Request for an Incidental Harassment Authorization
Parallel Thimble Shoal Tunnel Project
Virginia Beach, Virginia

Prepared by:

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September 2021
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>ACBM</td>
<td>Articulated concrete block mattress</td>
</tr>
<tr>
<td>CBBT</td>
<td>Chesapeake Bay Bridge-Tunnel</td>
</tr>
<tr>
<td>CTJV</td>
<td>Chesapeake Tunnel Joint Venture</td>
</tr>
<tr>
<td>dB</td>
<td>decibel</td>
</tr>
<tr>
<td>dB re 1µPa²sec</td>
<td>decibels reference level 1 micropascal squared per second</td>
</tr>
<tr>
<td>District</td>
<td>Chesapeake Bay Bridge and Tunnel District</td>
</tr>
<tr>
<td>DQM</td>
<td>National Dredging Quality Management System</td>
</tr>
<tr>
<td>DTH</td>
<td>Down-the-hole</td>
</tr>
<tr>
<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
</tr>
<tr>
<td>ESA</td>
<td>Endangered Species Act</td>
</tr>
<tr>
<td>FE</td>
<td>Federally Endangered</td>
</tr>
<tr>
<td>FR</td>
<td>Federal Register</td>
</tr>
<tr>
<td>GARFO</td>
<td>Greater Atlantic Regional Fisheries Office</td>
</tr>
<tr>
<td>HRSD</td>
<td>Hampton Roads Sanitation District</td>
</tr>
<tr>
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<td>Hertz</td>
</tr>
<tr>
<td>IHA</td>
<td>Incidental Harassment Authorization</td>
</tr>
<tr>
<td>IWC</td>
<td>International Whaling Commission</td>
</tr>
<tr>
<td>JGR</td>
<td>Jet grout residuals</td>
</tr>
<tr>
<td>kHz</td>
<td>Kilohertz</td>
</tr>
<tr>
<td>MHW</td>
<td>Mean High Water</td>
</tr>
<tr>
<td>MLLW</td>
<td>Mean Lower Low Water</td>
</tr>
<tr>
<td>MLW</td>
<td>Mean Low Water</td>
</tr>
<tr>
<td>MMMP</td>
<td>Marine Mammal Monitoring Plan</td>
</tr>
<tr>
<td>MMPA</td>
<td>Marine Mammal Protection Act</td>
</tr>
<tr>
<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
</tr>
<tr>
<td>NOAA Fisheries</td>
<td>NOAA National Marine Fisheries Service</td>
</tr>
<tr>
<td>NODS</td>
<td>Norfolk Ocean Disposal Site</td>
</tr>
<tr>
<td>PI 1</td>
<td>Portal Island 1</td>
</tr>
<tr>
<td>PI 2</td>
<td>Portal Island 2</td>
</tr>
<tr>
<td>PSO</td>
<td>Protected Species Observer</td>
</tr>
<tr>
<td>PTS</td>
<td>Permanent Threshold Shift</td>
</tr>
<tr>
<td>PTST</td>
<td>Parallel Thimble Shoal Tunnel</td>
</tr>
<tr>
<td>RMS SPL</td>
<td>Root mean squared sound pressure level</td>
</tr>
<tr>
<td>SE</td>
<td>State Endangered</td>
</tr>
<tr>
<td>SEL&lt;sub&gt;CUM&lt;/sub&gt;</td>
<td>Cumulative sound exposure level</td>
</tr>
<tr>
<td>SPL&lt;sub&gt;PEAK&lt;/sub&gt;</td>
<td>Peak sound pressure level</td>
</tr>
<tr>
<td>TBM</td>
<td>Tunnel boring machine</td>
</tr>
<tr>
<td>TSS</td>
<td>Total suspended sediment</td>
</tr>
<tr>
<td>USACE</td>
<td>U.S. Army Corps of Engineers</td>
</tr>
<tr>
<td>VDEQ</td>
<td>Virginia Department of Environmental Quality</td>
</tr>
<tr>
<td>VMRC</td>
<td>Virginia Marine Resources Commission</td>
</tr>
<tr>
<td>VPDES</td>
<td>Virginia Pollution Discharge Elimination System</td>
</tr>
<tr>
<td>ZOI</td>
<td>Zone of Impact</td>
</tr>
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</table>
1. DESCRIPTION OF SPECIFIED ACTIVITY

1.1 INTRODUCTION

The Chesapeake Tunnel Joint Venture (CTJV) is submitting this Incidental Harassment Authorization (IHA) application for the proposed Parallel Thimble Shoal Tunnel Project (the PTST Project). The Chesapeake Bay Bridge and Tunnel District, (the District), is the PTST Project owner, and the Federal Highway Administration is the lead federal sponsor for the PTST Project. The PTST Project will be part of the Lucius J. Kellam, Jr. Bridge Tunnel; a 23-mile-long facility that connects the Hampton Roads area of Virginia to the Eastern Shore of Virginia. The PTST Project is proposed for construction between Portal Island No. 1 and No. 2 and will be bored underneath the Thimble Shoal Channel in the lower Chesapeake Bay.

The CTJV is constructing a two-lane parallel tunnel to the west of the existing Thimble Shoal Tunnel, connecting Portal Island Nos. 1 and 2. In-water pile driving to create vessel moorings, temporary work trestles (Temporary dock on Portal Island 1, Roadway Trestle on Portal Island 1 & 2 and Omega Trestles on both Island to support Berm construction) and Support Of Excavation (SOE) walls on both islands will take place during the construction process.

Pile driving activities for the PTST Project have the potential to cause sound levels that exceed Level A and Level B acoustic harassment thresholds for marine mammals, as defined by the National Oceanic and Atmospheric Administration (NOAA) and National Marine Fisheries Service (NMFS) Office of Protected Resources (NOAA Fisheries 2016h).

The project is located in areas of the lower Chesapeake Bay that overlap with the range of several marine mammal species. Marine mammals are protected under the Marine Mammal Protection Act (MMPA) of 1972. The MMPA prohibits the incidental take (i.e., to “harass, hunt, capture or kill, or attempt to harass, hunt, capture or kill”) of marine mammals. An IHA may be granted under 101(a)(5)(D) of the MMPA, which can allow for a set number of “takes” per species of marine mammal during project activities provided there is negligible impact to the marine mammal species.

This IHA application follows the guidance and guidelines provided by NOAA and incorporates the Guidelines approved in June 2020, provided by NMFS for the Down the Hole Hammer Sound modeling. It also adopts methods for calculating takes based on NFMS guidance on nearby projects. This new guidance acknowledges that variation exists among mammal groups in their sensitivity to sound and incorporates the hearing range of marine mammal groups in the development of group-specific acoustic thresholds. The updated guidance provides revised sound thresholds for Level A harassment, and an updated methodology for calculating the distance from the activity that these sound thresholds are expected to be exceeded. The NOAA Fisheries 2016 guidance does not address Level B harassment thresholds. The previous guidance (NOAA Fisheries 2015a) was used for Level B harassment.

This application was submitted prior to the expiration of the current IHA due to the needed increase in quantities of 36 and 42-inch hollow steel. For this IHA application, the CTJV requests takes for five species of marine mammals by Level B harassment: harbor seals (Phoca vitulina), gray seals (Halichoerus grypus), humpback whale (Megaptera novaeangliae), harbor...
A description of pile driving activities considered in this IHA request are provided Table 1 and 2.
Upon completion, the new tunnel will carry two lanes of southbound traffic and the existing tunnel will remain in operation and carry two lanes of northbound traffic. The new parallel tunnel will be bored under the Thimble Shoal Channel. The 6,525 linear ft. of new tunnel will be constructed with a top of tunnel depth/elevation of 100 ft. below Mean Low Water (MLW) within the width of the 1,000-ft-wide navigation channel.

Construction of the tunnel structure began on Portal Island No. 1 and has moved from south to north to Portal Island No. 2. It is anticipated that this project will be constructed with limited effect on the existing tunnel and traffic operations.

The Tunnel Boring Machine (TBM) components will be barged and trucked to Portal Island No. 1. The TBM will be assembled within an entry/launch portal that will be constructed on Portal Island No. 1. The machine will then both excavate material and construct the tunnel as it progresses from Portal Island No. 1 to Portal Island No. 2. Material excavated from within the tunnel will be transported via a conveyor belt system back to Portal Island No 1. Approximately 350,000 cy (in situ volume) of material will be excavated by the TBM and 524,000 cy (bulked volume) will be conveyed to Portal Island No. 1. This material will be transported offsite using a combination of trucks and barges and will be disposed at an approved off-site, upland facility in accordance with the Dredged Material Management Plan (DMMP).

Precast concrete tunnel segments will be transported to the TBM for installation. The TBM will assemble the tunnel segments in-place as the tunnel is bored. After the TBM reaches Portal Island No. 2, it will be disassembled, and the components will be removed via an exit/receiving portal on Portal Island No. 2. After the tunnel structure is completed, final upland work for the PTST Project will include installation of the final roadway, lighting, finishes, mechanical systems, and other required internal systems for tunnel use and function. In addition, the existing fishing pier will be repaired and refurbished.

### 1.3.1 Activities to Be Completed During Calendar Year of Requested IHA:

Below are detailed descriptions of the construction activities anticipated to take place during the 1-year time frame of the requested IHA (Table 1). All work anticipated to be completed prior to the issuance of this IHA request (November 2021) or after the one-year expiration (October 2022) have been omitted from this application and are only reflected in Table 2.

- Berm Construction Mooring piles on Portal Island 1& Island 2:
  - Portal Island No.1: Installation of (28) 36-inch hollow steel pipe piles. Installation will be by vibratory hammer with bubble curtain. It is expected to take a total of 7 days over several months to install the 28 piles (4 piles/day).
  - Portal Island No. 2: Installation of (16) 36-inch hollow steel pipe piles, which shall be installed by vibratory hammer with bubble curtain. The anticipated installation is expected to take a total of 4 days, which shall be completed over several months.

- Construction of two temporary Omega trestles:
- Portal Island No. 1- Installation of (26) 42” pipe piles diameter steel pipe piles. These will be installed using a vibratory hammer with bubble curtain. In the event a large boulder is encountered during installation then the vibratory hammer will be switched out with an impact hammer. The estimated production rate for the installation of these piles are 2 piles/day. There will be a 2-week span between the driving of a pair of these pipe piles to allow for the installation of the trestle super structure before continuing with the extension. The total number of days of actual driving of these piles should not exceed 13 days.

- Portal Island No. 2- Installation of (24) 36” piles hollow steel piles for the original design of the trestle will be done with the DTH and impact hammer with bubble curtain. As with on Island 1, the estimated production rate will be 2 piles per day followed by the installation of the superstructure. It will take a total of 12 days spanning over several months in install the (24) 36” piles. The (24) 42” piles for the trestle extension will be installed via vibratory hammer with bubble curtain. Based on the forecasted schedule of activities during the year of this IHA, it is anticipated that only 16 of these 24 piles will be installed. If boulders are encountered during installation the vibratory hammer will be switched out with an impact hammer with bubble curtain and will follow the same production schedule as the 36” piles, taking a total of 8 days under this IHA, spread over several months.

- Construction of two engineered berms:

- Portal Island No. 1- Installation of (209) 36” hollow steel interlocking piles on the west wall and (107) on the East wall of the Portal Island 1 Berms. Both will be installed to the West of the existing berm, starting on the northwest corner of Island 1, extending channelward in alignment with the existing tunnel. Pile installation will occur with the use of the DTH hammer to cut through existing armor stone and the impact hammer with bubble curtain to drive the remainder of the pile to the design elevation. On the west wall, 3 piles a day can be installed, while only 2 piles a day can be installed on the east wall. This is due to the significant size and quantity of the boulders encountered on the east wall, which is closer to the existing berm. It will take 70 days to install the west wall and 54 days to install the east wall, although some of these piles will be installed simultaneously.

-Portal Island No. 2- Installation of (257) 36” hollow steel interlocking piles on the west wall and (166) on the east wall of the Portal Island 2 Berms. Based on the forecasted schedule of activities during the year of this IHA, it is anticipated that only 204 of the 257 piles on the west wall and 134 of the 166 on the east wall will be installed. Both will be installed to the west of the existing berm, starting on the southwest corner of Island 2, extending channelward in alignment with the existing tunnel. Pile installation will occur with the use of the DTH hammer to cut through existing armor stone and the impact hammer with bubble curtain to drive
the remainder of the pile. Production rates will be the same as on Island 1 and will take 68 days to install the west wall and 67 days to install the east wall.

Table 1: Anticipated Pile Installation Schedule (November 2021- October 2022)

<table>
<thead>
<tr>
<th>Pile Location</th>
<th>Pile Function</th>
<th>Pile Type</th>
<th>Installation/Removal Method</th>
<th>Bubble Curtain</th>
<th>Number of Piles Below MHW</th>
<th>Number of Days per Activity (Total)</th>
<th>Number of Days per Activity (Per Hammer Type)</th>
<th>Anticipated Installation Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portal Island No. 1</td>
<td>Berm Construction Trestle Mooring Piles &amp; Dolphins</td>
<td>36-inch Diameter Hollow Steel Pipe Pile</td>
<td>Vibratory</td>
<td>Yes</td>
<td>28</td>
<td>7</td>
<td>7 Days (4 Piles/Day)</td>
<td>November 2021 through June 2022</td>
</tr>
<tr>
<td>Portal Island No. 1</td>
<td>Berm Construction Trestle Extension (Omega Trestle Extension)</td>
<td>42-inch Diameter Hollow Steel Pipe Piles</td>
<td>Vibratory</td>
<td>Yes</td>
<td>26</td>
<td>13</td>
<td>13 Days (2 Piles/Day)</td>
<td>November 2021 through May 2022</td>
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<tr>
<td>Portal Island No. 1</td>
<td>Berm Support of Excavation Wall - West Side</td>
<td>36-inch Diameter Hollow Steel Interlocked Pipe Piles</td>
<td>DTH</td>
<td>No</td>
<td>209</td>
<td>140</td>
<td>70 Days (3 Piles/Day)</td>
<td>November 2021 through June 2022</td>
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<tr>
<td>Portal Island No. 1</td>
<td>Berm Support of Excavation Wall - East Side</td>
<td>36-inch Diameter Hollow Steel Interlocked Pipe Piles</td>
<td>DTH</td>
<td>No</td>
<td>107</td>
<td>108</td>
<td>54 Days (2 Piles/Day)</td>
<td>November 2021 through June 2022</td>
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<td>Portal Island No. 2</td>
<td>Berm Construction Trestle (Omega Trestle)</td>
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<td>DTH</td>
<td>No</td>
<td>24</td>
<td>24</td>
<td>12 Days (2 Piles/Day)</td>
<td>January 2022 through June 2022</td>
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<td>Portal Island No. 2</td>
<td>Berm Construction Trestle (Omega Trestle)</td>
<td>42-inch Diameter Hollow Steel Pipe Piles</td>
<td>Vibratory</td>
<td>Yes</td>
<td>16*</td>
<td>8</td>
<td>8 Days (2 Piles/Day)</td>
<td>July 2022 through October 2022</td>
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<td>Portal Island No. 2</td>
<td>Berm Support of Excavation Wall - West Side</td>
<td>36-inch Diameter Hollow Steel Interlocked Pipe Piles</td>
<td>DTH</td>
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<td>204*</td>
<td>136</td>
<td>68 Days (3 Piles/Day)</td>
<td>February 2022 through October 2022</td>
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<td>Portal Island No. 2</td>
<td>Berm Support of Excavation Wall - East Side</td>
<td>36-inch Diameter Hollow Steel Interlocked Pipe Piles</td>
<td>DTH</td>
<td>No</td>
<td>134*</td>
<td>134</td>
<td>67 Days (2 Piles/Day)</td>
<td>February 2022 through October 2022</td>
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<td>36-inch Diameter Hollow Steel Pipe Pile</td>
<td>Vibratory</td>
<td>Yes</td>
<td>16</td>
<td>4</td>
<td>4 Days (4 Piles/Day)</td>
<td>1 March 2022 through October 2022</td>
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</tbody>
</table>

* Operation won’t be completed under this IHA
### Table 2: Detail of Piles Completed to Date and Proposed Piles for IHA Request

