevation. Where bearing layer sediments are deep, driving will be conducted using an impact hammer so that the structural capacity of the pile embedment can be verified. The pile installation methods used will depend on sediment depth and conditions at each pile location. Table 1 provides additional information on the pile driving operation including estimated pile driving times. The sum of the days of pile installation is greater than the anticipated number of days because more than one pile installation method will be used within a day.

Prior to installing steel pipe piles near shorelines protected with rock armor and/or rip rap (*e.g.*, South Island shorelines; North Shore shoreline), it will be necessary to

temporarily shift the rock armoring that protects the shoreline to an adjacent area to allow for the installation of the piles. The rock armor should only be encountered at the shoreline and at relatively shallow depths below the mudline. The rock armor and/or rip rap will be moved and reinstalled near its original location following the completion of pile installation. Alternatively, the piles may be installed without moving the rock, by first drilling through the rock with a DTH hammer (*e.g.*, Berminghammer BH 80 drill or equivalent) to allow for the installation of the piles. It is estimated that a down-the-hole hammer will be used for approximately 1 to 2 hours per pile, when necessary. It is anticipated that approximately 5 percent of the North Shore Work Trestle piles, 10 percent of the Jet Grouting Trestle piles, 10 percent of the Conveyor Trestle piles, and 50 percent of the TBM Platform piles may require use of a down-the-hole hammer (Table 1).

Detailed descriptions of the project components for this IHA request are explained below.

Project Segments

The project design is divided into five segments (see also Figure 2) 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 trestles. 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 trestles, including any approach slabs. This segment covers approximately 1 km (0.6 mi) along I-64;
- Segment 2a (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 2.9 km (1.8 mi) along I-64;
- Segment 3a (South Trestle-Bridge) includes the new South Trestle-Bridge 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 1.93 km (1.2 mi) along I-64;
- Segment 3b (Willoughby Spit) continues from the south end of the south approach slabs for the south trestle and ends at the north end of the north approach slabs for the Willoughby Bay trestles. This segment includes a modified interchange connection to Bayville Street, and has a truck inspection station for the westbound tunnels. This segment covers approximately 1 km (0.6 mi) along I-64;
- Segment 3c (Willoughby Bay 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 1.6 km (1.0 mi) 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 1.6 km (1.0 mi) 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 2.4 km (1.5 mi) along I-64; and
- 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 1.93 km (1.2 mi) along I-64.

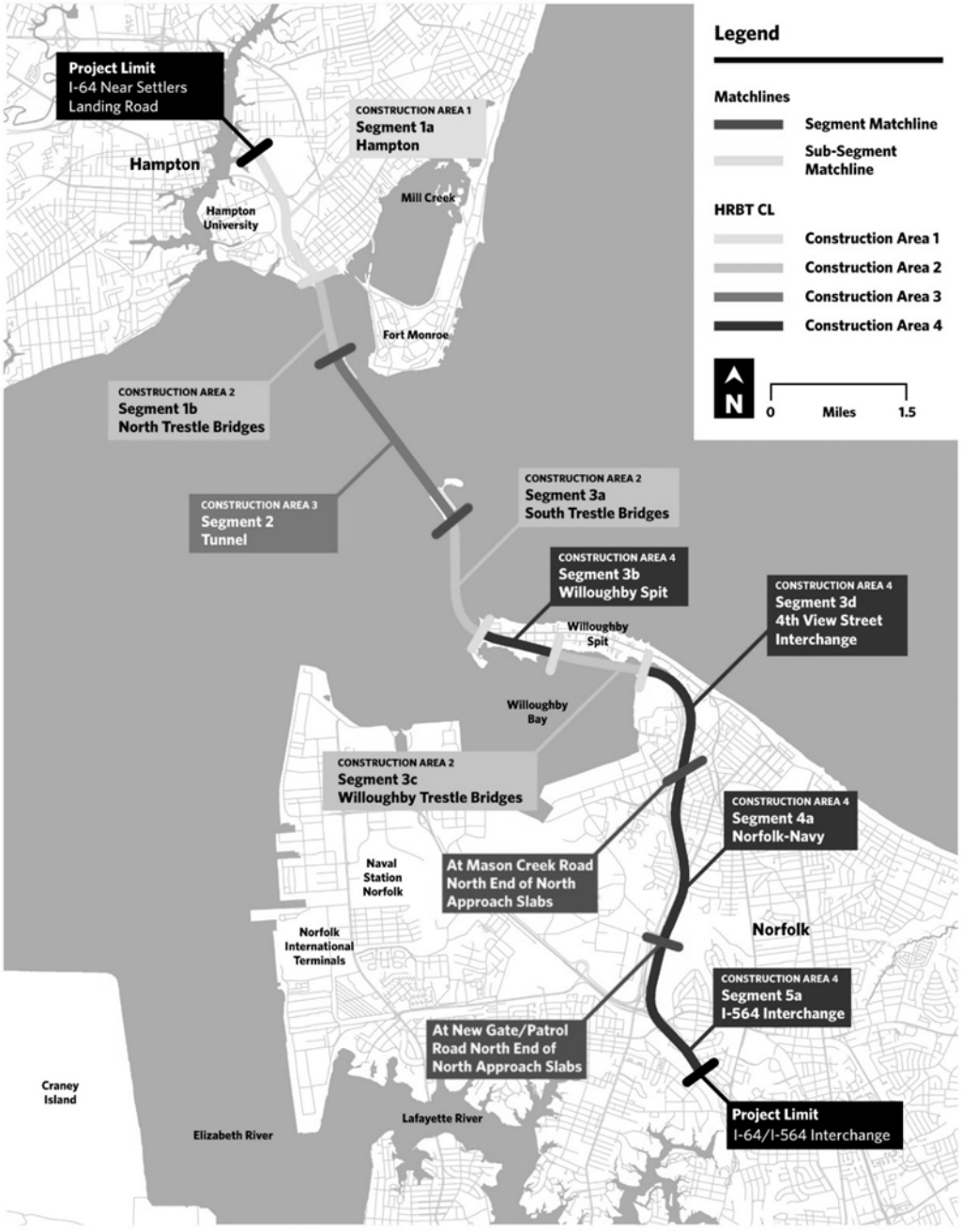

Figure 2. HRBT Expansion Project Design Segments

However, the only planned in-water marine construction activities that have potential to affect marine mammals and result in take would occur at the following locations in the following segments:

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

Approximately, 1070 piles (of all sizes) would be installed (only some removed) under this IHA (Table 1). For 36-in steel piles, 698 piles would be installed. For 42-in steel piles, 257 piles would be installed. For 24-in piles, 66 piles would be installed. For 54-in concrete cylinder piles, 33 piles would be installed. For 24-in or 30-in concrete square piles, 16 piles would be installed. Removal would only occur for piles as part of the test pile program (Table 1).

Project Components that are Likely to Result in Take of Marine Mammals

Tunnel Boring Machine (TBM) Platform at the South Island (Segment 2a) - The HRCP is constructing the temporary TBM Platform or "quay" at the South Island to allow for the delivery, unloading, and assembly of the TBM components from barges to the Island. The large TBM components will be delivered by barge and then transferred to the platform using a Self- Propelled Modular Transport, crawler crane, sheerleg crane and/or other suitable equipment. The TBM Platform will also allow barge delivery and storage of concrete tunnel segments as the boring operation progresses. The concrete tunnel segments will be offloaded and moved using a combination of crawler cranes and

a gantry crane installed on the TBM Platform. The tunnel segments will be stored on the platform prior to delivery to the tunnel shaft for installation.

The TBM Platform is a steel structure founded on (216) 36-in diameter steel piles, with an overall area of approximately 0.40 acres (approximately 50.6 m x 2.7 m). The piles will be installed using a combination of vibratory and impact hammers except along the perimeter where down-the-hole hammering may be needed to install piles through the rock armor stone. The piles are 47 m (154 ft) long and will have an average embedded length of approximately 42.7 m (140 ft). Table 1 provides additional information on the pile driving operation including estimated pile installation times and number of strikes necessary to drive a pile to completion.

The superstructure of the platform is set on top of the piles and consists of transverse and longitudinal beams below a 13/16-in-thick plate set on top of the beams. Rail beams will be installed on top of the plate and will support the gantry crane. A concrete slab may be placed on top of the steel plates or timber trusses.

Dolphins will be installed along the shoreline of the South Island in the areas adjacent to the TBM Platform. Each dolphin will consist of 36-in steel piles and will be installed with a combination of vibratory and impact hammers.

Conveyor Trestle at the South Island (Segment 2a) - Tunnel boring spoils and other related materials will be moved between the South Island and barges via a conveyor belt and other equipment throughout tunnel boring. The Conveyor Trestle will also be used for maintenance and mooring of barges and vessels carrying TBM materials and other project related materials.

The Conveyor Trestle is a steel structure founded on (84) 36-in diameter steel piles, with an overall area of approximately 0.42 acres (approximately 205 m x 8 m). The piles will be installed using a combination of vibratory (International Construction Equipment (ICE) 416L or similar) and impact hammers (S35 or similar). The piles are approximately 42.7 m (140 ft) long and will have an average embedded length of approximately 30.5 m (100 ft). Table 1 provides additional information on the pile driving operation including estimated pile driving times and number of strikes necessary to drive a pile to completion.

Additionally, mooring dolphins will be installed along the outside edge of the Conveyor Trestle. Each dolphin will consist of 36-in steel piles and will be installed with a combination of vibratory and impact hammers.

Temporary Trestle for Bridge Construction at the North Shore Work Trestle (Segment 1b) - The temporary North Shore Work Trestle will support construction of the permanent eastbound North Trestle Bridge in the shallow water (< 1.2 – 1.8 m (4 - 6 ft) MLW) closer to the North Shore, avoiding the need to dredge or deepen this area (which otherwise would have been required for barge access) and minimizing potential impacts to the adjacent submerged aquatic vegetation (SAV). The temporary North Shore Work Trestle is a steel structure founded on 194 36-in diameter steel piles with 9 - 12 m (30-40 ft) spans sized to accommodate a 300-ton crane. The main portion of the work trestle will be approximately 345 m long x 14 m wide (1,130 ft long by 45 ft wide), with three approximately 24.4 m x 9 m (80 ft x 30 ft) fingers and an additional landing area approximately 45.7 m x 14 m (150 ft x 45 ft), for a total overall approximate area of 0.006 km^2 (1.49 acres).

Dolphins will be installed at the southern end and along the outside edge of the work trestle. Each dolphin will consist of 24-in steel piles. In addition, 42-in steel pipe piles will be installed along the outer edge of the work trestle to provide additional single mooring points for barges and vessels delivering material and accessing the trestle. The mooring dolphin piles and the single mooring point piles will be installed using a vibratory hammer.

Moorings at the North Island Expansion (Segment 2a) - Temporary moorings will be installed along the perimeter of the North Island Expansion area to support the construction of the Island expansion. Eighty 42-in steel pipe piles will be installed to provide mooring points for barges and vessels. The mooring point piles will be installed using a vibratory hammer.

Temporary Trestles for Jet Grouting at the South Island (Segment 2a) - Unconsolidated soil conditions at the western edge of the South Island – along the centerline and depth of the planned tunnel alignment – require ground improvements to allow tunnel boring to proceed safely and efficiently. Ground improvements will be achieved using deep injection or jet grouting to stabilize and consolidate the sediments along the planned tunnel alignment and tunnel depth.

Two temporary work trestles will be constructed along either side of the planned tunnel alignment to support jet grouting activity. Each trestle will be approximately 12.2 m (40 ft) wide and extend approximately 305 m (1,000 ft) west of the South Island shoreline, for a total overall approximate area of 0.007 km^2 (1.84 acres). Two temporary Jet Grouting Trestles will be constructed, each will be founded on (102) 36-in diameter

steel piles (a total of 204 steel piles) with 7.6 m (25 ft) +/- spans sized to accommodate a 35-ton drill rig and support equipment.

Moorings at the South Trestle (Segment 3a) - Temporary moorings will be installed in the area of the South Trestle to support the construction of temporary work trestles and permanent trestle bridges. Six mooring dolphins will be installed and each will consist of (3) 24-in steel piles for a total of (18) 24-in piles. An additional (41) 42-in steel pipe piles will be installed along what will become the outer edge of the work trestle to provide additional single mooring points for barges and vessels delivering material and accessing the trestle. The mooring dolphin piles and the single mooring point piles will be installed using a vibratory hammer.