<table>
<thead>
<tr>
<th>Activity</th>
<th>Location</th>
<th>Piles Authorized in Previous IHA</th>
<th>Piles Completed Up to October 31, 2021</th>
<th>Piles Requested in Proposed IHA (November 2021-October 2022)</th>
<th>Anticipated Piles Remaining After October 31, 2022</th>
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</thead>
<tbody>
<tr>
<td>Berm Construction Mooring Piles &amp; Dolphins</td>
<td>Portal Island 1</td>
<td>36-inch diameter hollow steel</td>
<td>Vibratory (Install)</td>
<td>16</td>
<td>28 0</td>
</tr>
<tr>
<td>Berm Construction Trestle Extension (Omega Trestle Extension)</td>
<td>Portal Island 1</td>
<td>42-inch diameter hollow steel *</td>
<td>Vibratory</td>
<td>0</td>
<td>26 0</td>
</tr>
<tr>
<td>Berm Support of Excavation Wall - West Side</td>
<td>Portal Island 1</td>
<td>36-inch diameter hollow steel interlocked piles*</td>
<td>DTH &amp; Impact</td>
<td>40</td>
<td>209 0</td>
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<tr>
<td>Berm Support of Excavation Wall - East Side</td>
<td>Portal Island 1</td>
<td>36-inch diameter hollow steel interlocked piles*</td>
<td>DTH &amp; Impact</td>
<td>144</td>
<td>107 0</td>
</tr>
<tr>
<td>Omega Trestle</td>
<td>Portal Island 2</td>
<td>36-inch diameter hollow steel</td>
<td>DTH &amp; Impact</td>
<td>0</td>
<td>24 0</td>
</tr>
<tr>
<td>Omega Trestle</td>
<td>Portal Island 2</td>
<td>42-inch diameter hollow steel *</td>
<td>Vibratory</td>
<td>0</td>
<td>16 8</td>
</tr>
<tr>
<td>Berm Support of Excavation Wall - West Side</td>
<td>Portal Island 2</td>
<td>36-inch diameter hollow steel interlocked piles</td>
<td>DTH &amp; Impact</td>
<td>0</td>
<td>204 53</td>
</tr>
<tr>
<td>Berm Support of Excavation Wall - East Side</td>
<td>Portal Island 2</td>
<td>36-inch diameter hollow steel interlocked piles</td>
<td>DTH &amp; Impact</td>
<td>0</td>
<td>134 32</td>
</tr>
<tr>
<td>Berm Construction Mooring Piles and Template</td>
<td>Portal Island 2</td>
<td>36-inch diameter hollow steel</td>
<td>Vibratory</td>
<td>0</td>
<td>16 0</td>
</tr>
</tbody>
</table>

* Quantity or size differs from previously authorized IHA

PILES TOTALS: 200 764 93

It is not anticipated to have more than 2 hammers on any given island under this authorization. Based on the project’s forecasted schedule for these activities, the pile driving work is estimated to take 144 days on Portal Island 1, from November 2021 till June 2022. This work will be done with two pile driving operations occurring simultaneously from November 2021 until its completion of work in June 2022, then one of the hammers will be transported to Portal Island 2.

On Portal Island 2 there is estimated to be 159 days of pile installation, which is scheduled to occur between January 2022 through October 2022. Because there will only be one pile installation operation occurring on Island 2 until the additional crane from Portal Island 1 is brought over in May 2022, fewer driving days will occur on Portal Island 2 until then.

These estimates are based on the project’s forecasted schedule of activities for the year of this IHA. In this schedule, there were approximately 25% of the days omitted to factor in weather and equipment delays resulting in a total of 21 days of drilling on each island per month, 252 days total.

Of the drilling days mentioned above, 65 days have the potential for simultaneous pile installation to occur on both islands on the same day from during the period between January 2022- June 2022. Since pile installation is intermittent, with numerous frequent stops and starts, of the 65 days that could have 3 hammers simultaneous operating between the two, it is assumed...
that only 75% of those days would occur at the same time. This results in a total of 51 days of possible simultaneous drilling to occur at the same time on both Island 1 and 2.

Table 3 displays the number of driving days and possible scenario that are likely to occur between November 2021 and October 2022.

**Table 3: Concurrent Driving Scenarios for PTST Project**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Days of Pile Driving on Island 1</th>
<th>Days of Pile Driving on Island 2</th>
<th>Days that Simultaneous Driving Could Occur on Both Islands*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact + DTH</td>
<td>124</td>
<td>147</td>
<td>48</td>
</tr>
<tr>
<td>DTH + Vibratory</td>
<td>10</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Impact + Vibratory</td>
<td>10</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>144</strong></td>
<td><strong>159</strong></td>
<td><strong>51</strong></td>
</tr>
</tbody>
</table>

* It is assumed that of the days that simultaneous driving on both islands only 75% would occur at the same time

Due to the regularly alternating driving methods, it will be assumed that 50% of the 51 simultaneous driving days, where 3 operations could occur on the same day, will be evenly split between impact and DTH driving. These days were evenly distributed among the possible simultaneous driving scenarios, based on hammer type and are reflected in Table 4.

**Table 4: Anticipated Scenarios for Days of Simultaneous Driving on Both Islands**

<table>
<thead>
<tr>
<th>Probably Activity Scenario</th>
<th>Days that Simultaneous Driving Could Overlap*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact + DTH + DTH</td>
<td>18</td>
</tr>
<tr>
<td>DTH + DTH + Vibratory</td>
<td>6</td>
</tr>
<tr>
<td>DTH + Vibratory + Impact</td>
<td>8</td>
</tr>
<tr>
<td>Impact + Impact + DTH</td>
<td>19</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td><strong>51</strong></td>
</tr>
</tbody>
</table>

* It is assumed that of the days that simultaneous driving on both islands on 75% would occur at the same time

To comply with Section 401 of the Clean Water Act, Virginia Protection Permit, Virginia Water Protection Permit, Virginia Pollutant Discharge Elimination System permits, Stormwater Construction General Permit and the conditions of the Virginia Marine Resources Commission, daily water quality monitoring will be performed during all in-water construction activities, including pile driving. This will ensure that aquatic resources in the vicinity of the project site will not be adversely impacted by in-water activities.
2. DATES AND DURATION, SPECIFIED GEOGRAPHIC REGION

2.1 DATES AND DURATION

The PTST Project construction activities are divided into four primary phases. It should be noted that some activities will occur simultaneously. Not all activities listed below with take place during the applicable duration of this IHA request. See Table 3 for the anticipated pile driving schedule for this IHA request.

- Phase I (on-island/upland pre-tunnel excavation activities): June 2017 – September 2022
  - Utility and power installation (Portal Island No. 1).
  - Selected splash wall replacement or repair (Portal Island Nos. 1 and 2).
  - Slurry wall construction and excavation for entry/launch and exit/receiving pits and on-island tunnel approaches (Portal Island Nos. 1 and 2).
  - Jet grouting to support construction for entry/launch and exit/receiving pits and tunnel approach construction (Portal Island Nos. 1 and 2).
  - Assembly of the TBM within the launch portal.
  - Installation of water tanks and cooling system to support TBM operations.

- Phase II (in-water activities to support to tunnel excavation): September 2018 – January 2025
  - Construction of a temporary dock (Portal Island No. 1), an integrated temporary conveyor dock (Portal Island No. 1), and pile installation for temporary moorings (Portal Island Nos. 1 and 2).
  - Construction of temporary offset trestles (with driving of in-water piles at both portal islands) to facilitate construction of the engineered berms.
  - Installation of piezometers.
  - Removal of selected existing armor stone from the existing tunnel berm.
  - Construction of engineered berms (limited mechanical dredging of unsuitable foundation materials at Portal Island No. 1, pile installation, placement of engineered, vibrocompaction, placement of flowable fill, placement of exterior filter stone, bedding stone, and armor stone).
  - Jet grouting to improve subsurface organic layer (Portal Island No. 2)
• Phase III (tunnel excavation and disposal of excavated material): February 2024 – July 2025
  o Tunnel boring activities and placement of pre-cast tunnel sections within the design alignment.
  o Onsite management, transport, and offsite disposal of excavated TBM material at an approved location(s).

• Phase IV (fishing pier rehabilitation/deck repair, roadway trestle and abutment modification/repair, and final upland construction activities on portal islands, roadways, and within tunnel): October 2021 – July 2027
  o Completion of the PTST and roadway structures/connection between Portal Island Nos. 1 and 2.
  o Road resurfacing on Portal Island Nos. 1 and 2.
  o Construction of new buildings/structures associated with stormwater and facilities management of the portal islands and final tunnel structures.
  o Installation of new security fencing, installation of parking areas and adjacent bollards.
  o Replacement of decking at the fishing pier and limited substructure repair (if inspections deem it needed) at Portal Island No. 1.
  o Removal of temporary dock, piles, and moorings.

In-water activities are limited to the duration of Phase II, and the beginning of Phase IV (if substructure repair work is required at the fishing pier and/or bridge trestles and abutments). Management of dredged material, excavated material, and JGR from in-water activities will occur throughout Phase II and Phase III.

2.2 SPECIFIED GEOGRAPHIC REGION

The PTST Project is proposed for construction between Portal Island Nos. 1 and 2 and will be bored underneath the Thimble Shoal Channel in the Chesapeake Bay (Figure 1; Appendix A). In Virginia, Waters of the United States, including wetlands, are regulated by USACE. These resources, and remaining State Waters are regulated by VDEQ, and Subaqueous Bottomlands and Tidal Wetlands are regulated by the Virginia Marine Resources Commission (VMRC). Construction activity within the Chesapeake Bay in Virginia is regulated by USACE, VDEQ, and the VMRC. These agencies have jurisdiction under the following regulations:

- Sections 401, 402 and 404 of the Clean Water Act
- Section 10 of the Rivers and Harbors Act of 1899
- The Virginia Water Protection Permit Program Regulation (9 VAC 25-210)
- The Virginia Wetlands Act (Chapter 13, Title 28.2 of the Code of Virginia).
No stream systems are located on the Portal Islands or within the Project’s Limit of Disturbance (Figures 2 and 3; Appendix A). There are approximately 370 acres of subaqueous bottomlands (E1UBL) located within the Project’s Environmental Study Area; subaqueous bottomlands are also classified as navigable waters and are under USACE jurisdiction. Water depths within the PTST construction area range from -0 to 60 ft. below MLW. The Thimble Shoal Channel is 1,000 ft. wide, is authorized to a depth of -55 ft. below Mean Lower Low Water (MLLW) and is maintained at a depth of -50 ft. MLLW.

3. SPECIES AND NUMBERS OF MARINE MAMMALS IN THE PROJECT AREA

Although 40 species of marine mammals under NMFS jurisdiction have been documented to occur within the waters of the mid-Atlantic region of the western North Atlantic Ocean; only 8 of those species (six cetacean and two pinniped) have regular (species that occurs as a regular or normal part of the fauna of the area, regardless of how abundant or common it is) or rare (species that only occurs in the area sporadically, not common) occurrences in the Chesapeake Bay (Department of the Navy (DoN) 2008). Any occurrences of other marine mammal species would be considered extralimital (a species that does not normally occur in the area). Based on correspondence between NOAA Fisheries and Federal Highway Administration and use of the U.S. Fish and Wildlife Service’s Information for Planning and Conservation Online System, a list of marine mammals that may be present in the Project Area was developed (Table 5).

Table 5 lists all species with expected potential for occurrence near the project area 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 (2020). 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 draft United States Atlantic and Gulf of Mexico Marine Mammal Stock Assessments (Hayes et al. 2019; 2020) and the North Atlantic Right Whale Consortium 2020 Annual Report Card (Pettis et al. 2020). All values presented in Table 5 are the most recent available at the time of publication.
<table>
<thead>
<tr>
<th>Species / Stock</th>
<th>ESA/MMPA Status; Strategic (Y/N)²</th>
<th>Stock abundance (CV, Nmin, most recent abundance survey)²</th>
<th>PBR</th>
<th>Annual M/SI³</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family Balaenidae</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Atlantic Right Whale⁷</td>
<td>E, D; Y</td>
<td>368 (95% credible intervals 0, 408, 2018)</td>
<td>0.8</td>
<td>18.6</td>
</tr>
<tr>
<td><em>Eubalaena glacialis</em></td>
<td>Western North Atlantic (WNA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family Balaenopteridae (rorquals)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humpback Whale⁶</td>
<td>-; N</td>
<td>1393 (0; 1375; 2016)</td>
<td>22</td>
<td>58</td>
</tr>
<tr>
<td><em>Megaptera novaeangliae</em></td>
<td>Gulf of Maine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fin Whale⁷</td>
<td>E,D; Y</td>
<td>6,802 (0.24; 5,573; 2016)</td>
<td>11</td>
<td>2.5</td>
</tr>
<tr>
<td><em>Balaenoptera physalus</em></td>
<td>WNA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Superfamily Odontoceti (toothed whales, dolphins and porpoises)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family Delphinidae</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottlenose Dolphin⁶</td>
<td>-; Y</td>
<td>6,639 (0.41; 4,759; 2011)</td>
<td>48</td>
<td>12.2-21.5</td>
</tr>
<tr>
<td><em>Tursiops truncatus</em></td>
<td>WNA Coastal, Northern Migratory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottlenose Dolphin⁶</td>
<td>-; Y</td>
<td>3,751 (0.06; 2,353; 2011)</td>
<td>23</td>
<td>0-148.3</td>
</tr>
<tr>
<td><em>Tursiops truncatus</em></td>
<td>WNA Coastal, Southern Migratory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottlenose Dolphin⁶</td>
<td>-; Y</td>
<td>823 (0.06; 782; 2017)</td>
<td>7.8</td>
<td>7.2-30</td>
</tr>
<tr>
<td><em>Tursiops truncatus</em></td>
<td>Northern North Carolina Estuarine System</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family Phocoenidae (porpoises)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harbor porpoise⁶</td>
<td>-; N</td>
<td>95,543 (0.31; 74, 034; 2016)</td>
<td>851</td>
<td>217</td>
</tr>
<tr>
<td><em>Phocoena phocoena</em></td>
<td>Gulf of Maine/Bay of Fundy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Order Carnivora – Superfamily Pinnipedia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family Phocidae (earless seals)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harbor Seal⁶</td>
<td>-; N</td>
<td>75,834 (0.1; 66,884, 2012)</td>
<td>2,006</td>
<td>350</td>
</tr>
<tr>
<td><em>Phoca vitulina</em></td>
<td>WNA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gray Seal⁶</td>
<td>-; N</td>
<td>27,131 (0.19, 23,158, 2016)</td>
<td>1,359</td>
<td>4,729</td>
</tr>
<tr>
<td><em>Halichoerus grypus</em></td>
<td>WNA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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-region. 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 - For the North Atlantic right whale the best available abundance estimate is derived from the North Atlantic Right Whale Consortium 2020 Annual Report Card (Pettis et al. 2020).

5 - 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 based on feeding location alone (i.e., Gulf of Maine) and is therefore likely an underestimate.

6 - The NMFS stock abundance estimate applies to U.S. population only; however, the actual stock abundance is approximately 505,000.

7 - Species are not expected to be taken or authorized for take.
3.1 SPECIES NOT EXPECTED TO BE INCIDENTALLY TAKEN

All species that could potentially occur in the planned survey areas are included in Table 5. However, the temporal and/or spatial occurrence of North Atlantic right whale and fin whale is such that takes are not expected to occur, and they are not discussed further beyond the explanation provided in this section.

Between 1998 and 2013, there were no reports of North Atlantic right whale strandings within the Chesapeake Bay and only four reported strandings along the coast of Virginia. During this same period, only six fin whale strandings were recorded within the Chesapeake Bay (Barco and Swingle 2014). There were no reports of fin whale strandings (Swingle et al. 2017) in 2016. Due to the low occurrence of North Atlantic right whales and fin whales, CTJV is not proposing to request any takes of these species. There are also few reported sightings or observations of either species in the Bay. Since June 7, 2017, elevated North Atlantic right whale mortalities have been documented, primarily in Canada, and were declared an Unusual Mortality Event (UME). As of September 30, 2019, only a single right whale mortality was documented that year, which occurred offshore of Virginia Beach, VA and was caused by chronic entanglement.

3.1.1 Fin Whale (Balaenoptera physalus)

Fin whales in the North Atlantic belong to the Western North Atlantic stock (Hayes et al. 2019). The fin whale is listed as endangered under the ESA and is considered a strategic stock although no critical habitat is designated. The fin whale is MMPA depleted throughout its range. The most recent estimate of abundance is 1,618 individuals in the Western North Atlantic stock while the minimum population estimate is 1,234 (Hayes et al. 2019) NMFS initiated a 5-year review of the fin whale in January 2018 to determine whether a reclassification or delisting may be warranted (83 FR 4032; NMFS 2019). In February 2019, the review indicated that, based on the best available scientific and commercial information, the fin whale should be down listed from endangered to threatened; however, this down listing has not occurred and is recommended for future action (NMFS 2019). Fin whales are typically found in waters of the Atlantic Exclusive Economic Zone (EEZ), from Cape Hatteras, North Carolina, northward to Maine (Hayes et al. 2019). New England waters tend to be the feeding grounds for the fin whale in the North Atlantic and it is believed that whales on these grounds exhibit patterns of seasonal occurrence and annual return (Hayes et al. 2019). Fin whales are in the mid-ocean near the Mid-Atlantic Ridge late fall through early winter (BOEM 2014). The Chesapeake Bay region is considered to be a normal part of the range of the fin whale, and it is noted that it was probably the most abundant large whale in Virginia’s waters (Blaylock 1985; DoN 2009). Fin whales have been sighted off Virginia (Cetacean and Turtle Assessment Program (CeTAP) 1981, 1982; Swingle et al. 1993; DoN 2009; Hyrenbach et al. 2012; Barco 2013; Mallette et al. 2016a, b; Aschettino et al. 2018; Engelhaupt et al. 2017, 2018; Cotter 2019), and in the Chesapeake Bay (Bailey 1948; CeTAP 1981, 1982; Morgan et al. 2002; Barco 2013; Aschettino et al. 2018); however, they are not likely to occur in the Project area. Eleven fin whale strandings have occurred off Virginia from 1988 to 2016 mostly during the winter months of February and March, followed by a few in the spring and summer months (Costidis et al. 2017). Six of the strandings occurred in the Chesapeake Bay (three on eastern shore; three on western shore) with the remaining five occurring on the Atlantic coast (Costidis et al. 2017). Documented strandings near the Project
area have occurred in: February 2012, a dead fin whale washed ashore on Oceanview Beach in Norfolk (Swingle et al. 2013); December 2017, a live fin whale stranded on a shoal in Newport News and died at the site (Swingle et al. 2018); February 2014, a dead fin whale stranded on a sand bar in Pocomoke Sound near Great Fox Island, Accomack (Swingle et al. 2015); and, March 2007, a dead fin whale near Craney Island, in the Elizabeth River, in Norfolk (Barco 2013). There have not been any Unusual Mortality Events (UMEs) documented for fin whales in the last three decades. However, only stranded fin whales have been documented in the Project area; no free-swimming fin whales have been observed. Therefore, this species is not likely to occur in the Project area and is not discussed further.

### 3.1.2 North American Right Whale (Eubalaena glacialis)

North Atlantic right whales are listed as endangered under the ESA (Table 4) and are considered one of the most critically endangered large whale species in the world (Clapham et al. 1999; Weinrich et al. 2000; Hayes et al. 2019; 71 FR 77704; 73 FR 12024). Since the 1890s, commercial whalers had hunted North Atlantic right whales to the brink of extinction. Although whaling is no longer a threat to the species, the leading causes of known mortality for North Atlantic right whales are entanglement in fishing gear and vessel strikes (Hayes et al. 2019).

North Atlantic right whales inhabit the Atlantic Ocean and belong to the Western stock (formerly the Western North Atlantic stock) (Hayes et al. 2019). The most recent estimate of abundance is 451 individuals in the Western stock while the minimum population estimate is 445 (Hayes et al. 2019). Based off the North Atlantic Right Whale Consortium 2018 Annual Report Card, the best estimate for the end of 2017 is 411 North Atlantic right whales (Pettis et al. 2018). In 2017, 17 North Atlantic right whales were confirmed dead stranded (12 in Canada; 5 in the U.S.) and in 2018, three whales stranded in the U.S including one offshore of Virginia Beach, Virginia (0 in Canada); these deaths declared an UME (NOAA Fisheries 2019b). In 2019, nine whales have stranded in Canada, and one in the U.S., leaving the current total mortalities for the UME at 30 dead stranded whales (21 in Canada; 9 in the U.S) since 2017 (NOAA Fisheries 2019b). Despite recovery efforts, North Atlantic right whales face a high risk of extinction into the foreseeable future (NMFS 2012). Three critical habitat areas were designated for this species in 1994: (1) the Cape Cod Bay/Stellwagen Bank, (2) the Great South Channel, and (3) waters adjacent to the coasts of Georgia and the east coast of Florida (59 FR 28805). In 2016, NMFS issued a final rule to replace the critical habitat for right whales in the North Atlantic with two new areas. The areas being designated as critical habitat contain approximately 29,763 square nautical miles of marine habitat in the Gulf of Maine and Georges Bank region (Unit 1) and off the Southeast U.S. coast (Unit 2) (81 FR 4837). No critical habitat occurs in the Project area. The Western stock primarily inhabits coastal waters from Florida to New England north to the Canadian Bay of Fundy, Scotian Shelf, and Gulf of St. Lawrence (Hayes et al. 2019). Research suggests that there are seven major habitats or congregation areas for this stock (Hayes et al. 2019): (1) the coastal waters of the southeastern U.S. (winter calving grounds [Florida and Georgia]); (2) the Great South Channel (spring calving grounds); (3) Jordan Basin; (4) Georges Bank/Gulf of Maine (fall feeding grounds); (5) Cape Cod and Massachusetts Bays (late winter/spring feeding grounds and nursery grounds; (6) the Bay of Fundy (summer/fall feeding grounds); and (7) the Scotian Shelf (summer/fall feeding grounds) (Weinrich et al. 2000; Mellinger et al. 2011; Hayes et al. 2019). In addition, Jeffreys Ledge, off the coasts of Massachusetts, New Hampshire, and Maine, is considered an important fall feeding area and summer nursery area for these whales (Weinrich et
The mid-Atlantic region has been identified as a primary migratory corridor for North Atlantic right whales (Knowlton et al. 2002; Firestone et al. 2008). Seasonal north-south migration of the Western stock occurs between feeding and calving areas, but North Atlantic right whales could be seen anywhere off the Atlantic U.S. throughout the year (Hayes et al. 2019). Seasonal occurrence of right whales in mid-Atlantic waters is normally during November through April, with peaks in December and April (Winn et al. 1986; Firestone et al. 2008) when whales are migrating to and from breeding/feeding grounds.

North Atlantic right whales have stranded in Virginia, one each in 2001, 2002, 2004, 2005: three during winter (February and March) and one in summer (September) (Costidis et al. 2017, 2019). All North Atlantic right whale strandings in Virginia waters have occurred on ocean-facing beaches along Virginia Beach and the barrier islands seaward of the lower Delmarva Peninsula (Costidis et al. 2017). Although there are no documented strandings near the Project area, in January 2018, a dead, entangled North Atlantic right whale was observed floating over 60 miles offshore of Virginia Beach (Costidis et al. 2019). This stranding was included as part of the 2017-2019 North Atlantic Right Whale UME (NOAA Fisheries 2019b). Therefore, this species is not likely to occur in the Project area and would not be exposed to any effects of bridge construction and is not discussed further.

4. AFFECTED SPECIES STATUS AND DISTRIBUTION

4.1 HUMPBACK WHALE (*MEGAPTERA NOVAEANGLIAE*)

4.1.1 Distribution and Status

Humpback whales inhabit all major ocean basins from the equator to subpolar latitudes. They generally follow a predictable migratory pattern in both hemispheres, feeding during the summer in the higher latitudes (40 to 70 degrees latitude) and migrating to lower latitudes (10 to 30 degrees latitude) where calving and breeding take place in the winter (Perry et al. 1999, NOAA Fisheries 2006a). During the spring, summer, and fall, humpback whales in the North Atlantic Ocean feed over a range that includes the eastern coast of the U.S., the Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland. Prior to commercial whaling, the global population of humpback whales was thought to be over 125,000. Current estimates for humpback whales in the North Atlantic are around 12,000 animals with a positive trend in population growth (NOAA Fisheries 2016f). The humpback whale is not federally listed under the ESA but is protected under the MMPA.

4.1.2 Presence in the Project Area

Humpback whales are the whale most likely to occur in the Project Area and could be found there at any time of the year. Three years of survey data collected by HDR and funded by the Naval Facilities Engineering Command (NAVFAC) are available for the Humpback Whale off the coast of Virginia Beach, VA (Aschettino et al. 2015; 2017; 2018; 2019; 2020). Based on the available data there has been a decline in whale sightings in the peak months since 2016/17. The distribution of whale sightings occurs most frequently in the months of January- March.
However, no survey data is available for the summer months, as whales are not expected to be present at that time (Table 6).

### Table 6: Summary of Individual Humpback Whale Sightings by Month from 2012 to 2019 in the Chesapeake Bay

<table>
<thead>
<tr>
<th>Month</th>
<th>Engelhaupt Surveys</th>
<th>Aschettino Surveys</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>February</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>March</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>April</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>May</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>June</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>July</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>August</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>September</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>October</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>November</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>December</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>


NOAA reported that between 2009-2013, three humpback whales were stranded in Virginia in the lower Bay (one off Northampton County, one near the York River, and one off Ft. Story), and two were stranded in Maryland near Ocean City (NOAA Fisheries 2015b). All the whales stranded in Virginia and Maryland had signs of human-caused injury. A reported mortality of a humpback whale during the 1999-2003 time period was at the mouth of the Chesapeake Bay in Virginia as the result of a ship strike. Three other humpback whale mortalities related to ship strikes or entanglement in fishing gear in Virginia waters were reported during the study period. One serious injury to a humpback whale as a result of entanglement in fishing gear occurred near Ocean City, Maryland (Cole et al. 2005).

There have been 33 humpback whale strandings recorded in Virginia since 1988; 11 had signs of entanglement and 9 had injuries from vessel strikes. Most of these strandings were reported from ocean facing beaches, but 11 were also within the Chesapeake Bay (Barco and Swingle 2014). Strandings occurred in all seasons but were most common in the spring. In the past 5 years of reported data (2011-2015), there have been five humpback whale strandings in Virginia (Swingle et al. 2012, Swingle et al. 2013, Swingle et al. 2014, Swingle et al. 2015, Swingle et al. 2016). Since the beginning of 2017, five dead humpback whales have been observed in Virginia (Funk 2017). Ship strikes have been attributed as the likely cause of death in these instances.
4.1.3 Life History

In winter, whales from the six feeding areas mate and calve primarily in the West Indies where spatial and genetic mixing among these groups occur (Waring et al. 2000). Various papers (Clapham and Mayo 1990, Clapham et al. 1992, Barlow and Clapham 1997, Clapham et al. 1999) summarized information gathered from a catalogue of photographs of 643 individuals from the western North Atlantic population of humpback whales (also referred to as the Gulf of Maine stock). These photographs identified reproductively mature western North Atlantic humpbacks wintering in tropical breeding grounds in the Antilles, primarily on Silver and Navidad Banks, north of the Dominican Republic. The primary winter range also includes the Virgin Islands and Puerto Rico (NOAA Fisheries 1991). Not all whales migrate to the West Indies every year and some are found in the mid- and high-latitude regions during the winter months. Increased numbers of humpback whales, specifically juveniles, have been spotted in the Chesapeake and Delaware Bays and along the Virginia and North Carolina coasts.

Humpback whales use the Mid-Atlantic as a migratory pathway to and from the calving/mating grounds, but it may also be an important winter-feeding area for juveniles. Since 1989, observations of juvenile humpbacks in the Mid-Atlantic have been increasing during the winter months, peaking from January through March (Swingle et al. 1993; Aschiettino et al. 2015, 2017, 2018). Biologists theorize that non-reproductive animals may be establishing a winter-feeding range in the Mid-Atlantic since they are not participating in reproductive behavior in the Caribbean. Swingle et al. (1993) identified a shift in distribution of juvenile humpback whales in the nearshore waters of Virginia, primarily in winter months. Identified whales using the Mid-Atlantic area were found to be residents of the Gulf of Maine and Atlantic Canada (Gulf of St. Lawrence and Newfoundland) feeding groups, suggesting a mixing of different feeding populations in the Mid-Atlantic region. Strandings of humpback whales have increased between New Jersey and Florida since 1985, consistent with the increase in Mid-Atlantic whale sightings. No critical habitat has been designated for the humpback whale (NOAA Fisheries 2006a). Strandings were most frequent during September through April in North Carolina and Virginia waters, and were composed primarily of juvenile humpback whales of no more than 11 meters in length (Wiley et al. 1995). Humpback whales feed primarily on krill, plankton, and small fish by filtering them from the water through baleen plates in their mouths. An individual may consume up to 1,360 kilograms of food per day (NOAA Fisheries 2017g).

4.1.4 Acoustics

Humpback whale hearing ranges from 20 Hz to 8 kHz, with highest sensitivity around 120 Hz to 4 kHz (Erbe 2002). Southall et al. (2007) categorized humpback whales in the low-frequency cetacean functional hearing group with an estimated auditory bandwidth of 7 Hz – 22 kHz.

4.2 BOTTLENOSE DOLPHIN (TURSIOPS TRUNCATUS.)

4.2.1 Distribution and Status

Bottlenose dolphins occur in temperate and tropical oceans throughout the world, ranging in latitudes from 45° N to 45° S (Blaylock 1985). In the western Atlantic Ocean, there are two distinct morphotypes of bottlenose dolphins, an offshore type that occurs along the edge of the
continental shelf and an inshore type. The inshore morphotype can be found along the entire U.S. coast from New York to the Gulf of Mexico, and typically occurs in waters less than 20 meters deep (NOAA Fisheries 2016a). There is evidence that the inshore bottlenose dolphins may be made up of seven different stock which may be either year-round residents or migratory. Bottlenose dolphins found in Virginia are representative of what is likely a northern migratory stock, which spends the winter along the coast of North Carolina and migrates as far north as Long Island, New York in the summer. Bottlenose dolphin are rarely found north of North Carolina in the winter (NOAA Fisheries 2016a).

Aerial surveys conducted in the summers of 2010 and 2011 estimated the northern migratory stock at 11,548 (NOAA Fisheries 2016a). Bottlenose dolphins are not listed under the ESA but are protected under the MMPA. The western North Atlantic Coastal type is designated as depleted under the MMPA.

4.2.2 Presence in the Project Area

Bottlenose dolphins are abundant along the Virginia coast and within the Chesapeake Bay. They are seen annually in Virginia from April through November with approximately 65 strandings occurring each year (Barco and Swingle 2014, Engelhaupt 2016). Stranded bottlenose dolphins have been recorded as far north as the Potomac River in the Chesapeake Bay (Blaylock 1985).

4.2.3 Life History

The inshore variety of bottlenose dolphins often travel in small groups of 2 to 15 individuals. These groups and will travel into bays, estuaries, and rivers to feed, utilizing echolocation to find a variety of prey, including fish, squid, and benthic invertebrates. Bottlenose dolphins will work cooperatively to herd prey, which may be stunned by a strike from the dolphin’s fluke prior to capture (NOAA Fisheries 2017b).

Bottlenose dolphins reach sexual maturity between 5-14 years of age. Gestation lasts 12 months, followed by 18-20 months of nursing. Bottlenose dolphins have a lifespan of 40-50 years, and females may give birth every 3-6 years throughout their lives (NOAA Fisheries 2017b).

The primary threat to bottlenose dolphins is injury and death due to entanglement with fishing gear, such as gillnets, seine nets, trawls, and longline fishing operations. Exposure to pollution and biotoxins and viral outbreaks are also a threat (NOAA Fisheries 2017b).

4.2.4 Acoustics

Southall et al. (2007) categorized bottlenose dolphins in the mid-frequency cetacean functional hearing group with an estimated auditory bandwidth of 150 Hz – 160 kHz.