Mooring at Willoughby Bay (Segment 3c) - Temporary moorings will be installed in Willoughby Bay to support the construction of temporary work trestles and permanent trestle bridges. Six mooring dolphins will be installed – each consisting of (3) 24-in steel piles. An additional (50) 42-in steel pipe piles will be installed along what will become the outer edge of the work trestle to provide additional single mooring points for barges and vessels delivering material and accessing the trestle. The mooring dolphin piles and the single mooring point piles will be installed using a vibratory hammer. A total of 68 steel pipe piles will be driven, (50) 42-in piles and (18) 24-in piles.

An additional (50) 42-in steel pipe piles will be installed in Willoughby Bay to create moorings for additional staging of barges and safe haven for vessels in the event of severe weather. The moorings will be configured as (2) 2,000-ft long lines with a 42-in mooring pile every 24.4 m (80 ft). The piles will be installed using a vibratory hammer.
Installation and Removal of Piles for Test Pile Program (Segments 1b, 2a, 3a, and 3c)

The HRCP will perform limited pile load testing to confirm permanent concrete pile design at the start of the project. Test piles will be installed at the North Trestle (1 load test pile, 10 production test piles), South Trestle (2 load test piles, 20 production test piles) and at Willoughby Bay (1 load test pile, 15 production test piles) – test piles will be 30-in square concrete or 54-in concrete cylinder piles (see Table 1). Test piles will be set using temporary steel templates designed to support and position the test pile while being driven. Concrete test piles will be driven using an impact hammer. Test pile templates will be positioned and held in place using spuds (one at each corner of the template). The test pile templates and pile load test frame and supports will be installed using a vibratory hammer and proofed using an impact hammer to confirm sufficient load capacity. Test piles will be cut below the mudline and removed. The temporary test pile templates and load test frame and supports will be removed using a vibratory hammer.

Table 1--Pile Driving and Removal Associated with the HRBT Project that are Likely to Result in the Take of Marine Mammals

Project Component	Pile Size) / Type and Material	Total Number of Piles	Embedment Length (feet)	Number of Piles Down-the-Hole	Average Down-the-Hole Duration Per Pile (minutes)	Number of Piles Vibrated / Hammered	Average Vibratory Duration Per Pile (minutes)	Approximate # of Impact Strikes Per Pile	Number of Piles Per Day Per Hammer	Estimated Total Number of Hours of Installation	Number of Days of Installation
North Trestle (Segment 1b)											
North Shore Work Trestle	36-in Steel Pipe	194	100	10	120	184	50	40	3	162	65
Moorings	42-in Steel Pipe	36	60	-	-	36	30	-	6	18	6
Moorings	24-in Steel Pipe	30	60	-	-	30	30	-	6	15	5

Project Component	Pile Size) / Type and Material	Total Number of Piles	Embedment Length (feet)	Number of Piles Down-the-Hole	Average Down-the-Hole Duration Per Pile (minutes)	Number of Piles Vibrated / Hammered	Average Vibratory Duration Per Pile (minutes)	Approximate # of Impact Strikes Per Pile	Number of Piles Per Day Per Hammer	Estimated Total Number of Hours of Installation	Number of Days of Installation
Test Pile Program (Load Test Piles)	54-in Concrete Cylinder Pipe	1	140	-	-	1		2,100	1	2	1
Test Pile Program (Production Piles)	54-in Concrete Cylinder Pipe	10	140	-	-	10	-	2,100	1	20	10
North Island (Segment 2a)											
Moorings	42-in Steel Pipe	80	60	-	-	80	30	-	6	40	13
Willoughby Bay (Segment 3c)											
Moorings	42-in Steel Pipe	50	60	-	-	50	30	-	6	25	9
Moorings	24-in Steel Pipe	18	60	-	-	18	30	-	6	9	3
Moorings (Safe Haven)	42-in Steel Pipe	50	60	-	-	50	30	-	6	25	9
Test Pile Program (Load Test Piles)	24-in or 30-in Concrete Square Pipe	1	140	-	-	1		2,100	1	2	1
Test Pile Program (Production Piles)	24-in or 30-in Concrete Square Pipe	15	140	-	-	15	-	2,100	1	30	15
South Trestle (Segment 3a)											
Moorings	42-in Steel Pipe	41	60	-	-	41	30	-	6	21	7
Moorings	24-in Steel Pipe	18	60	-	-	18	30	-	6	9	3
Test Pile Program (Load Test Piles)	54-in Concrete Cylinder Pipe	2	140	-	-	2		2,100	1	4	2

Project Component	Pile Size) / Type and Material	Total Number of Piles	Embedment Length (feet)	Number of Piles Down-the-Hole	Average Down-the-Hole Duration Per Pile (minutes)	Number of Piles Vibrated / Hammered	Average Vibratory Duration Per Pile (minutes)	Approximate # of Impact Strikes Per Pile	Number of Piles Per Day Per Hammer	Estimated Total Number of Hours of Installation	Number of Days of Installation
Test Pile Program (Production Piles)	54-in Concrete Cylinder Pipe	20	140	-	-	20	-	2,100	1	40	20
South Island (Segment 2a)											
TBM Platform	36-in Steel Pipe	216	140	108	120	108	60	60	2	216	108
Jet Grouting Trestle	36-in Steel Pipe	204	100	20	120	184	50	40	3	170	68
Conveyor Trestle	36-in Steel Pipe	84	100	8	120	76	50	40	3	70	28
Total		1,070									

Planned in-water marine construction activities that have potential to affect marine mammals will occur at the following locations in Construction Areas 2 and 3 (Figure 2):

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

Mitigation, monitoring, and reporting measures are described in detail later in this document (please see **Mitigation** and **Monitoring and Reporting** section).

A detailed description of the planned project is provided in the **Federal Register** notice for the proposed IHA (85 FR 16194; March 20, 2020). Since that time, no changes have been made to the planned construction activities. Therefore, a detailed

description is not provided here. Please refer to that **Federal Register** notice for the description of the specific activity.

Comments and Responses

A notice of NMFS's proposal to issue an IHA to HRCP was published in the **Federal Register** on March 20, 2020 (85 FR 16194). That notice described, in detail, the project activity, the marine mammal species that may be affected by the activity, and the anticipated effects on marine mammals. During the 30-day public comment period, NMFS received comments from the Marine Mammal Commission (Commission). The Commission's letter is available online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*. Please see the letter for full details of the recommendations and associated rationale.

Comment: The Commission commented that NMFS used incorrect proxy source levels for impact installation of 30- and 54-in concrete piles based on MacGillivray *et al*. (2007) and therefore underestimated the various Level A and B harassment zones noted in Tables 11 and 12 of the **Federal Register** notice of proposed IHA and Tables 2 and 3 in the draft authorization. The Commission said that NMFS omitted the fact that source levels for impact installation of 36-in concrete piles were used as a proxy for the 30- and 54-in concrete piles in the **Federal Register** notice (85 FR 16194; March 20, 2020).

Response: NMFS revised the source levels for 30- and 54-in concrete piles to 193 dB SPLpeak (peak sound pressure level), 187 dB SPLrms (sound pressure level, root mean square), and 177 decibels (dB) SEL (sound exposure level) and therefore revised

the Level A and Level B harassment zones accordingly. However, the source level of 36-in concrete piles were not used as a proxy for the 30- and 54-in concrete piles.

Comment: The Commission stated that NMFS incorrectly noted that the source levels for unattenuated and attenuated impact installation of 36-in piles originated from Chesapeake Tunnel Joint Venture (CTJV; 2018) and Department of the Navy (2015) rather than California Department of Transportation (Caltrans; 2015) in Table 5 of the **Federal Register** notice (85 FR 16194; March 20, 2020).

Response: NMFS recognizes this error and has made the correction in this notice.

Comment: The Commission commented that NMFS indicated that three or more hammers could be used simultaneously in the proposed IHA (85 FR 16194; March 20, 2020), but did not specify what the resulting source levels would be if up to four vibratory hammers were used, what the Level B harassment zone would be for the combined source level when four hammers are used, whether multiple hammers of the same type would be used at a given site, or what the worst-case scenario would be. The Commission stated that extents of the Level B harassment zones, similar to Table 3 in the draft authorization, must be specified to ensure the appropriate zones are used to extrapolate the number of Level B harassment takes during simultaneous use of vibratory hammers, particularly since the monitoring zones are much smaller than the Level B harassment zones.

Response: NMFS did provide the worst-case scenarios for when multiple vibratory hammers (3) are used for 42-in steel piles. This was described in Table 7 and 11. Table 11 assumes the max number of 42-in steel piles that could be driven in a given day by multiple impact hammers for two scenarios, three piles or two piles driven

simultaneously. It is not anticipated that four hammers would be used simultaneously so the wording "or more" was an error and has been omitted from the final notice. NMFS did not provide what the resulting source levels would be for four hammers as the applicant indicated three would be the maximum used. Therefore, no changes were made in Table 13 for the calculated distances for Level B harassment in this notice or Table 3 of the final IHA.

Comment: The Commission recommended using 162 rather than 161 dB re 1 µPa rms (1 micro Pascal, root mean square) at 10 m for vibratory installation of 24-in piles and to re-estimate the Level A and B harassment zones accordingly.

Response: NMFS believes that 161 dB re 1 µPa rms remains appropriate for use in this circumstance and does not adopt the recommendation to re-estimate the Level A and B harassment zones. The source level is within ±2 dB of the Commission's recommended source level.

Comment: The Commission recommends that NMFS (1) have its experts in underwater acoustics and bioacoustics review and finalize in the next month its recommended proxy source levels for impact pile driving of the various pile types and sizes, (2) compile and analyze the source level data for vibratory pile driving of the various pile types and sizes in the near term, and (3) ensure action proponents use consistent and appropriate proxy source levels in all future rulemakings and proposed IHA. If a subset of source level data is currently available *(i.e*., vibratory pile driving of 24-in steel piles), those data should be reviewed immediately.

Response: NMFS concurs with this recommendation and has prioritized this effort. NMFS will conclude the process as soon as possible.

Comment: The Commission recommends that, for all authorizations involving DTH drilling including HRCP's final IHA and proposed rulemaking, NMFS use (1) source level data from Denes *et al.* (2019), the Level A harassment thresholds for impulsive sources, and the relevant expected operating parameters to estimate the extents of the Level A harassment zones and (2) source level data from Denes *et al.* (2016) and its Level B harassment threshold of 120-dB re 1 μPa rms for continuous sources to estimate the extents of the Level B harassment zones. If NMFS does not revise the Level B harassment zones based on a more appropriate proxy source level and the Level B harassment thresholds for continuous sources, the Commission recommends that NMFS justify its decision not consider a DTH hammer to be an impulsive, continuous sound source.

Response: NMFS did use the source level data from Denes *et al*. (2019) and its Level A harassment thresholds for impulsive sources, and the relevant expected operating parameters to estimate the extents of the Level A harassment zones for DTH drilling in the proposed IHA (85 FR 16194; March 20, 2020). For the calculation of the Level B harassment zone, NMFS concurs with the recommendation for this IHA and made the change using the threshold of 120-dB re 1 μPa rms for continuous sources to estimate the extents of the Level B harassment zones using source level data from Denes *et al*. (2016). However, NMFS does not agree that using Denes *et al*., 2019 as a source level is necessarily appropriate for "all authorizations" and will evaluate the best source level to use based on the operational details of future projects and the source level data available at that time.

Comment: The Commission commented on the assumptions used by NMFS regarding the efficacy of bubble curtains and NMFS adoption of a standard 7 dB source level reduction when bubble curtains are use. The Commission recommends that NMFS (1) consult with acousticians, including those at University of Washington, Applied Physics Lab, regarding the appropriate source level reduction factor to use to minimize near-field (<100 m) and far-field (>100 m) effects on marine mammals or (2) use the data NMFS has compiled regarding source level reductions at 10 m for near-field effects and assume no source level reduction for far-field effects for all relevant incidental take authorizations. The Commission has made this recommendation, with supporting justification and responses to NMFS's previous responses, since mid-December 2019—NMFS has yet to address it. NMFS has directed the Commission to NMFS's response from before the Commission made this specific recommendation and to a **Federal Register** notice that does not even pertain to NMFS. The Commission explicitly requests a detailed response to both parts of this recommendation if NMFS does not follow or adopt it, as required under section 202(d) of the MMPA.