4.3 HARBOR PORPOISE (PHOCOENA PHOCOENA)

4.3.1 Distribution and Status

The harbor porpoise is typically found in colder waters in the northern hemisphere. In the western North Atlantic Ocean, harbor porpoises range from Greenland to as far south as North
Carolinas (Barco and Swingle 2014). They are commonly found in bays, estuaries, and harbors less than 200 meters deep (NOAA Fisheries 2017c).

Harbor porpoises in the U.S. are made up of the Gulf of Main/Bay of Fundy stock. Gulf of Main/Bay of Fundy stock are concentrated in the Gulf of Maine in the summer but are widely dispersed from Maine to New Jersey in the winter. South of New Jersey, harbor porpoises occur at lower densities. Migrations to and from the Gulf of Maine do not follow a defined route. (NOAA Fisheries 2016c).

Harbor porpoises are not listed under the ESA but are protected by the MMPA. The Gulf of Maine/Bay of Fundy stock was estimated at approximately 80,000 animals in 2011 (NOAA Fisheries 2016c).

4.3.2 Presence in the Project Area

Harbor porpoise are the second most common marine mammal in Virginia (Barco and Swingle 2014). They occur seasonally in the winter and spring in small numbers. Strandings occur primarily on ocean facing beaches, but they occasionally travel into the Chesapeake Bay to forage and could occur in the Project Area (Barco and Swingle 2014).

4.3.3 Life History

The only true porpoise in the northern Atlantic Ocean, the harbor porpoise is one of the smallest marine mammals, only reaching around 1.5 meters in length (Blaylock 1985). Harbor porpoises frequent inshore habitats where they feed primarily on small schooling fish species, such as anchovies and shad, as well as squid and octopus (NOAA Fisheries 2017c).

Female harbor porpoises reach sexual maturity at 3 to 4 years of age and may give birth annually for several years in a row. Gestation lasts 10-11 months, with nursing lasting 8-12 months (NOAA Fisheries 2017c). The lifespan of harbor porpoises is around 24 years. Harbor porpoises are unlikely to be affected by vessel strikes but are susceptible to entanglement in fishing gear, particularly gill nets.

4.3.4 Acoustics

Harbor porpoises are sensitive to frequencies ranging from 16-140 kHz, with a reduction in sensitivity around 64 kHz (Kastelein et al 2005). Southall et al. (2007) categorized harbor porpoises in the high-frequency cetacean functional hearing group with an estimated auditory bandwidth of 150 Hz – 160 kHz.

4.4 HARBOR SEAL (PHOCA VITULINA)

4.4.1 Distribution and Status

Harbor seals occur in arctic and temperate coastal waters throughout the northern hemisphere, including on both the east and west coasts of the U.S. On the east coast, harbor seals can be found from the Canadian Arctic down to Georgia (Blaylock 1985). Harbor seals occur year-round in Canada and Maine and seasonally (September-May) from southern New England.
to New Jersey (NOAA Fisheries 2016d). The range of harbor seals appears to be shifting as they are regularly reported further south than they were historically. In recent years, they have established haulout sites in the Chesapeake Bay including on the portal islands of the CBBT (NOAA Fisheries 2016d, Rees et al 2016).

A 2012 survey estimated the abundance of harbor seals in the western North Atlantic at around 76,000 (NOAA Fisheries 2016d). Population trends of this stock have not been conducted but are thought to be increasing (Barco and Swingle 2014, NOAA Fisheries 2016d).

4.4.2 Presence in the Project Area

Harbor seals are the most common seal in Virginia (Barco and Swingle 2014). They can be seen resting on the rocks around the portal islands of the CBBT from December through April. Seal observation surveys conducted at the CBBT recorded 112 harbor seals in the 2014/2015 season and 184 harbor seals during the 2015/2016 season (Rees et al 2016). Only limited numbers have used Portal Island 1 and 2 as haulouts (<6 percent of total sightings). The majority of haulout sightings have been found on Portal Island 3 (~90 percent) (Jones et al. 2018).

4.4.3 Life History

The harbor seal is a medium-sized seal, reaching about 2 meters in length. They spend a fair amount of time hauled out on land, often in large groups (Rees et al 2016). Haulout sites which may be rocks, beaches, or ice provide the opportunity for rest, thermal regulation, social interaction, parturition, and predator avoidance (NOAA Fisheries 2017e). When feeding, harbor seals may dive shallow or deep to locate prey, which include fish, shellfish, and crustaceans (NOAA Fisheries 2017e).

Harbor seals mate at sea and give birth during the spring and summer. Pups can swim just minutes after being born. The nursing period lasts for an average of 24 days. The lifespan of harbor seals is 25-30 years (NOAA Fisheries 2017e).

Entanglement in fishing gear, vessel strikes, pollution are the primary threats to harbor seals. Harassment by humans when on land may also impact harbor seals (NOAA Fisheries 2017e).

4.4.4 Acoustics

Harbor seals are sensitive to frequencies ranging from 1-180 kHz, with peak sensitivity around 32 kHz (Kastak and Schusterman 1995). Southall et al. (2007) categorized harbor seal in the pinnipeds in water functional hearing group with an estimated auditory bandwidth of 75 Hz – 75 kHz.

4.5 GRAY SEAL (HALICHOERUS GRYPUS)

4.5.1 Distribution and Status

Gray seals occur on both coasts of the Northern Atlantic Ocean and are divided into three major populations (NOAA Fisheries 2016b). The western north Atlantic stock occurs in eastern Canada and the northeastern U.S., occasionally as far south as North Carolina. Gray seals inhabit rocky
coasts and islands, sandbars, ice shelves and icebergs (NOAA Fisheries 2016b). In the U.S., gray seals congregate in the summer to give birth at four established colonies in Massachusetts and Maine (NOAA Fisheries 2016b). From September through May, they disperse and can be abundant as far south as New Jersey. The range of gray seals appears to be shifting as they are regularly being reported further south than they were historically (Rees et al 2016).

Population estimates of the total western north Atlantic stock are not available, but assessments of the Canadian population are greater than 500,000 animals (NOAA Fisheries 2016b).

4.5.2 Presence in the Project Area

Uncommon in Virginia and the Chesapeake Bay. Only 15 gray seal strandings were documented in Virginia from 1988-2013 (Barco and Swingle 2014). They are rarely found resting on the rocks around the portal islands of the CBBT from December through April alongside harbor seals. Seal observation surveys conducted at the CBBT recorded one gray seal in each of the 2014/2015 and 2015/2016 seasons (Rees et al 2016).

4.5.3 Life History

Gray seals are a large seal at around 2-3 meters in length and can dive to depths of 475 meters to capture prey. Prey include fish, crustaceans, squid, octopus, and occasionally seabirds (NOAA Fisheries 2017d). Like harbor seals, gray seals spend a fair amount of time hauled out on land to rest, thermoregulate, give birth or avoid predators (Rees et al 2016).

Gray seals will gather in large colonies in the summer for mating and birthing. At the breeding colonies, a male may maintain a harem of up to 10 females. After a 3-month delay in the implantation of the fertilized egg, the gestation period lasts around 11.5 months with pupping occurring from September through November. The lifespan of gray seals is 25-35 years.

Gray seals are susceptible to entanglement in fishing gear, vessel strikes, and harassment from humans when hauled out of the water.

4.5.4 Acoustics

Southall et al. (2007) categorized gray seal as part of the in water functional hearing group with an estimated auditory bandwidth of 75 Hz – 75 kHz.

5. TYPE OF INCIDENTAL TAKING AUTHORIZATION REQUESTED

5.1 INCIDENTAL HARASSMENT AUTHORIZATION

Under Section 101(a)(5)(D) of the MMPA, the CTJV is requesting the issuance of an IHA for Level B Harassments of humpback whales, bottlenose dolphin, harbor porpoises, harbor seals, and gray seals that may occur in the Project area during construction. In addition, CTJV requests Level A Harassments of harbor porpoises, gray seals and harbor seals that may occur incidentally in the Project area. The request for a small number of takes for each species that is
rarely or occasionally observed in the Project area reduces the risk of the Project being shut
down if one of these species enters the Level B harassment zone during pile installation or
removal. The summary of actions for each species shutdown zones is displayed in Table 7.

The methodology described in Section 6 estimates potential noise exposures of marine mammals
resulting from pile installation and removal in the marine environment by vibratory and impact
hammers with bubble curtains and drilling with a down-the-hole hammer. Modeling of potential
exposures estimates tends to overestimate exposures because all animals are assumed to be
available to exposure while piles are being installed and removed, it is assumed that animals
remain in the area despite the sound levels, and the formulas used to estimate transmission loss
(TL) and distance to sound-level thresholds use idealized parameters. Additionally, this approach
assumes that no individuals avoid the area and that all exposed individuals are “taken”,
contributing to an overestimation of “take”. The type of incidental takes most likely to occur is
that associated with Level B harassment as the result of noise from pile installation or removal.
No serious injury or lethal takes are expected as a result of the proposed pile installation or
removal.

The CTJVs mitigation measures for the Project (Section 9) include monitoring of Level A and
Level B harassment zones prior to the initiation of pile installation and removal and “soft starts”
or ramp-up procedures designed to allow marine mammals to leave the Project area before noise
levels reach the threshold for takes and the use of bubble curtains for steel pipe piles located in
deeper waters (greater than 10 feet) driven with impact and vibratory hammers. These mitigation
measures decrease the likelihood that marine mammals will be exposed to SPLs that could cause
takes.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status*</th>
<th>Take Requested</th>
<th>Action during Project Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fin whale</td>
<td>Balaenoptera physalus</td>
<td>FE/SE</td>
<td>No</td>
<td>Shutdown if observed approaching or within ZOIs A or B</td>
</tr>
<tr>
<td>Humpback whale</td>
<td>Megaptera novaeangliae</td>
<td></td>
<td>Yes</td>
<td>Record take for Level B; Shutdown if observed approaching or within Level A ZOI</td>
</tr>
<tr>
<td>North Atlantic right whale</td>
<td>Eubalaena glacialis</td>
<td>FE/SE</td>
<td>No</td>
<td>Shutdown if observed approaching or within ZOIs A or B</td>
</tr>
<tr>
<td>Bottlenose dolphin</td>
<td>Tursiops truncatus.</td>
<td></td>
<td>Yes</td>
<td>Record take for Level B; Shutdown if observed approaching or within Level A ZOI</td>
</tr>
<tr>
<td>Harbor porpoise</td>
<td>Phocoena phocoena</td>
<td></td>
<td>Yes</td>
<td>Record take for Levels A &amp; B; Shutdown if observed approaching 200 meters</td>
</tr>
<tr>
<td>Harbor seal</td>
<td>Phoca vitulina</td>
<td></td>
<td>Yes</td>
<td>Record take for Levels A &amp; B; Shutdown if observed approaching 150 meters</td>
</tr>
<tr>
<td>Gray seal</td>
<td>Halichoerus grypus</td>
<td></td>
<td>Yes</td>
<td>Record take for Levels A &amp; B; Shutdown if observed approaching 20 meters</td>
</tr>
</tbody>
</table>

*FE=Federally Endangered, SE=State Endangered; ZOI = Zone of Impact

Incidental taking by Level A harassment is being requested for species including the harbor
porpoise, harbor seal, and gray seal. ZOIs for Level B harassment have been calculated
using the exposure to both underwater and airborne sound disturbance. Zones of Impact (ZOIs)
for harassment and takes have been calculated according to the 2016-2020 NOAA guidance and
current 2020 NMFS Basic Guidance for Assessment of DTH Pile Installation as described in Section 6.
If any marine mammal species without an authorized take appears to be crossing into the Level A ZOIs, pile driving activities will cease immediately until the animal(s) depart on their own. By the implementation of the monitoring and mitigation procedures described in this IHA application, Level A harassment takes will be minimized and any potential disturbances to marine mammals are expected to be temporary, with no long-term impacts to individuals or populations. No serious injuries or lethal takes are expected. CTJV is requesting that the IHA issued be effective from November 2021 to October 2022.

6. TAKE ESTIMATES FOR MARINE MAMMALS

This section discusses the size of the ZOIs for the installation of steel piles (using an impact, down-the-hole and vibratory hammers) above and below MHW and the number of takes being requested for each species. Incidental take estimates, on a per species basis, are determined by the likelihood of that species presence within the Level B ZOI during the period of in-water pile installation. Hollow steel round pile installation is expected to occur from November 2021 to October 2022.

The requested takes will primarily be by Level B, as use of the acoustic sources (i.e., pile driving, DTH drilling) has the potential to result in disruption of behavioral patterns for individual marine mammals. Please note, for phocids (harbor seals) there exist a minimal potential auditory injury (Level A harassment) because predicted auditory injury zones are larger than for mid-frequency species and otariids for phocids (harbor seals). Auditory injury, Level A harassments, while highly unlikely, should be limited to phocids as cetaceans and otariids should only have limited exposure. The planned mitigation and monitoring measures proposed (Section 9) are expected to minimize the severity of such harassments to the extent practicable. With implementation of the planned mitigation and monitoring measures, no Level A harassment is anticipated for low-frequency cetaceans (humpback whales and gray whales). As mentioned, previously, no mortality is anticipated or authorized for this activity.

Authorized takes were estimates made with the consideration of: (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 are the factors considered in more detail and the take estimates.

6.1 NOAA/ NMFS FISHERIES SERVICE ACOUSTIC CRITERIA

New guidance provided by NMFS Fisheries (2020) on the Assessment of DTH pile installation explains the new evaluation of thresholds on the DTH hammer source levels. Since DTH pile driving includes both impulsive and continuous components, the guidance recommends treating Level A harassment as impulsive and Level B harassment as continuous. This is incorporated
into the previously provided guidance from NOAA (2016-20h) describing updated definitions for the Permanent Threshold Shift (PTS) onset for Level A and B harassment for each of the four marine mammal functional hearing groups (Table 8 & 9). This new guidance provides a refinement of previously used thresholds by incorporating the hearing range specific to each mammal group into the development of the threshold. Separate onset levels are defined for impulsive sound (e.g., impact pile driving) and non-impulsive sound (e.g., vibratory sound). For impulsive sounds, acoustic thresholds are described with two metrics: cumulative sound exposure ($SPL_{CUM}$ and $SPL_{PEAK}$); non-impulsive thresholds are described only with $SEL_{CUM}$.

**Table 8: Level A Harassment Thresholds for Marine Mammals that May Occur in the Project Area**

<table>
<thead>
<tr>
<th>Functional Hearing Group</th>
<th>PTS Onset Acoustic Thresholds ($SEL_{CUM}$) (dB re 1µPa²sec)</th>
<th>Peak Sound Threshold ($SPL_{PEAK}$) (dB re 1µPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Frequency Cetaceans (e.g., fin, humpback, North Atlantic right whale)</td>
<td>183</td>
<td>199</td>
</tr>
<tr>
<td>Mid-Frequency Cetaceans (e.g., bottlenose dolphin)</td>
<td>185</td>
<td>198</td>
</tr>
<tr>
<td>High-Frequency Cetaceans (e.g., harbor porpoise)</td>
<td>155</td>
<td>173</td>
</tr>
<tr>
<td>Phocid Pinnipeds (e.g., harbor seals and gray seals)</td>
<td>185</td>
<td>201</td>
</tr>
</tbody>
</table>

1-NMFS published updated Technical Guidance: The measure of the cumulative sound exposure over time. A function of the sum of the SELs for 1 strike and the number of strikes over a defined amount of time.  
$SPL_{PEAK}$ – Peak Sound Pressure Level – The highest sound pressure level made by an action. In a sinusoidal sound pressure wave, this is the absolute value of the max variation from the neutral position of the wave.  
$dB$ re 1µPa²sec – decibels reference level 1 micropascal squared per second

**Table 9: Level B Harassment Thresholds for Marine Mammals that May Occur in the Project Area**

<table>
<thead>
<tr>
<th>Functional Hearing Group</th>
<th>RMS SPL (dB re 1µPa)</th>
<th>RMS SPL (dB re 1µPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impulsive (Impact Pile Driving)</td>
<td>Non-Impulsive (Vibratory and DTH Pile Driving)</td>
<td></td>
</tr>
<tr>
<td>Low-Frequency Cetaceans (e.g., fin, humpback &amp; North Atlantic right whales)</td>
<td>160</td>
<td>122.78</td>
</tr>
<tr>
<td>Mid-Frequency Cetaceans (e.g., bottlenose dolphin)</td>
<td>160</td>
<td>122.78</td>
</tr>
<tr>
<td>High-Frequency Cetaceans (e.g., harbor porpoise)</td>
<td>160</td>
<td>122.78</td>
</tr>
<tr>
<td>Phocid Pinnipeds (e.g., harbor seals and gray seals)</td>
<td>160</td>
<td>122.78</td>
</tr>
</tbody>
</table>

RMS SPL – Sound Pressure Level Root Mean Squared – The RMS is a type of average that is determined by squaring all the sound wave amplitudes over the period of interest, determining the mean of the squared values, and then taking the square root of the mean of the squared values.  
$dB$ re 1µPa²sec – decibels reference level 1 micropascal squared per second

To assess potential effects of exposure to underwater anthropogenic sound on the hearing of marine mammals, the CTJV used NMFS published updated Technical Guidance (NMFS 2020a). This Technical Guidance identifies the received levels, or thresholds, above which individual marine mammals are predicted to experience permanent changes (e.g., a permanent threshold.
shift [PTS]) in their hearing sensitivity from incidental exposure to underwater anthropogenic sound sources (NMFS 2020a). NMFS considers the Technical Guidance to represent the best available scientific information and, on this basis, suggests that these thresholds and weighting functions be used to assess the potential for PTS in marine mammals, which equates to Level A harassment under the MMPA. The models used to derive the acoustic thresholds for onset of PTS incorporate marine mammal auditory weighting functions in recognition of the variability found among marine mammal species in their hearing sensitivity. The auditory weighting functions are defined for four functional hearing groups that are present in the Project area: low-frequency (LF), mid-frequency (MF), and high-frequency (HF) cetaceans, and phocid in water (PW) pinnipeds. Additionally, the models used to derive the PTS onset acoustic thresholds incorporate a time component in the form of a cumulative sound exposure level (SELcum) for both impulsive and non-impulsive sound, and a SPL component by using peak sound level (Lpk) for impulsive sounds (NMFS 2020a).

Level B Harassment for non-explosive sources—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 has previously used a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. It is predicted that marine mammals are likely to be behaviorally harassed in a manner considered 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) and above 160 dB re 1 μPa (rms) for non-explosive impulsive (e.g., impact pile driving) or intermittent (e.g., scientific sonar) sources. CTJV’s planned activity includes the use of continuous (vibratory and DTH hammer pile driving) and impulsive (impact pile driving) sources, and therefore the 120 and 160 dB re 1 μPa (rms) thresholds are applicable. Following the 2020 NMFS guidance for DTH Pile installation, the DTH hammer pile driving is considered both impulsive and continuous components and indicated that Level A harassment is impulsive, and Level B is a continuous source level of 166 dB re 1 μPa (rms). Given that a bubble curtain will be utilized for all vibratory and impact pile driving, updated 2020 Caltrans guidance allows a 5 dB reduction, however justification for the CTJV using a 6 dB reduction is discussed in section 6.

Level A harassment for non-explosive sources—NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2020) 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 from two different types of sources (impulsive or non-impulsive).

These thresholds are provided in Table 10. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance.
### Table 10: Thresholds Identifying the Onset of Permanent Threshold Shift

<table>
<thead>
<tr>
<th>Hearing Group</th>
<th>Impulsive</th>
<th>Non-impulsive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low-Frequency (LF) Cetaceans</strong></td>
<td>Cell 1: ( L_{pk,flat} ): 219 dB ( L_{E,LF,24h} ): 183 dB</td>
<td>Cell 2: ( L_{E,LF,24h} ): 199 dB</td>
</tr>
<tr>
<td></td>
<td>Cell 3: ( L_{pk,flat} ): 230 dB ( L_{E,MF,24h} ): 185 dB</td>
<td></td>
</tr>
<tr>
<td><strong>Mid-Frequency (MF) Cetaceans</strong></td>
<td>Cell 5: ( L_{pk,flat} ): 202 dB ( L_{E,HF,24h} ): 155 dB</td>
<td>Cell 6: ( L_{E,HF,24h} ): 173 dB</td>
</tr>
<tr>
<td><strong>High-Frequency (HF) Cetaceans</strong></td>
<td>Cell 7: ( L_{pk,flat} ): 218 dB ( L_{E,PW,24h} ): 185 dB</td>
<td>Cell 8: ( L_{E,PW,24h} ): 201 dB</td>
</tr>
<tr>
<td><strong>Phocid Pinnipeds (PW) (Underwater)</strong></td>
<td>Cell 9: ( L_{pk,flat} ): 232 dB ( L_{E,OW,24h} ): 203 dB</td>
<td>Cell 10: ( L_{E,OW,24h} ): 219 dB</td>
</tr>
</tbody>
</table>

* 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 1µPa²s. 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 (NMFS, 2020b).

### 6.2 DESCRIPTION OF NOISE SOURCES

The Project will temporarily increase existing in-air and underwater acoustic levels in the Project vicinity, which is part of a high-use industrial area with frequent marine vessel traffic and associated activities. The soundscape in the vicinity of the Project will include existing ambient sound plus pile installation and removal noise from the Project. The Project may affect marine mammals by generating noise associated with installation of piles using vibratory hammers, impact hammers and down-the-hole hammers and removal by vibratory hammers. Refer to Section 1.3.3 for a description of in-water marine construction activities. Other activities associated with the Project (e.g., upland and above-water construction activities, vessel movements, and placement of fill) do not produce in-air or underwater noise levels expected to exceed Level A or Level B harassment levels for any marine mammal hearing group.

#### 6.2.1 AMBIENT SOUND

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

In June 2019, the CTJV conducted a hydroacoustic study to identify the sound source characterization of the DTH hammer on the project site. Underwater sound was recorded on three, fixed-location, Autonomous Multichannel Acoustic Recorders (AMARs, JASCO). Each AMAR was fitted with two M8 omnidirectional hydrophones (Geo Spectrum Technologies Inc.), one hydrophone was low sensitivity (-195 ± 3 dB re 1 V/µPa) to record high-level sounds during DTH near the source and one was higher sensitivity (-165 ± 3 dB re 1 V/µPa) to record lower levels sounds, including ambient levels. The AMARs recorded continuously at 64,000 samples per second for a recording bandwidth of 10 Hz to 32 kHz. The recording channels had 24-bit resolution with a spectral noise floor of ~20 dB re 1 µPa2/Hz, and a nominal ceiling level of 201 dB re 1 µPa and 171 dB re 1 µPa, for the low and high sensitivity hydrophones respectively. Acoustic data were stored on 1TB of internal solid-state flash memory. As configured, the recorders were capable of continuously recording for >4 weeks.

Broadband (10 Hz – 31.5 kHz) and decidecade band levels were analyzed in 30-minute intervals from 28 June through 15 July for recordings from Station 3. Sound levels include anthropogenic sources (e.g., vessel noise and possible noise from automotive traffic on the bridge), as well as natural (e.g., wind and rain) and biological noise (e.g., animal vocalization) during the period of analysis. The median SPL for when there was no pile driving or construction activity was 122.78 dB re 1 µPa, with a maximum level of 155.43 dB. 90% of the time, the SPL was below 130.32 dB. Band levels below 31.5 Hz were the largest contributors to the SPL (Appendix D, Jasco Report). For modeling purposes, this 122.78 dB for ambient noise was used as opposed to NOAAs traditional guidance of 120 dB for the Level B harassment threshold.

6.2.2 Ensonified Area

Below is an explanation of the operational and environmental parameters of the construction activities that will feed into identifying the area ensonified above the acoustic thresholds, which include source levels and transmission loss coefficient.

The sound field in the project area is the existing background noise plus additional construction noise from the planned project. Pile driving generates underwater noise that can potentially result in disturbance to marine mammals in the project area. The maximum (underwater) area ensonified is determined by the topography of the Bay including shorelines to the west south and north as well as by hard structures such as the portal islands.

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:

\[ TL = B \times \log_{10} \left( \frac{R_1}{R_2} \right) \]

where

TL = transmission loss in dB
B = transmission loss coefficient; for practical spreading equals 15

R₁ = the distance of the modeled SPL from the driven pile, and

R₂ = 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]). A practical spreading value of fifteen is often used under conditions, such as the PTST project site where water generally increases with depth as the receiver moves away from pile driving locations, resulting in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions. Practical spreading loss is assumed here.

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. In order to calculate distances to the Level A harassment and Level B harassment thresholds for the 36-inch and 42-inch hollow steel piles planned in this project, the CTJV used acoustic monitoring data from other locations as described in Caltrans 2015-2020 for impact and vibratory driving. CTJV also conducted their own sound source verification testing on 42-inch steel pipes as described below to determine source levels associated with DTH drilling. NMFS previously authorized driving of 36-in steel pile source levels for vibratory driving of 42-inch piles/casings source levels. CTJV will continue to employ bubble curtains during impact and vibratory driving of 36 and 42-inch steel piles. Based on monitoring of the sound source levels for 36” hollow steel piles with a bubble curtain and 36” hollow steel piles without a bubble curtain at the project site in 2019, it was determined that the bubble curtain system used for this project provided a 6 dB reduction in near field sound levels (Denes, 2019). Therefore the reduced the source level of 6 dB was used to calculate harassment isopleths.

Based on the 2020 NMFS Guidance for Assessment of DTH Pile Installation, DTH pile driving includes both impulsive and continuous components. Level A harassment is considered impulsive, while Level B harassment is considered continuous. Level A source levels for both 36- inch and 42- inch diameter piles diameter are SELss: 164 dB, 1-sec SEL: 174 dB and the SPLpk: 194 dB (Reyff & Heyvaert 2019) (Reyff 2020) (Denes et al.2019). For Level B source levels it was recommended to use Denes et al. (2016): 166 dB (1-sec SEL, or 1-sec SPLrms) for all pile sizes. Source levels associated with DTH drilling of 42-inch steel piles were assumed to be the same as recorded levels for the installation of 36-in steel pipe by DTH.
6.2.3 MULTIPLE HAMMER NOISE LEVELS

Simultaneous use of hammers could result in increased SPLs and harassment zone sizes given the proximity of the component sites and the rules of decibel addition. NMFS (2018b) has previously recommended to use overlapping sound fields that are created using more than one hammer differently for impulsive (impact hammer and Level A harassment zones for drilling with a down-the-hole hammer) and continuous sound sources (vibratory hammer and Level B harassment zones for drilling with a down-the-hole hammer). At different times, drilling with a down-the-hole hammer has previously been classified by NMFS as a continuous noise source and an impulsive noise source (84 FR 64847), but due to the evolving understanding of sound propagation resulting from its use, drilling with a down-the-hole hammer will be treated the same as an impact hammer (impulsive noise) for this Level A analysis, and as a vibratory hammer (continuous noise) for this Level B analysis.

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. This method was previously used by NMFS for the CTJV’s past IHAs, by the Washington State Department of Transportation (WSDOT) for the construction of the Seattle Multimodal Construction Project (82 FR 15497 and Ferry Berth Improvements in Tongass Narrows, Alaska (85 FR 673). When two or more vibratory hammers are used simultaneously, and the isopleth of one sound source encompasses the sound source of another isopleth, the sources are considered additive and combined using the following rules (Table 11) 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 11: Rules for Combining Sound Levels Generated during Pile Installation**

<table>
<thead>
<tr>
<th>Hammer Type</th>
<th>Difference in SSL</th>
<th>Level A Zones</th>
<th>Level B Zones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibratory, Impact</td>
<td>Any</td>
<td>Use impact zones</td>
<td>Use largest zone</td>
</tr>
<tr>
<td>Impact, Impact</td>
<td>Any</td>
<td>Use zones for each pile size</td>
<td>Use zones for each pile size</td>
</tr>
<tr>
<td>Vibratory, Vibratory</td>
<td>0 or 1 dB</td>
<td>Add 3 dB to the higher source level</td>
<td>Add 3 dB to the higher source level</td>
</tr>
<tr>
<td></td>
<td>2 or 3 dB</td>
<td>Add 2 dB to the higher source level</td>
<td>Add 2 dB to the higher source level</td>
</tr>
<tr>
<td></td>
<td>4 to 9 dB</td>
<td>Add 1 dB to the higher source level</td>
<td>Add 1 dB to the higher source level</td>
</tr>
<tr>
<td></td>
<td>10 dB or more</td>
<td>Add 0 dB to the higher source level</td>
<td>Add 0 dB to the higher source level</td>
</tr>
</tbody>
</table>

Source: Modified from USDOT 1995, WSDOT 2018 and NMFS 2018b

Note: dB - decibel; SSL - sound source level

For simultaneous usage of three 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 (2) 36-, and (1) 42-inch diameter steel pipe piles with SSLs of 186, and 170 dB rms respectively, 36-inch and 42-inch would be added together; given that 186 – 170 = 16 dB, then 1 dB is added to the highest of the two SSLs (186 dB), for a combined noise level of 187 dB. Next, the newly calculated 187 dB is...
added to the 42-inch steel pile with SSL of 186 dB. Since \(187 - 186 = 1\) dB, 3 dB is added to the highest value for the combination of 36- and 42-inch steel pipe piles (NMFS 2018b; WSDOT 2018).

During installation activities covered under this IHA request, there will be times when multiple construction sites are active concurrently. 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 and documented; on occasion and for short durations, it is anticipated that up to 3 hammers could be in use simultaneously, with no more than 2 hammers on any island.

6.3 ESTIMATED EXTENT OF ACTIVITY

The refined ZOIs for Level A and B harassment were calculated following the NOAA Fisheries 2016-2020 guidance, NMFS 2020 guidance and the accompanying Optional User Spreadsheet to determine the radii and area of each isopleth, then removing the areas that land or the Portal Islands interfered. Separate ZOIs were calculated for impact, DTH (impulsive and non-impulsive), vibratory pile driving and varieties of simultaneous drilling combinations for hollow round steel pile installation. Table 13 provides refined areas of the ZOI for all proposed methods of driving hollow steel piles.

The Optional User Spreadsheet requires estimates of the sound produced by the source (RMS SPL) and the distance at which the sound was measured. Data reported in Reyff & Heyvaert (2019), Denes et al. (2016) and Caltrans (2015) were used for similar piles size and types are shown in Table 12. Use of a bubble curtain is expected to reduce sound levels by 6 dB for pile instillation using impact and vibratory hammer (dB) (NAVFAC 2014, ICF Jones and Stokes 2009). Using data from previous projects (Caltrans 2020) and the amount of sound reduction expected from the sound mitigation methods (Jasco Report), we estimated the peak noise level (SPLpeak), the root mean squared sound pressure level (RMS SPL), and the single strike exposure level (sSEL) for each pile driving scenario of the PTST Project.

6.3.1 Calculations of Disturbance ZOIs for In-water Noise

6.3.1.1 Level A

**Impact Hammer Pile Driving** – The Impact Pile Driving (Stationary Source: Impulsive, Intermittent) (Sheet E.1) provided by NOAA Fisheries requires inputs for the sound pressure level of the source (dB, RMS and/or SPL), the expected activity duration in hours per 24-hour period, pulse duration (seconds), single strike SEL, the propagation of the sound (unitless constant), and the distance from the source at which the sound pressure level was measured. Calculations assume the SEL is based on a single strike rather than on cumulative strikes. Model inputs are provided in Table 12 and the refined areas of the impact zones are provided in Table 13.

**DTH Hammer Pile Driving** – Based on the 2020 NMFS Guidance for Assessment of DTH Pile Installation, we are changing the approach to DTH hammering so that we estimate the potential impulsive components (using the associated thresholds) of the operations for the purposes of
predicting Level A harassment and estimate the potential continuous components (using the
associated threshold) for the purposes of predicting Level B harassment. We used the Denes et
al. (2019) source levels as a proxy source level for the purposes of the Level A harassment
assessment. Level A harassment is considered impulsive, while Level B harassment is
considered continuous. Level A source levels for both 36- inch and 42- inch diameter piles
diameter are SELss: 164 dB, 1-sec SEL: 174 dB and the SPLpk: 194 dB (Reyff & Heyvaert 2019)
(Reyff 2020) (Denes et al. 2016). For Level B source levels, it was recommended to use Denes et
al. (2016): 166 dB (1-sec SEL, or 1-sec SPLrms) for all pile sizes. Source levels associated with
DTH drilling of 42-inch steel piles were assumed to be the same as recorded for installation of
36-in steel pipe by DTH. Model inputs are provided in Table 12 and the refined areas of the
impact zones are provided in Table 13 are provided in Table 13.