Response: NMFS disagrees with the Commission regarding this issue, and does not adopt the recommendation. The Commission has raised this concern before and NMFS refers readers to our full response, which may be found in a previous notice of issuance of an IHA (84 FR 64833, November 25, 2019). NMFS will additionally provide a detailed explanation of its decision within 120 days, as required by section 202(d) of the MMPA.

Comment: The Commission recommends that NMFS require HRCP to (1) conduct hydroacoustic monitoring (a) during impact installation of 54-in concrete piles,

(b) when multiple vibratory hammers are used simultaneously and multiple DTH hammers are used simultaneously, (c) when only one DTH hammer is used, and (d) when 36-in steel piles are installed both with and without the bubble curtain, (2) ensure that signal processing is conducted appropriately 28 for DTH drilling, and (3) adjust the Level A and B harassment zones accordingly.

Response: The Commission states that it is "apparent" that HRCP "should be" conducting hydroacoustic monitoring, but fails to justify the necessity of this recommended requirement, and does not address the practicability of such a requirement. The Commission's recommendation is based on the fact that source levels for 36-in piles are used as a proxy for 54-in piles, as well as the following assertions: (1) source levels for DTH drilling have yet to be analyzed appropriately and (2) the presumed 7-dB source level reduction associated with use of a bubble curtain has yet to be proven. In addition, the Commission states that the extents of the Level B harassment zones "have not been substantiated." NMFS disagrees with these points and does not adopt the recommendation. It is common practice to use the best available proxy data when data are not available for a particular pile type or size and, while additional data may be useful, the use of a proxy does not alone justify a requirement to conduct hydroacoustic monitoring. Moreover, the Commission's assumption that source levels are underestimated does not ultimately lead to a conclusion that the evaluation of potential effects is similarly underestimated, given the simple and conservative assumptions made in relation to expected transmission loss. The source levels for DTH drilling are provided through a hydroacoustic monitoring study for a similar project at a nearby location. The Commission does not further explain its reasoning on this point. The assumed 7-dB

source level reduction attributed to use of the bubble curtain was developed as a generic standard through review of a large amount of data relating to use of bubble curtains and, therefore, the Commission's suggestion that this reduction "has yet to be proven" is incorrect. Further, the suggestion to conduct this type of testing is inconsistent with the Commission's own insistence that no reduction should be applied in any circumstances. Finally, the suggestion that the size of the Level B harassment zones has "yet to be substantiated" is nonsensical, as the project has yet to begin, and is inconsistent with typical practice. The vast majority of projects proceed with assumptions regarding zone size, and the Commission does not adequately explain why the cost and logistical considerations associated with hydroacoustic monitoring are warranted in this case to "substantiate" the zone sizes.

The Commission points out that the HRCP plans to conduct more than 5 years of activities. This IHA only pertains to one year of those activities. The applicant has requested a rulemaking/Letter of Authorization for another 5 years of work to complete the overall project. NMFS will consider the potential need for hydroacoustic monitoring with the applicant as part of the rulemaking/Letter of Authorization process.

Comment: The Commission noted its understanding that NMFS has formed an internal committee to address perceived issues with estimating Level A harassment zone sizes and is consulting with external acousticians and modelers as well. In the absence of relevant recovery time data for marine mammals, the Commission continues to believe that animat modeling that considers various operational and animal scenarios should be used to inform the appropriate accumulation time and could be incorporated into NMFS's user spreadsheet that currently estimates the Level A harassment zones. The Commission

recommends that NMFS continue to make this issue a priority to resolve in the near future and consider incorporating animat modeling into its user spreadsheet.

Response: NMFS concurs with this recommendation and has prioritized the issue.

Comment: The Commission recommends that NMFS increase the number of takes from 261 to at least 3,588 takes of harbor seals, equating to at least 753 Level A harassment and 2,835 Level B harassment takes of harbor seals.

Response: NMFS disagrees with the Commission's recommendation and does not adopt it. In the proposed IHA, NMFS proposed 55 takes by Level A harassment and 206 takes by Level B harassment. During the comment period, NMFS informally discussed with the Commission increasing harbor seals takes using 8 seals/day multiplied by 156 days for a total of 1,248 takes. The Commission did not indicate any opposition to this new estimate. That said, NMFS has determined that it will use the average 5-year daily count of 13.6 seals (Jones *et al*., 2020) in its take estimate to be more conservative than the proposed IHA as fully described in the **Estimated Take** section.

Comment: The Commission recommends that NMFS use the Chesapeake Bay density of 1.38 dolphins/square kilometer (km^2) from Engelhaupt *et al*. (2016) and (1) the Level B harassment ensonified area of 131.4 km^2 west of the HRBT and 312 days of activities, (2) the Level B harassment ensonified area of 221.46 km^2 for vibratory installation of 42-in steel piles at the South Trestle and 7 days of activities, (3) the Level B harassment ensonified area associated of 27.65 km^2 for vibratory installation of 24-in steel piles at the South Trestle and 3 days of activities, and (4) the Level B harassment ensonified area associated of 0.87 km^2 for impact installation of 54-in concrete piles at

the South Trestle and 22 days of activities to increase the numbers of Level B harassment takes of bottlenose dolphins from 6,343 to 58,856.

Response: NMFS has accepted the Commission's recommendation and will use the dolphin density of 1.38 dolphins/km^2 from Engelhaupt *et al.* (2016) to estimate take of bottlenose dolphins as described in the **Estimated Take** section. However, NMFS notes the Commission's statement that the use of bottlenose dolphin data in the notice of proposed IHA "appears to be an attempt to reduce the number of takes rather than an effort to use the best available data." The Commission's statement is both inappropriate and incorrect, and NMFS strongly objects to the Commission's attempt to interpret intent.

Comment: The Commission recommends that NMFS ensure HRCP keeps a running tally of the total takes, based on observed and extrapolated takes, for Level A and B harassment.

Response: We agree that HRCP must ensure they do not exceed authorized takes, but do not concur with the recommendation. NMFS is not responsible for ensuring that HRCP does not operate in violation of an issued IHA.

Comment: The Commission recommends that NMFS require HRCP to use at least (1) one protected species observer (PSO) to monitor the shut-down zones for each hammer that is in use at each site, (2) one PSO to monitor the Level B harassment zones during vibratory installation of piles at Willoughby Bay and to be located near the entrance of the Bay to observe animals entering and exiting the Level B harassment zone, (3) one PSO to monitor the Level A and B harassment zones during impact installation of 30- and 54-in piles at North and South Trestle, (4) three PSOs to monitor the Level B harassment zones during vibratory pile driving of 24-in piles at South Trestle, one PSO

on the Hampton side and one on the Norfolk side of Chesapeake Bay to the east of HRBT and one PSO on the Hampton side to the west of HRBT, (5) four PSOs to monitor the Level B harassment zones during vibratory pile driving of 42-in piles at South Trestle, one on the Hampton side and one on the Norfolk side of Chesapeake Bay to the east of HRBT and one on the Hampton side and one on the Norfolk side to the west of HRBT, and (6) four PSOs to monitor the Level B harassment zones during vibratory pile driving and/or DTH drilling of 36- and 42-in piles and during simultaneous use of multiple hammers at North Trestle, North Island, and South Island, two on the Hampton side and two on the Norfolk side to the west of HRBT.

Response: NMFS appreciates the Commission's recommendations for PSO locations. As previously described in the proposed IHA, monitoring locations will provide an unobstructed view of all water within the shutdown zone and as much of the Level B harassment zone as possible for pile driving activities. However, after further discussion with the applicant, HRCP will station between one and four PSOs at locations offering the best available views of the Level A and Level B monitoring zones during in-water pile driving at the North Trestle, North Island, South Trestle, and South Island. When and where able, as determined by the PSO or Lead PSO when multiple observers are required, Level A and Level B harassment zones may be monitored for multiple pile driving locations by the same individual PSO. HRCP will be required to station between one and two PSOs at locations offering the best available views of the Level A and Level B monitoring zones during in-water pile driving at Willoughby Bay.

Comment: The Commission recommends that NMFS include in (1) section 3 of the final authorization the requirement that HRCP conduct pile-driving activities during

daylight hours only and (2) section 4 of the final authorization the requirement that, if the entire shut-down zone(s) is not visible due to fog or heavy rain, HRCP delay or cease pile-driving and -removal activities until the zone(s) is visible.

Response: NMFS does not concur and does not adopt the recommendation. The work is anticipated to be conducted during daylight hours. However, if work needs to extend into the night, work may only be conducted under conditions where there is full visibility of the shutdown zone or where stopping ongoing work would otherwise create an unsafe work condition. In addition, the IHA requires that work must be conducted during conditions of good visibility. If poor environmental conditions restrict full visibility of the shutdown zone, pile installation must be delayed. Poor visibility implies a condition that would occur under fog or heavy rain.

Comment: The Commission recommends that NMFS include in all draft and final IHA the explicit requirements to cease activities if a marine mammal is injured or killed during the specified activities until NMFS reviews the circumstances involving any injury or death that is likely attributable to the activities and determines what additional measures are necessary to minimize additional injuries or deaths.

Response: NMFS concurs with the Commission's recommendation as it relates to this IHA and has added the referenced language to the **Monitoring and Reporting** section of this notice and the Reporting section of the issued IHA. We will continue to evaluate inclusion of this language in future IHAs.

Comment: The Commission reiterates programmatic recommendations regarding NMFS' potential use of the renewal mechanism for one-year IHAs.

Response: NMFS does not agree with the Commission and, therefore, does not adopt the Commission's recommendation. NMFS will provide a detailed explanation of its decision within 120 days, as required by section 202(d) of the MMPA.

Comment: The Commission recommends that NMFS (1) publish a revised proposed authorization for public comment, (2) consult with HRCP regarding the numerous issues raised in this letter and direct the applicant to revise its letter of authorization application accordingly, and (3) refrain from publishing for public comment proposed IHAs and proposed rules based on underlying applications that contain omissions, errors, and inconsistencies and instead return such applications to action proponents as incomplete.

Response: NMFS does not agree with the Commission and does not adopt the recommendation. NMFS disagrees that the information presented in association with the proposed IHA was insufficient to facilitate public review and comment, as the Commission states. What the Commission claims are "omissions, errors, and inconsistencies" are, for the most part, differences of opinion on how available data should be applied to our analysis and, in each case, we have presented reasons why we disagree with specific recommendations. If we did agree that there actually was an error or that the Commission's logic is more appropriate to implement, we have made the recommended changes. We note many of the recommendations by the Commission are detail-oriented and, in NMFS' view, do not provide additional conservation value or meaningfully influence any of the analyses underlying the necessary findings. NMFS strongly disagrees with the Commission's suggestion that NMFS' negligible impact and least practicable adverse impact determinations may be invalid, and we note that the

Commission does not provide any information supporting this comment, whether NMFS retained the take numbers and mitigation requirements from the proposed IHA or adopted those recommended by the Commission. Overall, there are no substantial changes or new information that would lead us to reach any other conclusions regarding the impact to marine mammals. For these reasons, NMFS is not republishing a notice of proposed IHA.

Changes from the Proposed IHA to the Final IHA

Changes were made to the source level for 30- and 54-in concrete piles during impact pile driving. Therefore, Level A and Level B harassment zones were recalculated and corrected in Tables 11 and 12 and in the final authorization. The Level B harassment zone was also recalculated for DTH drilling for 36-in piles, reflecting use of the continuous noise, 120-dB threshold. Appropriate corrections were made to Table 12 and in the final authorization. Changes to the estimated take numbers for harbor seals and bottlenose dolphins were made, as recommended by the Commission. For mitigation and monitoring, clarification of the timing of the work as well as PSO locations were also made.

Description of Marine Mammals in the Area of Specified Activities

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history, of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS's Stock Assessment Reports (SARs; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*) and more general information about these species (*e.g.*, physical and

behavioral descriptions) may be found on NMFS's website (*https://www.fisheries.noaa.gov/find-species*).

Table 2 lists all species or stocks for which take is expected and authorized for this action, and summarizes information related to the population or stock, including regulatory status under the MMPA and ESA and potential biological removal (PBR), where known. For taxonomy, we follow Committee on Taxonomy (2019). PBR is defined by the MMPA as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (as described in NMFS's SARs). While no mortality is anticipated or authorized here, PBR and annual serious injury and mortality from anthropogenic sources are included here as gross indicators of the status of the species and other threats.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS's stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS's United States Atlantic and Gulf of Mexico Marine Mammal SARs. All values presented in Table 2 are the most recent available at the time of publication and are available in the draft 2019 SARs (*https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports*).

Table 2--Marine Mammal Species Likely To Occur Near the Project Area

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N)[1]	Stock abundance (CV, N_{min}, most recent abundance survey)[2]	PBR	Annual M/SI[3]
Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)						
Family Balaenopteridae (rorquals)						
Humpback whale[4]	*Megaptera novaeangliae*	Gulf of Maine	-,-; N	896 (.42; 896; 2012)	14.6	9.7
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae						
Bottlenose dolphin	*Tursiops spp.*	Western North Atlantic (WNA) Coastal, Northern Migratory	-,-; Y	6,639 (0.41; 4,759; 2011)	48	6.1-13.2
		WNA Coastal, Southern Migratory	-,-; Y	3,751 (0.06; 2,353; 2011)	23	0-14.3
		Northern North Carolina Estuarine System (NNCES)	-,-; Y	823 (0.06; 782; 2013)	7.8	0.8-18.2
Family Phocoenidae (porpoises)						
Harbor porpoise	*Phocoena phocoena*	Gulf of Maine/Bay of Fundy	-, -; N	79,833 (0.32; 61,415; 2011)	706	256
Order Carnivora – Superfamily Pinnipedia						
Family Phocidae (earless seals)						
Harbor seal	*Phoca vitulina*	WNA	-; N	75,834 (0.1; 66,884, 2012)	2,006	345
Gray seal	*Halichoerus grypus*	WNA	-; N	27,131 (0.19, 23,158, 2016)	1,359	5,688

1 - Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) 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 PBR 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- NMFS marine mammal stock assessment reports online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports*. CV is coefficient of variation; Nmin is the minimum estimate of stock abundance. In some cases, CV is not applicable.

3 - These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.,* commercial fisheries, ship strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.

4 - 2018 U.S. Atlantic SAR for the Gulf of Maine feeding population lists a current abundance estimate of 896 individuals. However, we note that the estimate is defined on the basis of feeding location alone (*i.e.*, Gulf of Maine) and is therefore likely an underestimate.

As indicated above, all five species (with seven managed stocks) in Table 2, temporally and spatially co-occur with the activity to the degree that take is reasonably

likely to occur, and therefore authorized. All species that could potentially occur in the planned project area are included in Table 3-1 of the application. While North Atlantic right whales (*Eubalaena glacialis*), minke whales (*Balaenoptera acutorostrata acutorostrata*), and fin whales (*Balaenoptera physalus*) have been documented in the area, the temporal and/or spatial occurrence of these whales is such that take is not expected to occur, and they are not discussed further. Detailed descriptions of marine mammals in the project area were provided in the **Federal Register** notice for the proposed IHA (85 FR 16194; March 20, 2020).

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al*., 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e.*, low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 dB threshold from the normalized composite audiograms, with the

exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 3.

Table 3--Marine Mammal Hearing Groups (NMFS, 2018)

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, *Kogia*, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz

* Represents the generalized hearing range for the entire group as a composite (*i.e.*, all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall *et al.* 2007) and PW pinniped (approximation).

The pinniped functional hearing group was modified from Southall *et al*. (2007) on the basis of data indicating that phocid species have consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä *et al*., 2006; Kastelein *et al*., 2009; Reichmuth and Holt, 2013).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information. Five marine mammal species (three cetacean and two phocid pinniped) have the reasonable potential to co-occur with the planned survey activities. Please refer to Table 2. Of the cetacean species that may be

present, one is classified as low-frequency (humpback whale), one is classified as mid-frequency (bottlenose dolphin) and one is classified as high-frequency (harbor porpoise).

Potential Effects of Specified Activities on Marine Mammals and their Habitat

The effects from underwater noise from the planned pile driving and removal activities have the potential to result in Level A and Level B harassment of marine mammals in the vicinity of the project area. The **Federal Register** notice for the proposed IHA (85 FR 16194; March 20, 2020) included a discussion of the effects of anthropogenic noise on marine mammals and their habitat, therefore that information is not repeated here; please refer to that **Federal Register** notice (85 FR 16194; March 20, 2020) for that information.

Estimated Take

This section provides an estimate of the number of incidental takes authorized through this IHA, which will inform both NMFS' consideration of "small numbers" and the negligible impact determinations.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as any act of pursuit, torment, or annoyance, which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) 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 (Level B harassment).

Take of marine mammals incidental to HRCP's pile driving and removal activities could occur by Level A and Level B harassment, as pile driving has the

potential to result in disruption of behavioral patterns for individual marine mammals. The planned mitigation and monitoring measures are expected to minimize the severity of such taking to the extent practicable. As described previously, no mortality is anticipated or authorized for this activity. Below we describe how the take is estimated.

Generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and, (4) and the number of days of activities. We note that while these basic factors can contribute to a basic calculation to provide an initial prediction of takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.*, previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the authorized take estimates for the IHA.

Acoustic Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur permanent threshold shift (PTS) of some degree (equated to Level A harassment).

Level B Harassment – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.*, frequency, predictability, duty cycle),

the environment (*e.g.*, bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.,* 2007, Ellison *et al.*, 2012). Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μPa (rms) for continuous (*e.g.,* vibratory pile-driving, drilling) and above 160 dB re 1 μPa (rms) for non-explosive impulsive (*e.g.*, impact pile driving seismic airguns) or intermittent (*e.g.*, scientific sonar) sources. The planned activities include the use of continuous, non-impulsive (vibratory pile driving) and impulsive (impact pile driving) sources and therefore, the 120 and 160 dB re 1 μPa (rms) are applicable. The DTH hammer is considered a continuous noise source for purposes of evaluating potential behavioral impacts.

Level A Harassment - NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise. The technical guidance identifies the received levels, or thresholds, above which individual marine mammals are predicted to experience changes in their hearing sensitivity for all underwater anthropogenic sound sources, and reflects the best available science on the potential for noise to affect auditory sensitivity by:

- Dividing sound sources into two groups (*i.e.*, impulsive and non-impulsive) based on their potential to affect hearing sensitivity;
- Choosing metrics that best address the impacts of noise on hearing sensitivity, *i.e.*, sound pressure level (peak SPL) and sound exposure level (SEL) (also accounts for duration of exposure); and
- Dividing marine mammals into hearing groups and developing auditory weighting functions based on the science supporting that not all marine mammals hear and use sound in the same manner.

These thresholds were developed by compiling and synthesizing the best available science, and are provided in Table 4 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technicalguidance*. The planned activity includes the use of impulsive (impact pile driving) and non-impulsive (vibratory pile driving) sources. The DTH hammer is considered an impulsive noise source for purposes of evaluating potential auditory impacts.

Table 4--Thresholds Identifying the Onset of Permanent Threshold Shift

	PTS Onset Acoustic Thresholds* (Received Level)	
Hearing Group	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	*Cell 1* $L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	*Cell 2* $L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	*Cell 3* $L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	*Cell 4* $L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	*Cell 5* $L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	*Cell 6* $L_{E,HF,24h}$: 173 dB

Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	*Cell 8* $L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	*Cell 10* $L_{E,OW,24h}$: 219 dB

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Note: Peak sound pressure (L_{pk}) has a reference value of 1 µPa, and cumulative sound exposure level (L_E) has a reference value of 1µPa^{2}s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

Ensonified Area

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds, which include source levels and transmission loss coefficient.

Sound Propagation

Transmission loss (TL) is the 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 depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is:

$TL = B * \log_{10}(R_1/R_2)$, where

B = transmission loss coefficient (assumed to be 15)

R_1 = the distance of the modeled SPL from the driven pile, and

R_2 = the distance from the driven pile of the initial measurement.

This formula neglects loss due to scattering and absorption, which is assumed to be zero here. The degree to which underwater sound propagates away from a sound source is dependent on a variety of factors, most notably the water bathymetry and presence or absence of reflective or absorptive conditions including in-water structures and sediments. Spherical spreading occurs in a perfectly unobstructed (free-field) environment not limited by depth or water surface, resulting in a 6 dB reduction in sound level for each doubling of distance from the source (20*log(range)). Cylindrical spreading occurs in an environment in which sound propagation is bounded by the water surface and sea bottom, resulting in a reduction of 3 dB in sound level for each doubling of distance from the source (10*log(range)). As is common practice in coastal waters, here we assume practical spreading loss (4.5 dB reduction in sound level for each doubling of distance). Practical spreading is a compromise that is often used under conditions where water depth increases as the receiver moves away from the shoreline, resulting in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions.

Sound Source Levels

The intensity of pile driving sounds is greatly influenced by factors such as the type of piles, hammers, and the physical environment in which the activity takes place. There are source level measurements available for certain pile types and sizes from the similar environments recorded from underwater pile driving projects (*e.g.*, Caltrans 2015) that were used to determine reasonable sound source levels likely result from the HRCP's pile driving and removal activities (Table 5). Bubble curtains will be used during impact

pile driving of 36-in steel piles at the Jet Grouting Trestle in water depths greater than 6 m (20 ft). Therefore, a 7dB reduction of the sound source level will be implemented (Table 5).

Table 5--Predicted Sound Source Levels for All Pile Types

Method and Pile Type	Sound Source Level at 10 meters			Source
Vibratory Hammer	dB rms			
42-in steel pile	168[a]			City and Borough of Sitka Department of Public Works 2017
36-in steel pile	167[b]			DoN 2015
24-in steel pile	161[c]			DoN 2015
Down-the-hole Hammer	dB rms	dB SEL	dB peak	
All pile sizes	180	164	190	Denes *et al*., 2019
Impact Hammer	dB rms	dB SEL	dB peak	
36-in steel pile	193	183	210	Caltrans, 2015
36-in steel pile, attenuated*	186	176	203	Caltrans, 2015
54-in concrete cylinder pile	187	177	193	MacGillivray *et al*., 2007
30-in concrete square pile	187	177	193	MacGillivray *et al*., 2007
24-in concrete square 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) are a 7 dB reduction for the usage of a bubble curtain.

[a] The SPL rms value of 168 dB is within 2 dB of Caltrans (2015) at 170 dB rms for 42-in piles.

[b] The SPL rms value of 167 is within 3 dB of Caltrans (2015) at 170 dB rms; however, the DoN (2015) incorporates a larger dataset and is better suited to this project.

[c] There is no Caltrans (2015) data available for this pile size. Caltrans is 155 dB rms for 12-in pipe pile or 170 dB rms for 36-in steel piles. The value of 161 dB rms has been also used in previous IHAs (*e.g*., 82 FR 31400, July 6, 2017; 83 FR 12152, March 20, 2018; 84 FR 22453, May 17, 2019; and 84 FR 34134, July 17, 2019).

During pile driving installation activities, there may be times when multiple construction sites are active and hammers are used simultaneously. For impact hammering, it is unlikely that the two hammers would strike at the same exact instant, and therefore, the sound source levels will not be adjusted regardless of the distance between the hammers. For this reason, multiple impact hammering is not discussed further. For simultaneous vibratory hammering, the likelihood of such an occurrence is anticipated to be infrequent and would be for short durations on that day. In-water pile installation is an intermittent activity, and it is common for installation to start and stop multiple times as each pile is adjusted and its progress is measured. When two continuous noise sources, such as vibratory hammers, have overlapping sound fields, there is potential for higher sound levels than for non-overlapping sources. When two or more vibratory hammers are used simultaneously, and the sound field of one source encompasses the sound field of another source, the sources are considered additive and combined using the following rules (see Table 6): for addition of two simultaneous vibratory hammers, the difference between the two SSLs is calculated, and if that difference is between 0 and 1 dB, 3 dB are added to the higher SSL; if difference is between 2 or 3 dB, 2 dB are added to the highest SSL; if the difference is between 4 to 9 dB, 1 dB is added to the highest SSL; and with differences of 10 or more decibels, there is no addition.

Table 6--Rules for Combining Sound Levels Generated during Pile Installation

Hammer Types	Difference in SSL	Level A Zones	Level B Zones
Vibratory, Impact	Any	Use impact zones	Use vibratory zone
Impact, Impact	Any	Use zones for each pile size and number of strikes	Use zone for each pile size

Vibratory, Vibratory	0 or 1 dB	Add 3 dB to the higher source level	Add 3 dB to the higher source level
	2 or 3 dB	Add 2 dB to the higher source level	Add 2 dB to the higher source level
	4 to 9 dB	Add 1 dB to the higher source level	Add 1 dB to the higher source level
	10 dB or more	Add 0 dB to the higher source level	Add 0 dB to the higher source level

Source: Modified from USDOT 1995, WSDOT 2018, and NMFS 2018b.
Note: dB = decibels; SSL = sound source level.