Vibratory Hammer Pile Driving – Sound collected from vibratory with bubble curtain
installation of 36-inch and 42- inch diameter piles resulted in a source level of mean 163 dB RMS
(Caltrans 2015). Model inputs are provided in Table 12 and the refined areas of the impact zones
are provided in Table 13.

NMFS User Manual calculations can also be found on Figure 4-9: Appendix A. Refined areas
reflected in Table 13 can be found on Figures 11-20 of Appendix A.

Table 12. User Spreadsheet Input Parameters Used for Calculating Harassment Isopleths

<table>
<thead>
<tr>
<th>Model Parameter</th>
<th>Vibratory(^a) (with Bubble Curtain)</th>
<th>DTH(^b) (impulsive)</th>
<th>Impact(^c) (with Bubble Curtain)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighting Factor (kHz)</td>
<td>2.5</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>RMS (dB)</td>
<td>164</td>
<td>170</td>
<td>186</td>
</tr>
<tr>
<td>Peak/SELss (dB)</td>
<td>174/164(^*)</td>
<td>194/ NA</td>
<td>204/177(^*)</td>
</tr>
<tr>
<td>Number of piles/day</td>
<td>6</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Duration to drive a pile (minutes)</td>
<td>12</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Propagation</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Distance from source (meters)</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Strikes per pile</td>
<td>36,000</td>
<td></td>
<td>1,000</td>
</tr>
</tbody>
</table>

\(^a\) Source level reduced by 6 dB to account for use of bubble curtain
\(^b\) Source: Reyff & Heyvaert (2019)
\(^c\) Source: Caltrans (2015) Table I.2.2

dB = decibel; na = not applicable; RMS = root mean square level; SEL = single strike sound exposure level
Table 13: Refined In-Water Area (km²) from Pile Driven to Level A and Level B Harassment Zones for Cetaceans, Pinnipeds and Otariids

<table>
<thead>
<tr>
<th>Driving Scenarios</th>
<th>Level A Harassment Zones</th>
<th>Level B Harassment Zones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Frequency</td>
<td>High-Frequency</td>
<td>Impact + DTH</td>
</tr>
<tr>
<td>Cetaceans</td>
<td>Pinnipeds</td>
<td></td>
</tr>
<tr>
<td>Radius (m)</td>
<td>Island 1</td>
<td>Island 2</td>
</tr>
<tr>
<td>Low-Frequency</td>
<td>44</td>
<td>1,225</td>
</tr>
<tr>
<td>Cetaceans</td>
<td>0.005</td>
<td>0.005</td>
</tr>
<tr>
<td>Mid-Frequency</td>
<td>47</td>
<td>1,313</td>
</tr>
<tr>
<td>Cetaceans</td>
<td>0.007</td>
<td>0.007</td>
</tr>
<tr>
<td>High-Frequency</td>
<td>48</td>
<td>1,460</td>
</tr>
<tr>
<td>Cetaceans</td>
<td>0.008</td>
<td>0.008</td>
</tr>
<tr>
<td>Hound Pinnipeds</td>
<td>656</td>
<td>5.743</td>
</tr>
<tr>
<td>Impact (4 piles/day)</td>
<td>124</td>
<td>6.719</td>
</tr>
<tr>
<td>Impact + Vibratory</td>
<td>147</td>
<td>6.711</td>
</tr>
<tr>
<td>Impact + Dual DTH</td>
<td>136</td>
<td>1127</td>
</tr>
<tr>
<td>Parallel Thimble Shoal Tunnel Project</td>
<td>Virginia Beach, Virginia</td>
<td>Chesapeake Tunnel Joint Venture</td>
</tr>
</tbody>
</table>
6.3.1.2 Level B (In-Water)

The underwater practical spreading loss equation (below) was used to determine the Level B harassment ZOI for marine mammals. Level B ZOI are shown on Table 13.

\[ TL = GL X \log_{10} \frac{R_2}{R_1} \]

Where:
TL = Transmission (propagation) loss constant; the transmission loss constant is assumed to be 15 underwater
R1 = The distance of a known or measured sound level
R2 = The estimated distance required for sound to attenuate to a prescribed acoustic threshold
GL = Geometric Loss Coefficient.

6.3.1.3 Level A and B Harassment Zones for Multiple Hammers

The proposed pile installation in this IHA application assumes the use of more than one (up to three) vibratory, impact or down-the-hole hammer drilling to occur within a single day or simultaneously. Down-the-hole hammers are considered by NMFS to produce impulsive noise near the pile, so decibel addition will not be used for Level A harassment zones. Each hammer scenario will implement Level A harassment zones based on whether or not there is not simultaneous use of hammer, according to the rules in Table 11, and are reflected in Table 13.

This measure, although conservative, would also minimize the need for onsite coordination among Project sites and components. When multiple vibratory or down-the-hole hammers are used simultaneously, the Level B harassment zone will depend on the combination of sound sources due to decibel addition of multiple hammers producing continuous noise.

Based on decibel addition for overlapping continuous sound sources, it is possible that sound will ensonify in a portion of the surrounding waters. However, pile installation is an intermittent activity with multiple stops and starts of the hammer for each pile, and decibel addition is applied only when the adjacent continuous sound sources experience overlapping sound fields, which requires proximity. It is anticipated that simultaneous use of more than one hammer making continuous sound with overlapping sound fields will be uncommon and of short duration.

6.3.1.4 Calculation of Disturbance ZOIs for Airborne Noise

The spherical spreading loss equation (below) was used to determine the Level B harassment ZOIs for marine mammals. The ZOIs are shown in Table 12.

\[ TL = GL X \log_{10} \frac{R_2}{R_1} \]

Where:
TL = Transmission (Propagation) loss constant; the transmission loss constant is assumed to be 20 in air
The distance of a known or measured sound level

R2 = The estimated distance required for sound to attenuate to a prescribed acoustic threshold

GL = Geometric Loss Coefficient.

Literature estimates were used to estimate the amount of in-air sound produced from impact driving a pile above the MHW line (Laughlin 2010 a, b). Hollow steel piles that were 30 inches in diameter were used as a close proxy to the 36 & 42-inch-diameter hollow steel piles that will be driven at the PTST Project. Airborne sound produced from DTH hammer pile driving for 36-inch diameter hollow steel piles was estimated based on a 90dB threshold for simplicity, though gray seals have a 100dB threshold. This does not affect harassments due to the areas being so much smaller than the in-water harassment zones.

Given the maximum source level of 98 dBA for in-air noise during impact pile installation of 42-inch steel piles, the calculated isopleths for in-air noise can be used for all pile sizes and types associated with the Project. Installation of smaller piles is generally assumed to produce lower sound levels than installation of larger piles. Based on this model, in-air noise from impact installation of 42-inch steel piles could extend up to 205 meters from the noise source over open water until it attenuates to a level below the NMFS threshold for harassment of phocid pinnipeds such as harbor and gray seals (Table 14).

<table>
<thead>
<tr>
<th>Source</th>
<th>Sound Level</th>
<th>Level A Harassment Zone (m)</th>
<th>Level B Harassment Zone (m)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact Hammer 36-inch Pile</td>
<td>97 dBLMAX at 92mA</td>
<td>N/A</td>
<td>205</td>
</tr>
<tr>
<td>Impact Hammer 42-inch Pile</td>
<td>97 dBLMAX at 92mA</td>
<td>N/A</td>
<td>205</td>
</tr>
<tr>
<td>Vibratory Hammer 36-inch Pile</td>
<td>98 dB LMAX @15.24m^b</td>
<td>N/A</td>
<td>40</td>
</tr>
<tr>
<td>Vibratory 42-inch Pile</td>
<td>98 dB LMAX @15.24m^b</td>
<td>N/A</td>
<td>40</td>
</tr>
<tr>
<td>Down-the-hole Hammer 42-inch Pile</td>
<td>88 dB LSEQ at 10m^c</td>
<td>N/A</td>
<td>7.94</td>
</tr>
</tbody>
</table>

* Laughlin 2007
^a Laughlin 2010
^b Mincon Group PLC. 2019.
^c Using 90dB threshold

6.4 ESTIMATED INCIDENTAL TAKES

Estimated exposure and take of marine mammals associated with the Project are based on presence/absence, distribution, and abundance information presented in Section 4. Marine mammal takes are requested for the following five species for the year of this IHA request.
6.4.1 Humpback Whale

Humpback whales are relatively rare in the Chesapeake Bay and density data for this species within the project vicinity were not available nor able to be calculated. Populations in the mid-Atlantic have been estimated for humpback whales off the coast of New Jersey with a density of 0.000130 per square kilometer (Whitt et al. 2015). Habitat-based density models produced by the Duke University Marine Geospatial Ecology Laboratory (Roberts et al. 2016) represent the best available information regarding marine mammal densities offshore near the mouth of the Chesapeake Bay. At the closest point to the PTST project area, humpback densities ranged from a high of 0.107/100 km² in March to 0.00010/100 km² in August. Because humpback whale occurrence is low, as mentioned above, the CTJV estimated that there will be a single humpback sighting every two months for the duration of in-water pile driving activities.

There are 12 months of in-water construction anticipated during the proposed IHA. Using an average group size of two animals, pile driving activities over a 12-month period would result in the take of 12 humpback whales by Level B. Because it is expected that a full shutdown can occur before the mammal can reach the full extent of the Level A zone, no takes by Level A harassment are expected or requested.

6.4.2 Bottlenose Dolphin

Expected bottlenose dolphin takes were estimated using Engelhaupt et al. (2016). The seasonal density values documented in that report were broken out by month and pile driving activity described in Section 1.3.1. The Level B harassment areas for each pile driving scenario, as shown in Table 15, were derived from mapping out the area of the isopleth’s radii for each sound source combination, then removing the areas of land and/or island interference to get the refined areas of impact.

Table 15. In-Water Area (km²) Used for Calculating Level B Dolphin Takes Per Construction Components Per Hammer Type

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Radius (m)</td>
<td>7,599</td>
<td>10,329</td>
<td>5,555</td>
<td>12,043</td>
<td>14,041</td>
<td>10,329</td>
<td>7,599</td>
</tr>
<tr>
<td>PI 1 Refined Area** (km²)</td>
<td>136</td>
<td>218</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PI 2 Refined Area** (km²)</td>
<td>147</td>
<td>250</td>
<td>79</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refined Area** When Simultaneous Drilling on Both Islands***</td>
<td>323</td>
<td>402</td>
<td>255</td>
<td>163</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* = Use of bubble curtain
** Total area based on isopleth of a circle minus land interference
*** Taking the refined areas from Table 15, it was then multiplied by the appropriate seasonal density and the anticipated number of days of that activity per month to derive the total number of takes for each pile installation scenario, as shown in Table 16. For simultaneous driving of 3 different piles, the areas were combined, and any overlapping area was removed to determine the
Level B takes. Since pile installation is an intermittent activity with multiple starts and stops of the hammer for each pile, it is assumed that of the days where more than 2 hammers are being used, only 75% of the simultaneous activity will occur at the same time.

Table 16 reflects the dolphin densities for the months covered under this IHA. It is then broken out by driving scenario (Impact +DTH, DTH+ Vibratory, etc.) and activity (Berm Excavation Wall, Berm Omega Trestle, etc.), per island. The dolphin takes associated with each activity, pile driving scenario, seasonal dolphin density and island is reflected in yellow and totaled in the far-right column of Table 16. The white cells for each activity are the days of that activity expected in that month.
Table 16. Estimated Takes of Bottlenose Dolphins by Level B Harassment by Month and Activity

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Portal Island 1 Berm Excavation Wall</strong></td>
<td>17</td>
<td>17</td>
<td>16</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>136</td>
<td>7,599</td>
<td>16,507</td>
</tr>
<tr>
<td><strong>Dolphin Takes Portal Island 1</strong></td>
<td>8971</td>
<td>1457</td>
<td>1371</td>
<td>600</td>
<td>952</td>
<td>544</td>
<td>680</td>
<td>1932</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portal Island 2 Berm Omega Trestle</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>147</td>
<td></td>
<td>46,766</td>
</tr>
<tr>
<td>Portal Island 2 Berm Excavation Wall</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>8</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dolphin Takes Portal Island 2</strong></td>
<td>0</td>
<td>0</td>
<td>62</td>
<td>186</td>
<td>294</td>
<td>147</td>
<td>588</td>
<td>6263</td>
<td>9916</td>
<td>9916</td>
<td>9697</td>
<td>9697</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Impact + Vibratory</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PI Berm Excavation Wall &amp; Omega Trestle Extension</strong></td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>218</td>
<td></td>
<td>3,235</td>
</tr>
<tr>
<td><strong>PI Berm Excavation Wall &amp; Portal Island 1 Mooring Dolphins</strong></td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>250</td>
<td></td>
<td>3,966</td>
</tr>
<tr>
<td><strong>Dolphin Takes Portal Island 1</strong></td>
<td>1692</td>
<td>275</td>
<td>138</td>
<td>138</td>
<td>0</td>
<td>0</td>
<td>218</td>
<td>774</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10,329</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portal Island 2 Berm Excavation Wall &amp; Omega Trestle Extension</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portal Island 2 Berm Excavation Wall &amp; Mooring Piles</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>250</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dolphin Takes Portal Island 2</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>250</td>
<td>0</td>
<td>0</td>
<td>888</td>
<td>888</td>
<td>970</td>
<td>970</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Impact + Vibratory</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Portal Island 1 Berm Excavation Wall &amp; Omega Trestle Extension</strong></td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>80</td>
<td></td>
<td>5,555</td>
</tr>
</tbody>
</table>

Chesapeake Tunnel Joint Venture
Virginia Beach, Virginia

Request for an Incidental Harassment Authorization
Parallel Thimble Shoal Tunnel Project
<table>
<thead>
<tr>
<th>Project Description</th>
<th>Takes (Counts)</th>
<th>Total Takes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portal Island 1 Berm Excavation Wall &amp; Portal Island 1 Mooring Piles</td>
<td>- - - - - - 1 1 - - - -</td>
<td>1,188</td>
</tr>
<tr>
<td><strong>Dolphin Takes Portal Island 1</strong></td>
<td>621 101 51 51 0 0 80 284 0 0 0 0</td>
<td>1,188</td>
</tr>
<tr>
<td>Portal Island 2 Berm Excavation Wall &amp; Omega Trestle Extension</td>
<td>- - - - - - - - - - -</td>
<td>79</td>
</tr>
<tr>
<td>Portal Island 2 Berm Excavation Wall &amp; Mooring Piles</td>
<td>- - - - - 1 - - 1 1 1 1</td>
<td>79</td>
</tr>
<tr>
<td><strong>Dolphin Takes Portal Island 2</strong></td>
<td>0 0 0 0 0 0 0 0 281 281 307 307</td>
<td>1,176</td>
</tr>
<tr>
<td><strong>DTH + DTH+ Impact</strong></td>
<td>323</td>
<td>12,043</td>
</tr>
<tr>
<td>Portal Island 1&amp; 2 Berm Excavation Wall Simultaneously</td>
<td>- - 1 3 4 5 4 1 - - - -</td>
<td>323</td>
</tr>
<tr>
<td><strong>Dolphin Takes</strong></td>
<td>0 0 204 611 1292 1615 1292 1147 0 0 0 0</td>
<td>6,161</td>
</tr>
<tr>
<td><strong>DTH + DTH+ Vibratory</strong></td>
<td>402</td>
<td>14,041</td>
</tr>
<tr>
<td>Portal Island 1&amp; 2 Berm Excavation Wall Simultaneously</td>
<td>- - - 1 2 2 1 - - - -</td>
<td>402</td>
</tr>
<tr>
<td><strong>Dolphin Takes</strong></td>
<td>0 0 0 254 804 804 402 0 0 0 0 0</td>
<td>2,264</td>
</tr>
<tr>
<td><strong>DTH + Vibratory + Impact</strong></td>
<td>255</td>
<td>10,329</td>
</tr>
<tr>
<td>Portal Island 1&amp; 2 Berm Excavation Wall Simultaneously</td>
<td>- - - 2 2 2 1 1 - - - -</td>
<td>255</td>
</tr>
<tr>
<td><strong>Dolphin Takes</strong></td>
<td>0 0 0 0 510 510 255 906 0 0 0 0</td>
<td>2,181</td>
</tr>
<tr>
<td><strong>Impact + Impact + DTH</strong></td>
<td>163</td>
<td>7,599</td>
</tr>
<tr>
<td>Portal Island 1&amp; 2 Berm Excavation Wall Simultaneously</td>
<td>- - 1 4 4 5 4 1 - - - -</td>
<td>163</td>
</tr>
<tr>
<td><strong>Dolphin Takes Portal Island 1</strong></td>
<td>0 0 103 411 652 815 652 579 0 0 0 0</td>
<td>3,212</td>
</tr>
<tr>
<td><strong>Total Takes:</strong></td>
<td>86,656</td>
<td></td>
</tr>
</tbody>
</table>
The CTJV is requesting a total of 86,656 takes by Level B harassment for bottlenose dolphins under this IHA. The total number of bottlenose dolphin Level B exposures will be split between three bottlenose dolphin stocks: Western North Atlantic Southern Migratory Coastal; Western North Atlantic Northern Migratory Coastal; and Northern North Carolina Estuarine System. There is insufficient information to apportion the requested takes precisely to each of these three stocks present in the Project area. Given that most of the Northern North Carolina Estuarine System stock are found in the Pamlico Sound Estuarine System, the Project will assume that no more than 200 of the requested takes will be from this stock. Since members of the Western North Atlantic Northern Migratory Coastal and Western North Atlantic Southern Migratory Coastal stocks are thought to occur in or near the Project area in greater numbers, CTJV will conservatively assume that no more than half of the remaining animals (86,456) will belong to either of these stocks (Table 20). Additionally, a subset of these takes would likely be comprised of Chesapeake Bay resident dolphins, although the size of that population is unknown.