For simultaneous usage of three or more continuous sound sources, such as vibratory hammers, the three overlapping sources with the highest SSLs are identified. Of the three highest SSLs, the lower two are combined using the above rules, then the combination of the lower two is combined with the highest of the three. For example, with overlapping isopleths from 24-, 36-, and 42-in diameter steel pipe piles with SSLs of 161, 167, and 168 dB rms respectively, the 24- and 36-inwould be added together; given that 167 – 161 = 6 dB, then 1 dB is added to the highest of the two SSLs (167 dB), for a combined noise level of 168 dB. Next, the newly calculated 168 dB is added to the 42-in steel pile with SSL of 168 dB. Since 168 – 168 = 0 dB, 3 dB is added to the highest value, or 171 dB in total for the combination of 24-, 36-, and 42-in steel pipe piles (NMFS 2018b; WSDOT 2018). As described in Table 6, decibel addition calculations were carried out for all possible combinations of vibratory installation of 24-, 36- and 42-in steel pipe piles throughout the project area (Table 7).

Table 7-- Possible Vibratory Pile Combinations for the Project

Method			Vibratory								
	Pile Diameter (Inches)		24	24+24	36	42	36+24	42+24	36+36	42+36	42+42
		SSL (dB)	161	164	167	168	168	169	170	171	171
Vibratory	24	161	164	166	168	169	-	-	-	-	-
	36	167	168	169	170	171	171	-	172	-	-
	42	168	169	169	171	171	171	172	172	173	173

SSL = Sound Source Level; dB = decibels.

"-" combination not valid, must compare lowest two values first, then highest value.

Level A Harassment

When the NMFS Technical Guidance (2016) was published, in recognition of the fact that ensonified area/volume could be more technically challenging to predict because of the duration component in the new thresholds, we developed a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which may result in some degree of overestimate of Level A harassment take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available, and NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources (such as from vibratory pile driving), NMFS User Spreadsheet predicts the closest distance at which, if a marine mammal remained at that distance the whole duration of the activity, it would incur PTS. Inputs used in the User Spreadsheet (Tables 8 through 10), and the resulting isopleths are reported below (Table 11).

In the chance that multiple vibratory hammers would be operated simultaneously, to simplify implementation of Level A harassment zones, the worst-case theoretical scenarios were calculated for the longest anticipated duration of the largest pile size (42-in steel pile) that could be installed within a day (see Table 8). However, it would be unlikely that six sets of three piles could be installed in synchrony, but more likely that installations of piles would overlap by a few minutes at the beginning or end, throughout

the day, so that during a 12-hour construction shift, there would be periods of time when zero, one, two, three, or more hammers would be working.

Table 8--NMFS Technical Guidance (2018) User Spreadsheet Input to Calculate PTS Isopleths for Vibratory Pile Driving for All Locations

User Spreadsheet Input –Vibratory Pile Driving Spreadsheet Tab A.1 Vibratory Pile Driving Used						
	24-in steel piles	36-in steel piles	36-in steel piles (at TBM platform)	42-in steel piles	42-in steel piles (multiple hammer event – 3 hammers simultaneously)	42-in steel piles (multiple hammer event – 2 hammers simultaneously)
Source Level (RMS SPL)	161	167	167	168	173	171
Weighting Factor Adjustment (kHz)	2.5	2.5	2.5	2.5	2.5	2.5
Number of piles within 24-hr period	6	3	2	6	6 (3 piles installed simultaneously, 6 piling events)	9 (2 piles installed simultaneously, 9 piling events)
Duration to drive a single pile (min)	30	50	60	30	30	30
Propagation (xLogR)	15	15	15	15	15	15
Distance of source level measurement (meters)	10	10	10	10	10	10

Table 9--NMFS Technical Guidance (2018) User Spreadsheet Input to Calculate PTS Isopleths for Impact Pile Driving for the Jet Grouting Trestle with and without a Bubble Curtain

User Spreadsheet Input – Impact Pile Driving Spreadsheet Tab E.1-2 Impact Pile Driving Used for Jet Grouting Trestle		
	36-in steel piles	36-in steel piles (attenuated)
Source Level (SEL)	183	176*
Weighting Factor Adjustment (kHz)	2	2
Number of piles within 24-hr period	3	3
Number of strikes per pile	40	40
Propagation (xLogR)	15	15

Distance of source level measurement (meters)+	10	10

*The attenuated piles account for a 7dB reduction from the use of a bubble curtain.

Table 10--NMFS Technical Guidance (2018) User Spreadsheet Input to Calculate PTS Isopleths for Impact Pile Driving and DTH Drilling

User Spreadsheet Input – Impact Pile Driving Spreadsheet Tab E.1-2 Impact Pile Driving										
	North Trestle	North Trestle, Willoughby Bay, and South Trestle Test Pile Program			South Island		DTH			
	36-in steel piles	24-in concrete square	30-in concrete square	54-in concrete cylinder	TBM Platform 36-in steel piles	Conveyor Trestle 36-in steel piles	TBM Platform 36-in steel piles	North Shore Work Trestle 36-in steel piles	Jet Grouting Trestle 36-in steel piles	Conveyor Trestle 36-in steel piles
Source Level (SEL)	183	166	177	177	183	183	164	164	164	164
Weighting Factor Adjustment (kHz)	2	2	2	2	2	2	2	2	2	2
Number of piles within 24-hr period	3	1	1	1	2	3	2	3	3	3
Number of strikes per pile	40	2,100	2,100	2,100	60	40	50,400	50,400	50,400	50,400
Propagation (xLogR)	15	15	15	15	15	15	15	15	15	15
Distance of source level measurement (meters)+	10	10	10	10	10	10	10	10	10	10

Table 11--Level A Harassment Isopleths for both Vibratory and Impact Pile Driving

User Spreadsheet Output		PTS isopleths (meters)				PTS isopleths (km^2)			
Pile Type/Activity	Sound Source Level at 10 m	Level A harassment				Level A harassment			
		Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid	Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid
Vibratory Pile Driving									
24-in steel pile installation (All Locations)	161 dB SPL	15	2	21	9	<0.01			

36-in steel pile installation (All Locations)	167 dB SPL	32	3	47	20	<0.01			
36-in steel pile installation (TMB Platform)	167 dB SPL	28	3	41	17	<0.01			
42-in steel pile installation (All Locations)	168 dB SPL	42	4	62	26	<0.10			
Impact Pile for the Jet Grouting Trestle									
36-in steel pile installation	183 dB SEL/193 SPL	243	9	290	130	0.11	<0.01	0.16	<0.10
36-in steel pile installation (attenuated)	176 dB SEL/186 SPL	83	3	99	45	0.014	<0.001	0.20	<0.01
Impact Pile Driving North Trestle									
36-in steel pile installation (North Shore Work Trestle)	183 dB SEL/193 SPL	243	9	290	130	0.19	<0.001	0.26	0.05
Impact Pile Driving for North Trestle, Willoughby Bay, and South Trestle Test Pile Program									
24-in concrete square pile installation/removal	166 dB SEL/190 SPL	121	5	144	65	0.05	<0.001	0.07	0.01
30-in concrete square pile installation/removal	177 dB SEL/187 SPL	652	23.2	776.6	348.9	1.335	0.002	1.8947	0.3824
54-in concrete square pile installation/removal	177 dB SEL/187 SPL	652	23.2	776.6	348.9	1.335	0.002	1.8947	0.3824
Impact Pile Driving for South Island									
36-in steel pile installation (TBM Platform)	183 dB SEL/193 SPL	243	9	290	130	0.11	<0.001	0.16	<0.10
36-in steel pile installation (Conveyor Trestle)	183 dB SEL/193 SPL	243	9	290	130	0.11	<0.001	0.16	<0.10
DTH Drilling									
36-in steel pile installation (TBM Platform)	164 SEL/180 dB SPL	1,171	42	1,395	627	2.437	<0.01	3.446	0.704
36-in steel pile installation (North Shore Work Trestle)	164 SEL/180 dB SPL	1,534	55	1,827	821	3.615	<0.01	4.790	1.548
36-in steel pile installation (Jet Grouting Trestle)	164 SEL/180 dB SPL	1,534	55	1,827	821	3.615	<0.01	5.908	1.548
36-in steel pile installation (Conveyor Trestle)	164 SEL/180 dB SPL	1,534	55	1,827	821	3.615	<0.01	5.908	1.548
Multiple Hammers - Vibratory Pile Driving (if occurs)*									
42-in steel pile installation (assumes 3 piles installed simultaneously, 6 piling events * 30 minutes each event in a 24-hr period)	173 dB SPL	89.6	7.9	132.5	54.5	0.025	0.0001	0.055	0.009

42-in steel pile installation (assumes 2 piles installed simultaneously, 9 piling events * 30 minutes each event in a 24-hr period)	171 dB SPL	86.4	7.7	127.8	52.5	0.023	0.0001	0.051	0.009

*SPLs were calculated by decibel addition as presented in Table 6 using the largest pile size (42-in steel piles) and possible combinations of two and three multiple hammer events. Please note: smaller piles may also have multiple hammer events; however, their SPLs would be smaller than the 42-in steel pipe pile scenarios so they are not presented here. The HRCP will be using the largest Level A isopleths calculated regardless of pile size during multiple hammering events.

For multiple hammering of 42-in steel pipe piles with a vibratory hammer on a single day, the calculated Level A harassment isopleth for the functional hearing groups would remain smaller than 100 m except for high-frequency cetaceans (*i.e.*, harbor porpoise). The Level A harassment isopleth for harbor porpoises would be 132.5 m and 127.8 m for the two scenarios (Table 11). It is unlikely that a harbor porpoise could accumulate enough sound from the installation of multiple piles in multiple locations for the duration required to meet these Level A harassment thresholds. Additionally, other combinations of pile sizes under multiple hammering with a vibratory hammer would result in Level A harassment thresholds smaller than 100 m. To be precautionary, a shutdown zone of 100 m would be implemented for all species for each vibratory hammer on days when it is anticipated that multiple vibratory hammers will be used regardless of pile size.

Level B Harassment

Utilizing the practical spreading loss model, underwater noise will fall below the behavioral effects threshold of 120 and 160 dB rms for marine mammals at the distances shown in Table 12 for vibratory and impact pile driving, respectively. Table 12 below provides all Level B harassment radial distances (m) and their corresponding areas (km^2) during HRCP's planned activities.

Table 12--Radial Distances (meters) to Relevant Behavioral Isopleths and Associated Ensonified Areas (km^2) Using the Practical Spreading Model

Location and Component	Method and Pile Type	Distance to Level B Harassment Zone (m)	Level B Harassment Zone (km^2)
Vibratory Hammer (Level B Isopleth = 120 dB)			
North Trestle			
Moorings	42-in steel piles	15,849	96.781
North Shore Work Trestle	36-in steel piles	13,594	85.525
Moorings	24-in steel piles	5,412	25.335
North Island			
Moorings	42-in steel piles	15,849	100.937
South Island			
TBM Platform	36-in steel piles	13,594	81.799
Conveyor Trestle	36-in steel piles	13,594	81.799
Jet Grouting Trestle	36-in steel piles	13,594	81.799
South Trestle			
Moorings	42-in steel piles	15,849	305.343
Moorings	24-in steel piles	5,412	55.874
Willoughby Bay			
Moorings	42-in steel piles	15,849	5.517
Moorings	24-in steel piles	5,412	5.517
Down-the-Hole Hammer (Level B Isopleth = 120 dB)			
North Shore Work Trestle	36-in steel piles	11,659	427.044
TBM Platform	36-in steel piles	11,659	427.044
Jet Grouting Trestle	36-in steel piles	11,659	427.044
Conveyor Trestle	36-in steel piles	11,659	427.044
Impact Hammer (Level B Isopleth = 160 dB)			
North Trestle			
North Shore Work Trestle	36-in steel piles	1,585	3.806

Location and Component	Method and Pile Type	Distance to Level B Harassment Zone (m)	Level B Harassment Zone (km^2)
South Island			
TBM Platform	36-in steel piles	1,585	0.087
Conveyor Trestle	36-in steel piles	1,585	0.087
Jet Grouting Trestle with Bubble Curtain	36-in steel piles	541*	0.012*
North Trestle, South Trestle, Willoughby Bay			
Test Pile Program	54-in concrete cylinder piles	631	1.2509
Test Pile Program	30-in concrete square piles	631	1.2509
Test Pile Program	24-in concrete square piles	117	0.04

dB = decibels; km^2 = square kilometers; TBM = Tunnel Boring Machine.
*Values smaller than other 36-in steel piles due to usage of a bubble curtain, resulting in a 7 dB reduction in dB rms, dB peak, and dB SEL.