Shutdown zones, further discussed in Section 9.2, will be used to prevent incidental Level A harassment from pile driving for bottlenose dolphins. Since the largest Level A isopleth is smaller than the shutdown zone, the CTJV is not requesting any takes by Level A harassment for bottlenose dolphins.

### 6.4.3 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 near the Project area, they have not been seen by the PSOs on the Project area during the construction. The used exposure analysis assumes that there is a porpoise sighting once during every two months of operations which would equate to six sightings over 12 months. Assuming an average group size of two (Hansen et al. 2018; Elliser et al. 2018) over 12 months of in-water work results in a total of 12 estimated takes of porpoises. Harbor porpoises are members of the high-frequency hearing group which have Level A harassment isopleths as large as 3.106 km2 during the use of two DTH and an impact hammer for the installation of 6 steel piles per day. Given the relatively large Level A harassment zones during simultaneous DTH and impact driving, CTJV assumed, as in previous IHAs, that 40 percent of estimated porpoises takes would be by Level A harassment. NMFS had previously assumed the same ratio for the previously issued IHA, resulting in 5 authorized takes of porpoises by Level A and 7 Level B harassments.

### 6.4.4 Harbor Seal

Following guidance from NMFS on a nearby project, CTJV altered how takes were calculated for harbor seals in this IHA from the previous IHAs. 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 17).
### Table 17: Harbor Seal Count at Chesapeake Bay Bridge Tunnel

<table>
<thead>
<tr>
<th>Field Season</th>
<th>&quot;In Season&quot; Survey Days</th>
<th>Total Seal Count</th>
<th>Average Daily Seal Count</th>
<th>Max Daily Seal Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014-2015</td>
<td>11</td>
<td>113</td>
<td>10</td>
<td>33</td>
</tr>
<tr>
<td>2015-2016</td>
<td>14</td>
<td>187</td>
<td>13</td>
<td>39</td>
</tr>
<tr>
<td>2016-2017</td>
<td>22</td>
<td>308</td>
<td>14</td>
<td>40</td>
</tr>
<tr>
<td>2017-2018</td>
<td>15</td>
<td>340</td>
<td>23</td>
<td>45</td>
</tr>
<tr>
<td>2018-2019</td>
<td>10</td>
<td>82</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td><strong>Average:</strong></td>
<td></td>
<td><strong>13.6</strong></td>
<td></td>
<td><strong>34.8</strong></td>
</tr>
</tbody>
</table>

This average count is 13.6 seals (rounded up to 14 seals). Fourteen seals/day multiplied by 95 days on Portal Island 1 and 111 days on Portal Island 2 (number of days of activities when the seals are present, December to May) 2,884 takes are expected (Table 18). The takes by Level A were calculated based on the guidance from NMFS prior IHAs, which assumes that 40 percent of the exposed seals will occur within the Level A zone and the remaining impacted seals would result in Level B. Therefore, 1,730 harassments by Level B and 1,154 by Level A harassment are being authorized for this IHA.

### Table 18: Calculation of the Number of Harbor Seal Takes

<table>
<thead>
<tr>
<th>Month</th>
<th>Max Daily Seal Count (Jones et al. 2018)</th>
<th>Total Pile Driving Days per Month on PI 1</th>
<th>Requested Takes for PI 1</th>
<th>Total Pile Driving Days per Month on PI 2</th>
<th>Requested Takes for PI 2</th>
<th>Total Number of Requested Takes</th>
</tr>
</thead>
<tbody>
<tr>
<td>November</td>
<td>Seals not expected to be present.</td>
<td></td>
<td>Seals not expected to be present.</td>
<td></td>
<td></td>
<td>210</td>
</tr>
<tr>
<td>December</td>
<td>14</td>
<td>5</td>
<td>70</td>
<td>10</td>
<td>140</td>
<td>210</td>
</tr>
<tr>
<td>January</td>
<td>14</td>
<td>21</td>
<td>294</td>
<td>21</td>
<td>294</td>
<td>588</td>
</tr>
<tr>
<td>February</td>
<td>14</td>
<td>20</td>
<td>280</td>
<td>20</td>
<td>280</td>
<td>560</td>
</tr>
<tr>
<td>March</td>
<td>14</td>
<td>17</td>
<td>238</td>
<td>18</td>
<td>252</td>
<td>490</td>
</tr>
<tr>
<td>April</td>
<td>14</td>
<td>21</td>
<td>294</td>
<td>21</td>
<td>294</td>
<td>588</td>
</tr>
<tr>
<td>May</td>
<td>14</td>
<td>11</td>
<td>154</td>
<td>21</td>
<td>294</td>
<td>448</td>
</tr>
<tr>
<td>June</td>
<td>Seals not expected to be present.</td>
<td></td>
<td>Seals not expected to be present.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>Seals not expected to be present.</td>
<td></td>
<td>Seals not expected to be present.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>Seals not expected to be present.</td>
<td></td>
<td>Seals not expected to be present.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>Seals not expected to be present.</td>
<td></td>
<td>Seals not expected to be present.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>Seals not expected to be present.</td>
<td></td>
<td>Seals not expected to be present.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>2884</strong></td>
</tr>
</tbody>
</table>

### 6.4.5 Gray Seal

The number of gray seals expected to be taken at the PTST Project Area was estimated using survey data collected by the U.S. Navy at the portal islands from 2014 through 2018 (Rees et al. 2016; Jones et al. 2018). The anticipated numbers of monthly takes were calculated following the same approach for harbor seals, the monthly takes were then summed (Table 19). Following the same guidance as above for harbor seals, we calculated a total number of 40 takes, 24 by Level B harassment and 16 by Level A harassment for gray seals.
We have modified the way we estimated the gray seals takes in this IHA from how it was previously done in prior IHAs because the previous IHA did not account for any in-water pile driving to take place in the month of February. To reduce the possibility that non-authorized takes of gray seal could result in work stoppage and factoring it the possibility that there could be delays to the construction schedule resulting in the need for in-water work in February, NMFS had used a conservative approach authorizing the take of 4 gray seals, 1 by Level A harassment and 3 by Level B harassment. Since there are 20 in-water pile driving days anticipated in this IHA, the previously used method was not appropriate.

**Table 19: Calculation of the Number of Gray Seal Takes**

<table>
<thead>
<tr>
<th>Month</th>
<th>Estimated Seals per Workday</th>
<th>Total Pile Driving Days per Month (includes upland driving)</th>
<th>Total Number of Requested Takes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep-21</td>
<td></td>
<td>Seals not expected to be present</td>
<td></td>
</tr>
<tr>
<td>Oct-21</td>
<td></td>
<td>Seals not expected to be present</td>
<td></td>
</tr>
<tr>
<td>Nov-21</td>
<td>0</td>
<td>22</td>
<td>0</td>
</tr>
<tr>
<td>Dec-21</td>
<td>0</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Jan-22</td>
<td>0</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Feb-22</td>
<td>1.6 (Rounded to 2)</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Mar-22</td>
<td>0</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>Apr-22</td>
<td>0</td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td>May-22</td>
<td>0</td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td>Jun-22</td>
<td></td>
<td>Seals not expected to be present</td>
<td></td>
</tr>
<tr>
<td>Jul-22</td>
<td></td>
<td>Seals not expected to be present</td>
<td></td>
</tr>
<tr>
<td>Aug-22</td>
<td></td>
<td>Seals not expected to be present</td>
<td></td>
</tr>
</tbody>
</table>

**6.5 ALL MARINE MAMMAL TAKES**

The above analyses provide estimates of the numbers of animals, by species, that could be exposed to received noise levels incidentally causing takes by Level A or Level B harassment during the year of project construction under this requested IHA (Table 20).

**Table 20: Number of Level A and B Takes Requested Per Species**

<table>
<thead>
<tr>
<th>Species</th>
<th>Stock</th>
<th>Level A Takes Requests</th>
<th>Level B Takes Requests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humpback Whale</td>
<td>Gulf of Maine</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>Harbor Porpoise</td>
<td>Gulf of Maine/ Bay of Fundy</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Bottlenose Dolphin</td>
<td>WNA Coastal, Northern Migratory</td>
<td>-</td>
<td>43,228</td>
</tr>
<tr>
<td></td>
<td>WNA Coastal, Southern Migratory</td>
<td>-</td>
<td>43,228</td>
</tr>
<tr>
<td></td>
<td>NNCES</td>
<td>-</td>
<td>200</td>
</tr>
<tr>
<td>Harbor Seal</td>
<td>Western North Atlantic</td>
<td>1,154</td>
<td>1,730</td>
</tr>
<tr>
<td>Gray Seal</td>
<td>Western North Atlantic</td>
<td>16</td>
<td>24</td>
</tr>
</tbody>
</table>
7. ANTICIPATED IMPACT OF THE ACTIVITY

Of the marine mammal species that may occur in the Project Area, harbor seals, gray seals, bottlenose dolphin, and humpback whales are the most likely to be present. Whales, seals, and porpoises are mobile species and are expected to easily avoid the disturbance and activity associated with construction.

Given the preference of whales for water deeper than is found in the Project Area, their presence near the construction areas is unlikely. Although, whales have been observed in the deeper waters in the vicinity of the PTST Project. Construction activity within open water will be located adjacent to Portal Island Nos. 1 and 2, and the use of the bored method for construction will prevent open water impacts in the areas more likely to be used by whale species. Given the feeding habits of whales, they are unlikely to be attracted to the portal islands and are not expected to venture into shallower construction areas.

Seals and harbor porpoises may be found in shallower areas; however, it is unlikely that harbor porpoises are using the shallowest areas of the Project Area. Both species may be temporarily displaced from the Project Area and within the Level A and B ZOIs. Seals are known to use the shallow portion of the Project Area to reach shoreline haul out areas on the portal islands. Seals would be displaced from these upland areas during construction areas and would likely continue to use Portal Island Nos. 3 and 4. Portal Island No. 3 would be used for storage of monthly materials, which would be consistent with existing routine operations associated with CBBT maintenance. Portal Island No. 4 is not located within the Project footprint.

7.1 POTENTIAL EFFECTS OF SPECIFIED ACTIVITIES ON MARINE MAMMALS

A pressure wave/underwater noise created in the water column as a result of pile driving could cause injury and/or behavioral impacts to marine mammals. Since 1997, NOAA Fisheries has used generic sound exposure thresholds to determine when an activity in the ocean that produces sound might result in impacts to a marine mammal such that a take by harassment might occur (70 FR 1871).

The Technical Guidance identifies the received levels, or thresholds, above which individual marine mammals are predicted to experience permanent changes (e.g., a permanent threshold shift [PTS]) in their hearing sensitivity from incidental exposure to underwater anthropogenic sound sources (NMFS 2018a). NMFS considers the Technical Guidance to represent the best available scientific information and, on this basis, suggests that these thresholds and weighting functions be used to assess the potential for PTS in marine mammals, which equates to Level A harassment under the MMPA. The models used to derive the acoustic thresholds for onset of PTS incorporate marine mammal auditory weighting functions in recognition of the variability found among marine mammal species in their hearing sensitivity. The auditory weighting functions are defined for four functional hearing groups that are present in the Project area: low-frequency (LF), mid-frequency (MF), and high-frequency (HF) cetaceans, and phocid in water (PW) pinnipeds. Behavioral harassment (Level B) is considered to have occurred when marine mammals are exposed to underwater sounds below the injury threshold, but greater than 160 dB...
re 1 μPa rms for impulsive sounds (e.g., impact pile driving) and greater than 120 dB re 1 μPa rms for non-impulsive noise (e.g., vibratory pile driving or extraction).

Table 13 provides the estimated distances from the activity where injury and behavioral impacts are expected for marine mammals. Mitigative measures will be employed to minimize the pressure waves and underwater noise associated with pile driving activities. Use of a soft start will occur prior to pile driving ramp up to provide aquatic animals and marine mammals with a warning of pile driving activity. Secondly, a bubble curtain will be used with both an impact and vibratory hammer to aid in sound reduction of 6 dB within the water.

The impact driving of each hollow steel pile (plumb) is expected to take approximately 1 hour (including the time it takes to position the pile, set-up the hammer and bubble curtain, and disassembly), and a maximum of six hollow steel piles will be impact driven per day per portal island. Simultaneous impact piling driving may occur at both islands. Species are expected to move away from these harassment zones during the soft start/ramp up procedures. For impact hammer pile driving, the hammer will be initially raised not more than a couple feet and dropped repeatedly several times at 30 second intervals. For diesel impact hammers, the construction crew will turn on the sound attenuation device for 15 seconds prior to the ramp-up (50 CFR part 217). A series of short strokes will be completed prior to initiating start full strikes. For vibratory hammers, contractors will initiate sound at reduced energy followed by a 1-minute waiting period. This will be repeated 2 times before full energy is achieved (from 50 CFR part 217).

If a marine mammal enters the Level A ZOI (shutdown zone), pile driving activity will cease, in accordance with the MMMP (Appendix B). No injury to marine mammals is expected. Marine mammals that happen to be within the zone of behavioral impact (Level B) are expected to move away from the location of pile driving during the soft start procedure and to areas with reduced or no behavioral impact.

The Action Area is within an area actively used for navigation and by the Navy. There are existing periodic high ambient noise levels and the overall background noise levels are relatively high.

7.2 POTENTIAL EFFECTS OF VESSEL INTERACTIONS ON MARINE MAMMALS

The presence of increased ship traffic throughout the duration of the Project could increase the chances of ship strikes with marine mammals. The North Atlantic right whale, in particular, is vulnerable to ship strikes, though its presence in the Project Area is rare. Harbor seals and gray seals that haul out on the portal islands of the CBBT from November through May, as well as bottlenose dolphins and harbor porpoises may be susceptible to ship strikes.

To minimize the potential for ship strikes associated with vessel traffic within the Project Area and traveling to and from the disposal facility, it will be required that all vessels travel at less than 10 knots, to be protective of right whales and other marine mammals. Vessels used for construction will consist of tugboats (50-100 ft long with a draft of 5-15 ft), barge/transport vessels (up to 500 ft long with a draft of up to 15 ft), and workboats (up to 60 ft long with a draft
of approximately 5 ft). Vessels traveling to the Project Area will come from existing commercial facilities and will travel via established navigation channels. Approximately 1,400 vessel trips are expected during construction activities. This includes vessel trips transporting dredged material and excavated TBM material to an upland disposal facility and vessel trips to and from the Little Creek Staging Area. During the busiest construction period, there may be up to six construction-related vessels moored along each engineered berm at any time. The equipment and materials required for the PTST Project will also be transported onto the portal islands via trucks throughout the construction period.