For the test pile program, in some cases, the calculated Level A harassment isopleths are larger than the Level B harassment zones. This has occurred due to the conservative assumptions going into calculation of the Level A harassment isopleths. Animals will most likely respond behaviorally before they are injured, especially at greater distances and unlikely to accumulate noise levels over a certain period of time that would likely lead to PTS.

When multiple vibratory hammers are used simultaneously, the calculated Level B harassment zones (Table 13) would be larger than the Level B harassment zones reported in above in Table 12 depending on the combination of sound sources due to decibel addition of multiple vibratory hammers as discussed earlier (see Table 7). Table 13 shows the calculated distances to the Level B harassment zone for decibel levels resulting from the simultaneous installation of piles with multiple vibratory hammers

using the data provided in Table 7. However, the actual monitoring zones applied during multiple vibratory hammer use are discussed in the **Monitoring and Reporting** section.

Table 13--Calculated Distances to Level B Harassment Zones for Multiple Hammer Additions

Combined SSL (dB)	Distance to Level B Harassment Zone (m)
163	7,356
164	8,577
165	10,000
166	11,659
167	13,594
168	15,849
169	18,478
170	21,544
171	25,119
172	29,286
173	34,145

Note: dB = decibels; SSL = sound source level.

Marine Mammal Occurrence and Take Calculation and Estimation

In this section, we provide the information about the presence, density, or group dynamics of marine mammals that will inform the take calculations. Potential exposures to impact and vibratory pile driving and removal for each acoustic threshold were estimated using local observational data. Authorized take by Level A and B harassment is also described.

Humpback Whales

Humpback whales are more rare in the project area and density data for this species within the project vicinity are not available. Humpback whale sighting data

collected by the U.S. Navy near Naval Station Norfolk and Virginia Beach from 2012 to 2015 (Engelhaupt *et al*. 2014, 2015, 2016) and in the mid-Atlantic (including the Chesapeake Bay) from 2015 to 2018 (Aschettino *et al*. 2015, 2016, 2017a, 2018) did not produce large enough sample sizes to calculate densities, or survey data were not collected during systematic line-transect surveys. Humpback whale densities have been calculated for populations off the coast of New Jersey, resulting in a density estimate of 0.000130 animals per square kilometer or one humpback whale within the area on any given day of the year (Whitt *et al*., 2015), which may be similar to the density of whales in the project area. Aschettino *et al*. (2018) observed and tracked two individual humpback whales in the Hampton Roads area of the project area (Movebank, 2019). The HRCP is estimating up to two whales may be exposed to project-related noise every two months. Pile installation/removal is expected to occur over a 12-month period; therefore, a total of 12 instances of take by Level B harassment of humpback whales is authorized. Due to the low occurrence of humpback whales and because large whales are easier to sight from a distance, we do not anticipate or propose take of humpback whales by Level A harassment.

Bottlenose Dolphin

The expected number of bottlenose dolphins in the project area was estimated using inshore seasonal densities provided in Engelhaupt *et al*. (2016) from vessel line-transect surveys near Naval Station Norfolk and adjacent areas near Virginia Beach, Virginia, from August 2012 through August 2015 (Engelhaupt *et al*., 2016). NMFS used the density of 1.38 dolphins/km^2 and (1) the Level B harassment ensonified area of 131.4 km^2 west of the HRBT multiplied by 312 days of activities, plus (2) the Level B

harassment ensonified area of 221.46 km^2 for vibratory installation of 42-in steel piles at the South Trestle multiplied by 7 days of activities, plus (3) the Level B harassment ensonified area associated of 27.65 km^2 for vibratory installation of 24-in steel piles at the South Trestle multiplied by 3 days of activities, and plus (4) the Level B harassment ensonified area associated of 0.87 km^2 for impact installation of 54-in concrete piles at the South Trestle multiplied 22 days of activities to increase the numbers of Level B harassment takes of bottlenose dolphins from 6,343 to 58,856. (Table 14).

Table 14--Authorized Bottlenose Dolphin Take

Total Project Days	Level B harassment west of the HRBT (km^2)	Dolphin density (animals/km^2)	Days 24-in pile driving	24-in piles: Level B harassment at South Trestle (km^2)	Dolphin density (animals/km^2)	Days 54-in pile driving	54-in piles: Level B harassment at South Trestle (km^2)	Dolphin density (animals/km^2)	Days 42-in pile driving	42-in piles: Level B harassment at South Trestle (km^2)	Dolphin density (animals/km^2)
312	131.4	1.38	3	27.65	1.38	22	0.87	1.38	7	221.46	1.38
56, 575.584			114.471			26.4132			2,139.3036		
Total Authorized Takes of Bottlenose Dolphin 58,855.77 (rounded to 58,856)											

Source: Engelhaupt *et al*., 2016.

Because the Level A harassment zones are relatively small (a 55-m isopleth is the largest during DTH drilling of 36-in piles) and we believe the PSO will be able to effectively monitor the Level A harassment zones, we do not anticipate take by Level A harassment of bottlenose dolphins.

Harbor Seals

The expected number of harbor seals in the project area was estimated using systematic, land- and vessel-based survey data for in-water and hauled-out seals collected by the U.S. Navy at the Chesapeake Bay Bridge Tunnel (CBBT) rock armor and portal islands from 2014 through 2019 (Jones *et al*., 2020). The average daily seal count from

the 2014 through 2019 field seasons ranged from 8 to 23 for an average of 13.6 harbor seals across all the field seasons (Table 15).

Table 15--Harbor seal counts at Chesapeake Bay Bridget Tunnel

Field Season	"In Season" Survey Days	Total Seal Count	Average Daily Seal Count	Max Daily Seal Count
2014-2015	11	113	10	33
2015-2016	14	187	13	39
2016-2017	22	308	14	40
2017-2018	15	340	23	45
2018-2019	10	82	8	17
Average			13.6	34.8

Source: Jones *et al*., 2020.

NMFS estimated take using the average daily seal count over five field seasons (2014-2019) (Jones *et al*., 2020). This average count is 13.6 seals (rounded up to 14 seals). Fourteen seals/day multiplied by 156 days (number of days of activities when the seals are present, December to May) equals 2,184 takes. The takes by Level A harassment were calculated from approximately 21 percent of the pile-driving days during DTH drilling when the Level A harassment zone is fairly large (821 m) for a total of 459 takes. Therefore, 1,725 takes by Level B harassment and 459 takes by Level A harassment are being authorized for this IHA.

Gray seals

The expected number of gray seals in the project area was estimated using systematic, land- and vessel-based survey data for in-water and hauled out seals collected by the U.S. Navy at the CBBT rock armor and portal islands from 2014 through 2018 (Rees *et al*., 2016; Jones *et al.*, 2018). Seasonal numbers of gray seals in the Chesapeake Bay waters in the vicinity of the project area in previous years have been low (Table 16).

Gray seals are not expected to be present in the Chesapeake Bay during the months of June through October (Table 16 and Table 17).

Table 16-- Summary of Historical Gray Seal Sightings by Month from 2014 to 2018

Number of Individual Gray Seals						
Month	2014	2015	2016	2017	2018	Monthly Average
January	-	0	0	0	0	0
February	-	1	1	0	1	0.8
March	-	0	0	0	0	0
April	-	0	0	0	0	0
May	-	0	0	0	0	0
June	Seals not expected to be present.					0
July	Seals not expected to be present.					0
August	Seals not expected to be present.					0
September	Seals not expected to be present.					0
October	Seals not expected to be present.					0
November	0	0	0	0	-	0
December	0	0	0	0	-	0

Source: Rees *et al*., 2016; Jones *et al*., 2018.

Table 17--Average Number of Individual Gray Seal Sightings Summarized by Season

Season	Average Number of Individuals per Season
Spring (March – May)	0
Summer (June – August)	0
Fall (September – November)	0
Winter (December – February)	1

Note: Data generated from Table 16.

Gray seals are expected to be very uncommon in the project area. The historical data indicate that approximately one gray seal has been seen per year. To be conservative, HRCP requests three instances of take by Level B harassment of gray seals during each winter month (December through February). Therefore, HRCP estimated and NMFS is authorizing nine instances of take by Level B harassment of gray seals (three gray seals per month multiple by three months = nine gray seals). Because of the unlikely to low occurrence of gray seals in the project area, we do not anticipate and are not authorizing take by Level A harassment of gray seals.

Harbor Porpoise

Harbor porpoises are known to occur in the coastal waters near Virginia Beach (Hayes *et al*. 2019), and although they have been reported on rare occasions in the Chesapeake Bay, closer to Norfolk, they are rarely seen in the project area. Density data for this species within the Project vicinity do not exist or were not calculated because sample sizes were too small to produce reliable estimates of density. Harbor porpoise sighting data collected by the U.S. Navy near Naval Station Norfolk and Virginia Beach from 2012 to 2015 (Engelhaupt *et al*., 2014; 2015; 2016) did not produce enough sightings to calculate densities. One group of two harbor porpoises was seen during spring 2015 (Engelhaupt *et al*., 2016). Based on this data, it estimated that one group of two harbor porpoises could be exposed to project-related in-water noise each month during the spring (March–May) for a total of six instances of take by Level B harassment (*i.e*., one group of two individuals per month multiplied by three months = six harbor porpoises).

The largest calculated Level A harassment isopleth for high frequency cetaceans (*i.e.*, harbor porpoises) extends 1,827 m during DTH drilling of 36-in steel pipe piles. Because harbor porpoises are relatively difficult to observe, it is possible they may occur within the calculated Level A harassment zone without detection. As such, HRCP requested a small number of takes by Level A harassment for harbor porpoises during the project. Therefore, we authorize a total of two instances of take by Level A harassment, the number requested by HRCP.

Table 18 below summarizes the authorized take for all the species described above as a percentage of stock abundance.

Table 18--Authorized Take by Level A and B Harassment and as a Percentage of Stock Abundance

Species	Stock	Authorized Level A Harassment Takes	Authorized Level B Harassment Takes	Total Takes Authorization	Percentage of Stock
Humpback whale	Gulf of Maine	0	12	12	Less than 2 percent
Harbor porpoise	Gulf of Maine/Bay of Fundy	2	4	6	Less than 1 percent
Bottlenose dolphin	WNA Coastal, Northern Migratory[a]	0	29,320	29,320	Less than 33*
	WNA Coastal, Southern Migratory[a]	0	29,320	29,320	Less than 33*
	NNCES[a]	0	216	216	26.25
Harbor seal	Western North Atlantic	459	1,725	2,184	Less than 1 percent
Gray seal	Western North Atlantic	0	9	9	Less than 1 percent

[a] Take estimates are weighted based on calculated percentages of population for each distinct stock, assuming animals present would follow same probability of presence in project area.
*Assumes multiple repeated takes of same individuals from small portion of each stock as well as repeated takes of Chesapeake Bay resident population (size unknown).

Mitigation

In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as proposed), the likelihood of effective implementation (probability implemented as proposed), and;

(2) The practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness

activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

The following mitigation measures are included in the IHA:

Timing Restrictions

HRCP would conduct work during daylight hours, and if poor environmental conditions restrict full visibility of the shutdown zone, pile installation must be delayed. However, work may extend into the night as necessary under conditions where there is full visibility of the shutdown zone or where stopping ongoing work would otherwise create an unsafe work condition.

Shutdown Zone for in-water Heavy Machinery Work

For in-water heavy machinery work other than pile driving, if a marine mammal comes within 10 m of such operations, operations will cease and vessels will reduce speed to the minimum level required to maintain steerage and safe working conditions.

Shutdown Zones

For all pile driving activities, HRCP will establish shutdown zones for a marine mammal (see Table 19 below). The purpose of a shutdown zone is generally to define an area within which shutdown of the activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). HRCP will maintain a minimum 10 m shutdown zone for all pile driving activities where the calculated PTS Isopleth is less than 10 m as described in Table 11.

If multiple vibratory hammering occurs, a shutdown zone of 100 m will be implemented for all species for each vibratory hammer on days when it is anticipated that multiple vibratory hammers will be used regardless of pile size.

During DTH drilling, a shutdown zone of 100 m for harbor seals will be implemented to reduce unnecessary shutdowns.

Table 19--Shutdown Zones

Pile Type/Activity	Sound Source Level at 10 m	Level A harassment Shutdown Zone (m)			
		Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid
Vibratory Pile Driving					
24-in steel pile installation (All Locations)	161 dB SPL	15	10	21	10
36-in steel pile installation (All Locations)	167 dB SPL	32	10	47	20
36-in steel pile installation (TMB Platform)	167 dB SPL	28	10	41	17
42-in steel pile installation (All Locations)	168 dB SPL	42	10	62	26
Impact Pile for the Jet Grouting Trestle					
36-in steel pile installation	183 dB SEL/193 SPL	243	10	290	130
36-in steel pile installation (attenuated)	176 dB SEL/186 SPL	83	10	99	45
Impact Pile Driving North Trestle					
36-in steel pile installation (North Shore Work Trestle)	183 dB SEL/193 SPL	243	10	290	130
Impact Pile Driving for North Trestle, Willoughby Bay, and South Trestle Test Pile Program					
24-in concrete square pile installation/removal	166 dB SEL/190 SPL	121	10	144	65
30-in concrete square pile installation/removal	177 dB SEL/187 SPL	652	24	777	349
54-in concrete square pile installation/removal	177 dB SEL/187 SPL	652	24	777	349
Impact Pile Driving for South Island					
36-in steel pile installation (TBM Platform)	183 dB SEL/193 SPL	243	10	290	130
36-in steel pile installation (Conveyor Trestle)	183 dB SEL/193 SPL	243	10	290	130
DTH Drilling					
36-in steel pile installation (TBM Platform)	164SEL/180 dB SPL	1,171	42	1,395	100

36-in steel pile installation (North Shore Work Trestle)	164 SEL/180 dB SPL	1,534	55	1,827	100
36-in steel pile installation (Jet Grouting Trestle)	164 SEL/180 dB SPL	1,534	55	1,827	100
36-in steel pile installation (Conveyor Trestle)	164 SEL/180 dB SPL	1,534	55	1,827	100
Multiple Hammers - Vibratory Pile Driving (if occurs)*					
42-in steel pile installation (assumes 3 piles installed simultaneously, 6 piling events * 30 minutes each event in a 24-hr period)	173 dB SPL	100	100	100	100
42-in steel pile installation (assumes 2 piles installed simultaneously, 9 piling events * 30 minutes each event in a 24-hr period)	171 dB SPL	100	100	100	100

*These zones are applicable for any multiple hammer events of any pile size where sound fields overlap.

Bubble Curtain

HRCP will use an air bubble curtain system during impact pile driving of 36-in steel pipe piles for the Jet Grouting Trestle. Bubble curtains would meet the following requirements:

The bubble curtain must distribute air bubbles around 100 percent of the piling perimeter for the full depth of the water column. The lowest bubble ring must be in contact with the mudline and/or rock bottom for the full circumference of the ring, and the weights attached to the bottom ring will ensure 100 percent mudline and/or rock bottom contact. No parts of the ring or other objects will prevent full mudline and/or rock bottom contact. The bubble curtain must be operated such that there is proper (equal) balancing of air flow to all bubblers. HRCP would employ the bubble curtain during impact pile driving in water depths greater than 6 m (20 ft) at the Jet Grouting Trestle.

Soft Start

HRCP would use soft start techniques when impact pile driving. Soft start requires contractors to provide an initial set of strikes at reduced energy, followed by a 30-second waiting period, then two subsequent reduced energy strike sets. A soft start would be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer.

Non-authorized Take Prohibited

If a species enters or approaches the Level B harassment zone and that species is either not authorized for take or its authorized takes are met, pile driving and removal activities must shut down immediately using delay and shutdown procedures. Activities must not resume until the animal has been confirmed to have left the area or an observation time period of 15 minutes has elapsed.

Based on our evaluation of the HRCP's planned measures, NMFS has determined that the mitigation measures provide the means effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring and Reporting

In order to issue an IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected

to be present in the action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

Pre-Activity Monitoring

Prior to the start of daily in-water construction activity, or whenever a break in pile driving of 30 min or longer occurs, PSOs will observe the shutdown and monitoring

zones for a period of 30 min. The shutdown zone will be cleared when a marine mammal has not been observed within the zone for that 30-min period. If a marine mammal is observed within the shutdown zone, pile driving activities will not begin until the animal has left the shutdown zone or has not been observed for 15 min. If the Level B harassment zone (*i.e.*, the monitoring zone) has been observed for 30 min and no marine mammals (for which take has not been authorized) are present within the zone, work can continue even if visibility becomes impaired within the monitoring zone. When a marine mammal for which Level B harassment take has been authorized is present in the monitoring zone, piling activities may begin and Level B harassment take will be recorded.

Monitoring Zones

The HRCP will establish monitoring zones for Level B harassment as presented in Table 12. The monitoring zones for this project are areas where SPLs are equal to or exceed 120 dB rms (for vibratory pile driving/removal and DTH drilling) or 160 dB rms (for impact pile driving). These zones provide utility for monitoring conducted for mitigation purposes (*i.e.*, shutdown zone monitoring) by establishing monitoring protocols for areas adjacent to the shutdown zones. Monitoring of the Level B harassment zones enables observers to be aware of and communicate the presence of marine mammals in the project area, and thus prepare for potential shutdowns of activity. The HRCP will also be gathering information to help better understand the impacts of their planned activities on species and their behavioral responses. If the entire Level B harassment zone is not visible, Level B harassment takes will be extrapolated based upon

the number of observed takes and the percentage of the Level B harassment zone that is not visible.

Multiple Hammer Level B Harassment Zones

Due to the likelihood of multiple active construction sites across the project area, it is possible that multiple vibratory hammers with overlapping sound fields may be in operation simultaneously during certain times throughout the duration of the project. As described in the **Estimated Take** section, the decibel addition of continuous noise sources results in much larger zone sizes than a single vibratory hammer. Decibel addition is not a consideration when sound fields do not overlap. Willoughby Bay is largely surrounded by land, and sound will be prevented from propagating to other project construction sites (see Figure 1-1 and Figure 6-1 of the application). Therefore, Willoughby Bay will be treated as an independent site with its own sound isopleths and observer requirements when construction is taking place within the bay. Willoughby Bay is relatively small and will be monitored from the construction site by a single observer.

Additionally, the South Trestle is the only site where the sound will propagate into Chesapeake Bay (see Figure 6-1 of the application). Sound from other construction sites will not overlap with South Trestle and will not propagate into Chesapeake Bay. Therefore, the South Trestle also will be treated as an independent site with its own sound isopleths and observer requirements when construction is taking place. When the South Trestle site is active, an observer will be positioned on land to view as much of the Level B harassment zone as possible. If the entire Level B harassment zone is not visible, Level B harassment takes will be extrapolated based upon the number of observed takes and the percentage of the Level B harassment zone that is not visible.

If two or more vibratory hammers at the other three project sites (North Trestle, North Shore, South Island) are installing piles, there is potential for the sound fields to overlap when installation occurs simultaneously. If two piles that are 36-in or larger in diameter are simultaneously installed with vibratory hammers, the Level B Harassment zone can extend up to a 25 km radius to the southwest (see Figure 6-1, 171 dB isopleth of the application). However, the Level B harassment zones resulting from simultaneous use of multiple vibratory hammers are truncated in nearly all directions by the mainland and islands, which prevent propagation of sound beyond the confines of a core area (see Figure 11-1 (area outlined in red) of the application). The largest ensonified radii extend to the south into the James and Nansemond rivers, areas where marine mammal abundance is anticipated to be low and approaching zero. Therefore, HRCP will monitor a core area, called the Core Monitoring Area, during times when two or more vibratory hammers are simultaneously active at the other three project construction sites (North Trestle, North Shore, South Island). The Core Monitoring Area would encompass the area between the two bridge/tunnels, with observers positioned at key areas to monitor the geographic area between the bridges (see Figure 11-1 (area outlined in red) of the application). Depending on placement, the observers will be able to view west/southwest towards Batten Bay and the mouth of the Nansemond River. Marine mammals transiting the area will be located and identified as they move in and out of the Chesapeake Bay.

Visual Monitoring

Monitoring would be conducted 30 minutes before, during, and 30 minutes after all pile driving/removal activities. In addition, PSOs will record all incidents of marine mammal occurrence, regardless of distance from activity, and will document any

behavioral reactions in concert with distance from piles being driven/removed. Pile driving/removal activities include the time to install, remove a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than 30 minutes.

Monitoring will be conducted by PSOs from land. The number of PSOs will vary from one or more, depending on the type of pile driving, method of pile driving and size of pile, all of which determines the size of the harassment zones. Monitoring locations will be selected to provide an unobstructed view of all water within the shutdown zone and as much of the Level B harassment zone as possible for pile driving activities. Monitoring locations may vary based on construction activity and location of piles or equipment. HRCP will station between one and four PSOs at locations offering the best available views of the Level A and Level B monitoring zones during in-water pile driving at the North Trestle, North Island, South Trestle, and South Island. When and where able, as determined by the PSO or Lead PSO when multiple observers are required, Level A and Level B harassment zones may be monitored for multiple pile driving locations by the same individual PSO. HRCP will be required to station between one and two PSOs at locations offering the best available views of the Level A and Level B monitoring zones during in-water pile driving at Willoughby Bay. If any entire Level B monitoring zone is not visible, pile driving activities may continue, and the number of individual animals within the Level B zone will be estimated and recorded. Estimated numbers of individuals will be extrapolated by dividing the number of observed individuals by the percentage of the monitoring zone that was visible.

In addition, PSOs will work in shifts lasting no longer than 4 hours with at least a 1-hour break between shifts, and will not perform duties as a PSO for more than 12 hours in a 24-hour period (to reduce PSO fatigue).

Monitoring of pile driving will be conducted by qualified, NMFS-approved PSOs, who will have no other assigned tasks during monitoring periods. The HRCP will adhere to the following conditions when selecting PSOs:

- Independent PSOs will be used (*i.e.*, not construction personnel);
- At least one PSO must have prior experience working as a marine mammal observer during construction activities;
- Other PSOs may substitute education (degree in biological science or related field) or training for experience;
- Where a team of three or more PSOs are required, a lead observer or monitoring coordinator will be designated. The lead observer must have prior experience working as a marine mammal observer during construction; and
- The HRCP will submit PSO curriculum vitaes for approval by NMFS for all observers prior to monitoring.

The HRCP will ensure that the PSOs have the following additional qualifications:

- Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance; use of binoculars may be necessary to correctly identify the target;
- Experience and ability to conduct field observations and collect data according to assigned protocols;

- Experience or training in the field identification of marine mammals, including the identification of behaviors;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;
- Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior;
- Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary; and
- Sufficient training, orientation, or experience with the construction operations to provide for personal safety during observations.

Reporting of Injured or Dead Marine Mammals

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, HRCP will report the incident to the Office of Protected Resources (OPR), NMFS and to the Greater Atlantic Region New England/Mid-Atlantic Regional Stranding Coordinator as soon as feasible. If the death or injury was clearly caused by the specified activity, the HRCP must immediately cease the specified activities until NMFS is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the IHA. HRCP must not resume their activities until notified by NMFS.

The report must include the following information:

- Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
- Species identification (if known) or description of the animal(s) involved;
- Condition of the animal(s) (including carcass condition if the animal is dead);
- Observed behaviors of the animal(s), if alive;
- If available, photographs or video footage of the animal(s); and
- General circumstances under which the animal was discovered.

Final Report

The HRCP will submit a draft report to NMFS no later than 90 days following the end of construction activities or 60 days prior to the issuance of any subsequent IHA for the project. PSO datasheets/raw sightings data would be required to be submitted with the reports. The HRCP will provide a final report within 30 days following resolution of NMFS' comments on the draft report. Reports will contain, at minimum, the following:

- Dates and times (begin and end) of all marine mammal monitoring;
- Construction activities occurring during each daily observation period, including how many and what type of piles were driven or removed and by what method (*i.e.*, impact or vibratory);
- Weather parameters and water conditions during each monitoring period (*e.g.*, wind speed, percent cover, visibility, sea state);
- The number of marine mammals observed, by species, relative to the pile location and if pile driving or removal was occurring at time of sighting;

- Age and sex class, if possible, of all marine mammals observed;
- PSO locations during marine mammal monitoring;
- Distances and bearings of each marine mammal observed to the pile being driven or removed for each sighting (if pile driving or removal was occurring at time of sighting);
- Description of any marine mammal behavior patterns during observation, including direction of travel and estimated time spent within the Level A and Level B harassment zones while the source was active;
- Number of individuals of each species (differentiated by month as appropriate) detected within the monitoring zone, and estimates of number of marine mammals taken, by species (a correction factor may be applied to total take numbers, as appropriate);
- Detailed information about any implementation of any mitigation triggered (*e.g.*, shutdowns and delays), a description of specific actions that ensued, and resulting behavior of the animal, if any;
- Description of attempts to distinguish between the number of individual animals taken and the number of incidences of take, such as ability to track groups or individuals;
- An extrapolation of the estimated takes by Level B harassment based on the number of observed exposures within the Level B harassment zone and the percentage of the Level B harassment zone that was not visible; and

- Submit all PSO datasheets and/or raw sighting data (in a separate file from the Final Report referenced immediately above).

Negligible Impact Analysis and Determination

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS's implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels). Of note, is the significant increase of takes by Level B harassment for bottlenose dolphins compared with what was evaluated in the notice of proposed IHA. Despite the increase in take numbers, our determination remains the same. There could be multiple takes of

individual animals but without any long-term adverse effects. Take by Level B harassment of bottlenose dolphins will be minimized through use of mitigation measures.

Pile driving activities associated with the planned HRCP project, as outlined previously, have the potential to disturb or displace marine mammals. The specified activities may result in take, in the form of Level B harassment (behavioral disturbance) or Level A harassment (auditory injury), incidental to underwater sounds generated from pile driving. Potential takes could occur if individuals are present in the ensonified zone when pile driving occurs. Level A harassment is only anticipated and authorized for harbor porpoises and harbor seals.

No serious injury or mortality is anticipated given the nature of the activities and measures designed to minimize the possibility of injury to marine mammals. The potential for these outcomes is minimized through the construction method and the implementation of the mitigation measures. When impact pile driving is used, implementation of bubble curtains (during 36-in steel piles at the Jet Grouting Trestle in water depths greater than 6 m (20 ft)), soft start and shutdown zones significantly reduce the possibility of injury. Given sufficient notice through use of soft starts (for impact driving), marine mammals are expected to move away from a sound source that is annoying prior to it becoming potentially injurious.

HRCP will use qualified PSOs stationed strategically to increase detectability of marine mammals, enabling a high rate of success in implementation of shutdowns to avoid injury for most species. PSOs will be stationed to provide a relatively clear view of the shutdown zones and monitoring zones. These factors will limit exposure of animals to noise levels that could result in injury.

HRCP's planned pile driving activities are highly localized. Only a relatively small portion of the Chesapeake Bay may be affected. Localized noise exposures produced by project activities may cause short-term behavioral modifications in affected cetaceans and pinnipeds Moreover, the mitigation and monitoring measures are expected to further reduce the likelihood of injury as well as reduce behavioral disturbances.

Effects on individuals that are taken by Level B harassment, on the basis of reports in the literature as well as monitoring from other similar activities, will likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring) (*e.g.*, Thorson and Reyff 2006). Individual animals, even if taken multiple times, will most likely move away from the sound source and be temporarily displaced from the areas of pile driving, although even this reaction has been observed primarily only in association with impact pile driving. The pile driving activities analyzed here are similar to, or less impactful than, numerous other construction activities conducted along both Atlantic and Pacific coasts, which have taken place with no known long-term adverse consequences from behavioral harassment. Furthermore, many projects similar to this one are also believed to result in multiple takes of individual animals without any documented long-term adverse effects. Level B harassment will be minimized through use of mitigation measures described herein and, if sound produced by project activities is sufficiently disturbing, animals are likely to simply avoid the area while the activity is occurring.

In addition to the expected effects resulting from authorized Level B harassment, we anticipate that small numbers of harbor porpoises and some harbor seals may enter the Level A harassment zones undetected, particularly during times of DTH drilling when the

Level A harassment zones are large. It is unlikely that the animals would remain in the area long enough for PTS to occur. If any animals did experience PTS, it would likely only receive slight PTS, *i.e.* minor degradation of hearing capabilities within regions of hearing that align most completely with the energy produced by pile driving (*i.e.,* the low-frequency region below 2 kHz), not severe hearing impairment or impairment in the regions of greatest hearing sensitivity. If hearing impairment occurs, it is most likely that the affected animal's threshold would increase by a few dBs, which is not likely to meaningfully affect its ability to forage and communicate with conspecifics. As described above, we expect that marine mammals would be likely to move away from a sound source that represents an aversive stimulus, especially at levels that would be expected to result in PTS, given sufficient notice through use of soft start.

The project is not expected to have significant adverse effects on marine mammal habitat. No important feeding and/or reproductive areas for marine mammals are known to be near the project area. Project activities would not permanently modify existing marine mammal habitat. The activities may cause some fish to leave the area of disturbance, thus temporarily impacting marine mammal foraging opportunities in a limited portion of the foraging range. However, because of the relatively small area of the habitat that may be affected, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences.

In summary and as described above, the following factors primarily support our determination that the impacts resulting from this activity are not expected to adversely affect the species or stock through effects on annual rates of recruitment or survival:

- No mortality is anticipated or authorized;

- Limited Level A harassment exposures (harbor porpoises and harbor seals) are anticipated;
- The anticipated incidents of Level B harassment consist of, at worst, temporary modifications in behavior that would not result in fitness impacts to individuals;
- The specified activity and associated ensonifed areas are very small relative to the overall habitat ranges of all species and does not include habitat areas of special significance (Biologically Important Areas or ESA-designated critical habitat); and
- The presumed efficacy of the mitigation measures in reducing the effects of the specified activity.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the monitoring and mitigation measures, NMFS finds that the total marine mammal take from the activity will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

As noted above, only small numbers of incidental take may be authorized under sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine

mammals. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

The authorized take of four of the five marine mammal species/stocks comprises less than one-third of the best available stock abundance, with the exception of the bottlenose dolphin stocks. There are three bottlenose dolphin stocks that could occur in the project area. Therefore, the estimated dolphin takes by Level B harassment would likely be portioned among the western North Atlantic northern migratory coastal stock, western North Atlantic southern migratory coastal stock, and NNCES stock. Based on the stocks' respective occurrence in the area, NMFS estimated that there would be 216 takes from the NNCES stock, with the remaining takes evenly split between the northern and southern migratory coastal stocks. Based on consideration of various factors described below, we have determined the numbers of individuals taken would likely comprise less than one-third of the best available population abundance estimate of either coastal migratory stock.

Both the northern migratory coastal and southern migratory coastal stocks have expansive ranges and they are the only dolphin stocks thought to make broad-scale, seasonal migrations in coastal waters of the western North Atlantic. Given the large ranges associated with these two stocks it is unlikely that large segments of either stock would approach the project area and enter into the Chesapeake Bay. The majority of both stocks are likely to be found widely dispersed across their respective habitat ranges and unlikely to be concentrated in or near the Chesapeake Bay.

Furthermore, the Chesapeake Bay and nearby offshore waters represent the boundaries of the ranges of each of the two coastal stocks during migration. The northern

migratory coastal stock is found during warm water months from coastal Virginia, including the Chesapeake Bay and Long Island, New York. The stock migrates south in late summer and fall. During cold water months dolphins may be found in coastal waters from Cape Lookout, North Carolina, to the North Carolina/Virginia. During January–March, the southern migratory coastal stock appears to move as far south as northern Florida. From April to June, the stock moves back north to North Carolina. During the warm water months of July–August, the stock is presumed to occupy coastal waters north of Cape Lookout, North Carolina, to Assateague, Virginia, including the Chesapeake Bay. There is likely some overlap between the northern and southern migratory stocks during spring and fall migrations, but the extent of overlap is unknown.

The Chesapeake Bay and waters offshore of the mouth are located on the periphery of the migratory ranges of both coastal stocks (although during different seasons). Additionally, each of the migratory coastal stocks are likely to be located in the vicinity of the Chesapeake Bay for relatively short timeframes. Given the limited number of animals from each migratory coastal stock likely to be found at the seasonal migratory boundaries of their respective ranges, in combination with the short time periods (~two months) animals might remain at these boundaries, it is reasonable to assume that takes are likely to occur only within some small portion of either of the migratory coastal stocks.

Both migratory coastal stocks likely overlap with the NNCES stock at various times during their seasonal migrations. The NNCES stock is defined as animals that primarily occupy waters of the Pamlico Sound estuarine system (which also includes Core, Roanoke, and Albemarle sounds, and the Neuse River) during warm water months

(July–August). Members of this stock also use coastal waters (≤1 km from shore) of North Carolina from Beaufort north to Virginia Beach, Virginia, including the lower Chesapeake Bay. Comparison of dolphin photo-identification data confirmed that limited numbers of individual dolphins observed in Roanoke Sound have also been sighted in the Chesapeake Bay (Young, 2018). Like the migratory coastal dolphin stocks, the NNCES stock covers a large range. The spatial extent of most small and resident bottlenose dolphin populations is on the order of 500 km^2, while the NNCES stock occupies over 8,000 km^2 (LeBrecque *et al*., 2015). Given this large range, it is again unlikely that a preponderance of animals from the NNCES stock would depart the North Carolina estuarine system and travel to the northern extent of the stock's range. However, recent evidence suggests that there is likely a small resident community of NNCES dolphins of indeterminate size that inhabits the Chesapeake Bay year-round (E. Patterson, NMFS, pers. comm.).

Many of the dolphin observations in the Bay are likely repeated sightings of the same individuals. The Potomac-Chesapeake Dolphin Project has observed over 1,200 unique animals since observations began in 2015. Re-sightings of the same individual can be highly variable. Some dolphins are observed once per year, while others are highly regular with greater than 10 sightings per year (J. Mann, Potomac-Chesapeake Dolphin Project, pers. comm.). Similarly, using available photo-identification data, Engelhaupt *et al*. (2016) determined that specific individuals were often observed in close proximity to their original sighting locations and were observed multiple times in the same season or same year. Ninety-one percent of re-sighted individuals (100 of 110) in the study area were recorded less than 30 km from the initial sighting location. Multiple sightings of the

same individual would considerably reduce the number of individual animals that are taken by Level B harassment. Furthermore, the existence of a resident dolphin population in the Bay would increase the percentage of dolphin takes that are actually re-sightings of the same individuals.

In summary and as described above, the following factors primarily support our determination regarding the incidental take of small numbers of the affected stocks of bottlenose dolphin:

- Potential bottlenose dolphin takes in the project area are likely to be allocated among three distinct stocks;
- Bottlenose dolphin stocks in the project area have extensive ranges and it would be unlikely to find a high percentage of any one stock concentrated in a relatively small area such as the project area or the Chesapeake Bay;
- The Chesapeake Bay represents the migratory boundary for each of the specified dolphin stocks and it would be unlikely to find a high percentage of any stock concentrated at such boundaries; and
- Many of the takes would likely be repeats of the same animals and likely from a resident population of the Chesapeake Bay.

Based on the analysis contained herein of the planned activity (including the mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS finds that small numbers of marine mammals will be taken relative to the population size of the affected species or stocks.

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216-6A, NMFS must evaluate our proposed action (*i.e.,* the promulgation of regulations and subsequent issuance of incidental take authorization) and alternatives with respect to potential impacts on the human environment. This action is consistent with categories of activities identified in Categorical Exclusion B4 of the Companion Manual for NAO 216-6A, which do not individually or cumulatively have the potential for significant impacts on the quality of the human environment and for which we have not identified any extraordinary circumstances that would preclude this categorical exclusion. Accordingly, NMFS determined that the action qualified to be categorically excluded from further NEPA review.

Endangered Species Act (ESA)

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq*.) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. No incidental take of ESA-listed marine mammals are expected or

authorized. Therefore, NMFS determined that consultation under section 7 of the ESA was not required for this action.

Authorization

As a result of these determinations, NMFS has issued an IHA to the HRCP for pile driving activities associated with the HRBT Expansion Project in Hampton-Norfolk, Virginia for a period of one year provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated.

Dated: August 4, 2020.

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Donna S. Wieting,

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National Marine Fisheries Service.

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