Outside the Action Area and within the established channels, vessels will operate within U.S. Coast Guard requirements and any vessel speed requirements. Given the high amount of vessel traffic already occurring in the area because of existing Navy operations and the nearby federal navigation channel, and because of the reduced vessel speeds that will be implemented, the increase in potential for vessel strikes will not measurably increase the risk of interaction with vessels for marine mammals. The mouth of the Bay and Atlantic Ocean are approximately 7 miles due east of the Action Area. The area between the Action Area and the Ocean consists of open water. Water depths in the Action Area extend to approximately 55 ft. Maximum water depths in the vicinity of the Action Area are approximately 80 ft. The width and depth of the waterway provide ample clearance in all directions for marine mammals to avoid project activities and disturbance. Therefore, any effects from the increase in the number and mooring of vessels are insignificant.

7.3 HABITAT MODIFICATION

Loss of Open Water Habitat—Habitat modification will occur through the loss of open water habitat. The PTST Project would permanently convert 1.50 acres of aquatic habitat/subaqueous bottom (1.02 acres of rock habitat and 0.48 acres of sand habitat) into upland. This habitat would be permanently eliminated from use as open water habitat by marine mammals but would serve as additional hauling out area for seals. The 1.50 acres of aquatic habitat to be eliminated is negligible for dolphins and seals and not viable for whales.

Habitat Conversion—There are 10.18 acres of open habitat (including rock and sand substrate) that would be converted to a shallower depth, and 8.27 acres of the 10.18 acres will have substrate converted from sand to rock. While this area would be converted to a shallower depth, it would remain available foraging habitat for bottlenose dolphins, harbor porpoises, seals and their prey following construction. Some of the habitat that will be converted is already at depths too shallow to support dolphins, porpoises, and whales. Of the habitat that will be converted, 7.49 acres are currently deeper than 30 ft.; of which 3.15 acres are deeper than 45 ft. After construction, there will still be 4.81 acres deeper than 30 ft., of which 0.71 acres will still have depths greater than 45 ft. These areas may, but are unlikely to, serve as foraging habitat for whales. Whales are typically found at deeper depths closer to and within the federal navigation channel, which would not be directly affected by construction activity. The shallow depths present in the Project Area make it unlikely that whales would be present in the first place; therefore, effects on whales are discountable.

Disturbance to the Bottom—Removal and replacement of existing armor stone could also disturb the substrate and the water column. As construction proceeds, existing armor stone will
be stockpiled at a nearby subaqueous location that overlaps with the footprint of the engineered berm. The subaqueous stockpile area will temporarily impact an additional 1.27 acres adjacent to the engineered berms. Stones will be removed and replaced one stone at a time, with directed placement into the subaqueous stockpile and then later back on the engineered berm. The temporary subaqueous stockpile of existing armor stone may cause an additional disturbance to the bottom. The shallow depths present in the Project Area make it unlikely that whales would be present; therefore, effects on whales are discountable.

7.4 TURBIDITY AND WATER QUALITY IMPACTS

Dredging—Suspended sediment levels from conventional mechanical clamshell bucket dredging operations have been shown to range from 105 milligrams per liter (mg/L) in the middle of the water column to 445 mg/L near the bottom (210 mg/L, depth-averaged) (USACE 2001) in systems with less dynamic water currents. Furthermore, a study by Burton (1993) measured turbidity levels at 500, 1,000, 2,000, and 3,300 ft. from dredge sites in the Delaware River and was able to detect turbidity levels between 15 and 191 mg/L up to 2,000 ft. from the dredge site. Based on these analyses, elevated suspended sediment levels of up to 445 mg/L may be present in the immediate vicinity of the clamshell bucket, and suspended sediment levels of up to 191 mg/L could be present within a 2,000-ft radius from the location of the clamshell dredge. The area of elevated turbidity is expected to be substantially smaller at the PTST Project because sediments are primarily comprised of sand, and current velocities range from 2.5 to 3.2 knots (CBBT 2015). Materials excavated at the PTST Project will be disposed of at an existing upland disposal facility in accordance with the Project’s Dredged Material Management Plan. Material will be transported to disposal site via split hull scow and to the upland disposal site via barge or sealed, lined trucks. Material excavated by the TBM will be transported to Portal Island No. 1 via a conveyor system located in the tunnel for offsite disposal via barge and truck and will not have contact with aquatic habitat. No impacts to marine mammals are expected as a result of dredging. Water Quality Monitoring (WQM) has been taking place since summer of 2019. This occurs during all in-water construction activities and has never detected any elevated turbidity levels to date.

Pile Driving—The installation of piles will disturb bottom sediments and may cause a temporary increase in suspended sediment in the Action Area. Previous studies from systems with less dynamic water currents have shown that pile driving activities can produce total suspended sediment (TSS) concentrations of approximately 5.0-10.0 mg/L within approximately 300 ft of the pile being driven (FHWA 2012). The small resulting sediment plume is expected to settle out of the water column within a short period of time. Studies of the effects of turbid water on fish suggest that concentrations of suspended sediment can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton 1993). The TSS levels expected for pile driving (5.0-10.0 mg/L) are below those shown to have adverse effects on fish (580.0 mg/L for the most sensitive species, with 1,000.0 mg/L more typical; see summary of scientific literature in Burton 1993) and benthic communities (390.0 mg/L [EPA 1986]). The area of elevated turbidity is expected to be substantially smaller at the PTST Project because sediments are primarily comprised of sand, and current velocities range from 2.5 to 3.2 knots (CBBT 2015). Monitoring turbidity during pile driving activities is part of the water quality monitoring program for the project. No impacts to marine mammals as a result of localized, temporary changes to water quality are expected.
Removal and Placement of Armor Stone — There are no known studies that estimate the amount of suspended sediment created by the removal and placement of armor stone. However, this activity is not expected to create any more suspended sediment than pile driving or dredging, as described above. The area of elevated turbidity is expected to be substantially smaller at the PTST Project compared to the examples provided because sediments are primarily comprised of sand, and current velocities range from 2.5 to 3.2 knots (CBBT 2015). No impacts to marine mammals are expected.

Wastewater Treatment Plant Discharges—Discharges from the wastewater treatment plant will be discharged to HRSD and directly to the ocean side of the Project Area via a VPDES permit, managed in accordance with a discharge permit from VDEQ, and would comply with state and federal water quality criteria. Treated wastewater would be managed within required permit limits and is not expected to affect water quality or generate turbidity. No impacts to marine mammals are expected.

Containment Using Geotextile Bags—Containment of flowable fill during engineered berm construction will be completed using geotextile bags in the deepest areas of the berm footprint. Engineered (flowable) fill material will be placed within the sheet pile cell up to the required elevation. The engineered fill will be capped in sections with a flowable fill (cementitious mix) plug. The flowable fill will be placed in an enclosed steel frame or geotextile bag system using a tremie pipe. Geo-textile bags will be lowered to the sea bottom and anchored to the SOE Walls or Sea-Bottom, as applicable. The flowable fill will be pumped direct into the bags. The geotextile bags are the forms for the flowable fill. They are fitted with ribs that will ensure the expected layer thickness is maintained throughout the bags. The Flow for the flowable fill would start at 40 cy/hr. and up to 60 Cy/hr. No significant turbidity will be generated during the flowable fill placement since bags are made with a double wall to diminish the potential for turbidity and or damage to the bags. No impacts to marine mammals are expected.

Thermal Discharges—Water used to cool the TBM may be intermittently discharged into the Chesapeake Bay during periods of very hot weather. This discharge of non-contact cooling water will pass through a cooling tower located at the site before being discharged into the Bay at a temperature of 95 degrees Fahrenheit or less. The total volume of water discharged is expected to be approximately 260,000 gallons per event and will be discharged over several hours. These thermal discharges are expected to occur approximately three times during TBM operations and would only occur during the summer months. These discharges would be completed in accordance with a VPDES permit and would comply with state and federal water quality criteria.

Thermal discharges would be from a single point source via a multi-point diffuser and may cause elevated temperatures in a localized area around the discharges. However, given the strong currents and tidal activity in the area, this discharge is expected to mix with the Chesapeake Bay and only cause a minor, localized increase in water temperatures. A negligible amount of sediment resuspension may occur but given the currents and tidal flushing in the area, TSS levels will return to background levels within a short distance of the discharge point. However, given the limited number of releases expected and the tidal flushing and currents in the area, impacts to marine mammals are not expected.
7.5 IMPACTS TO PREY

Primary impacts to forage species would result from disturbance to the water column from construction activities (e.g., dredging, rock placement, pile driving) and from permanent and temporary fill of open water. Construction activities would result in the displacement of forage fish and the loss of benthos that they feed upon. Some areas of disturbance and fill will be temporary and would only have a temporary adverse effect on planktonic crustaceans, forage fish and their prey species. There would be 18.5 acres of permanently affected aquatic habitat. Of this, 1.3 acres would be permanently converted to upland habitat. This area of aquatic habitat loss is relatively minor when considered relative to the overall aquatic habitat in the lower Chesapeake Bay.

There are no hydrodynamic changes expected as a result of this Project. Since there are no changes to prevailing water currents, no changes to plankton presence or distribution in the Project area or region are expected. Water quality impacts are expected to be negligible because the Project area occurs in a high energy, dynamic area with strong tidal currents.

The pressure wave caused by pile driving could temporarily impact forage fish species, particularly those with a swim bladder. These species will likely avoid the Project Area during the time period when pile driving is occurring. The Project will continue to employ a soft start and ramp up of impact pile driving activities to allow mobile species to leave the area before impact pile driving occurs at full intensity.

7.6 CONCLUSIONS REGARDING IMPACTS TO SPECIES OR STOCKS

Sound resulting from pile driving during the construction process has the potential to impact marine mammals. Mitigative measures such as the use of an impact hammer and Vibratory hammer with a bubble curtain will be used to reduce the impact of construction noise in the Project Area.

Marine mammals that are present in the lower Chesapeake Bay during construction activities are expected to avoid the disturbance and activity associated with construction. Given the preference of fin whales, humpback whales, and the North Atlantic right whales for water deeper than is found in the Project Area and their rare presence in the Chesapeake Bay, their presence in the construction area is unlikely. Whales have been observed in the deeper waters in the area. Bottlenose dolphins, harbor porpoises, and seals may use shallower areas within the Action Area; however, they are highly mobile and able to avoid the construction activity. Construction activity within open water will be located adjacent to Portal Island Nos. 1 and 2, and the use of the bored method for construction will prevent open water impacts in the areas more likely to be used by whale species. Given the feeding habits of whales, they are unlikely to be attracted to the portal islands and are not expected to venture into shallower construction areas. Bottlenose dolphins and harbor porpoises are also expected to avoid disturbance from construction activity in the Project Area. Reduced vessel speeds in the Project Area will protect marine mammals from potential ship strikes.

Omega trestle, containment structure, and other in-water construction adjacent to the portal islands has the potential to impact the use of the portal islands by harbor seals and gray seals as...
haul out areas. The impact is expected to be temporary and is not expected to result in the permanent abandonment of the area.

7.7 Negligible Impact Analysis and Determination

During the review of the 2019 authorized IHA, NMFS concluded a Negligible Impact Analysis and Determination. The findings are below:

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 harassments 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 harassments 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).

Pile driving activities associated with the planned PTST 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 harassments could occur if individuals are present in the ensonified zone when pile driving occurs. Level A harassment is only anticipated for harbor porpoises, harbor seals, and gray 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 planned mitigation measures. Specifically, vibratory driving, impact driving, and drilling with DTH hammers will be the primary methods of installation and pile removal will occur with a vibratory hammer. Impact pile driving produces short, sharp pulses with higher peak levels and much sharper rise time to reach those peaks. When impact and vibratory pile driving is used, implementation of bubble curtains, soft start and shutdown zones significantly reduces any 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.

The use qualified Protected Species Observers (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 on a specific Portal Island...
whenever pile driving operations are underway at that location. More than one PSO may be stationed on an island in order to provide a relatively clear view of the shutdown zone and monitoring harassment zones. These factors will limit exposure of animals to noise levels that could result in injury.

CTJV'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 required 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, based on 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 like this one are also believed to result in multiple harassments 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 bottlenose dolphins, harbor porpoises, harbor seals and gray seals may sustain some limited Level A harassment in the form of auditory injury. However, animals (such as bottlenose dolphins) that experience PTS 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 preliminary 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 (bottlenose dolphins, harbor porpoises, harbor seals, and gray seals) are anticipated to result only in slight PTS, within the lower frequencies associated with pile driving.

- 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 ensonified areas are very small relative to the overall habitat ranges of all species and does not include habitat areas of special significance (BIAs or ESA-designated critical habitat); and

- The presumed efficacy of the required 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 preliminarily finds that the total marine mammal take from the planned activity will have a negligible impact on all affected marine mammal species or stocks.

7.8 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.

Authorized take of marine mammal stocks comprises less than 3.8 percent of the Western North Atlantic harbor seal stock abundance, and less than one percent of the other stocks, except for bottlenose dolphin stocks. There are three bottlenose dolphin stocks that could occur in the project area. Therefore, the estimated 86,656 dolphin harassments by Level B harassment would likely be split 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, CTJV estimated that there would be 200 Level B and 0 Level A harassments from the NNCES stock, with the remaining harassments split evenly between the northern and southern migratory coastal stocks. No Level A takes are being requested for bottlenose dolphins in the application.
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 the Bay. Most 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 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 in the vicinity of the 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 harassments 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 km², while the NNCES stock occupies over 8,000 km² (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 like a small resident community of NNCES dolphins that inhabits the Chesapeake Bay year-round (Patterson, 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 (Mann, pers. comm.). Multiple sightings of the same individual would considerably reduce the number of individual animals that are taken by harassment. Furthermore, the existence of a resident dolphin population in the Bay would increase the percentage of dolphin harassments that are re-sightings of the same individuals.

In summary and as described above, the following factors primarily support our preliminary determination regarding the incidental take of small numbers of a species or stock:

- Potential bottlenose dolphin harassments 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 Bay.

- The 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 harassments would be repeats of the same animal and it is likely that several individual animals could be taken multiple times.

Under the Previous IHA, issued by NOAA on March 10, 2020, PSOs were on site for 108 days to observe both upland and in-water pile driving activities. Of those 108 days, only 64 were used for in-water pile driving activities. At no time during both upland and in-water pile driving did PSOs observe any Level A exposures to marine mammals. On two separate days, a total of 5 Level B takes occurred for bottlenose dolphins. Given this data, the CTJV determined that of the takes requested, only a small fraction of them would actually be used.

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

7.9 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 previously determined that the total taking of affected species or stocks should not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

7.10 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 review CTJV’s action (i.e., the issuance of incidental harassment authorizations) with respect to potential impacts on the human environment. This action is consistent with categories of activities identified in
Categorical Exclusion B4 (incidental harassment authorizations with no anticipated serious injury or mortality) of the Companion Manual for NOAA Administrative Order 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 has previously determined that the issuance of this IHA to CTJV qualifies to be categorically excluded from further NEPA review.

7.11 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 ensure 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 species is authorized or expected to result from this activity. NMFS has previously determined that formal consultation under section 7 of the ESA are not required for this action.

8. ANTICIPATED IMPACTS ON SUBSISTENCE USES

No impacts to subsistence uses are expected. There are no known subsistence uses of marine mammals in the vicinity of the PTST Project Area.

9. MITIGATION MEASURES

9.1 GENERAL CONSTRUCTION MITIGATION

This Project serves to address/enhance vehicle transportation safety, and facilitate traffic crossing the Chesapeake Bay at the location of the existing Thimble Shoal Tunnel. Impacts, both temporary (during construction) and permanent have been minimized by choosing the bored tunnel versus the immersed tube tunnel construction method. However, some impacts to the Chesapeake Bay cannot be avoided while meeting the Project purpose. Through the selection of a bored tunnel approach, which modified the construction methods from an immersed tube tunnel construction method. However, some impacts to the Chesapeake Bay cannot be avoided while meeting the Project purpose. Through the selection of a bored tunnel approach, which modified the construction methods from an immersed tube tunnel for the Project, the total in-water impact for the Project was reduced from 59 acres to 13.8 acres. The total temporary in-water impacts for the Project will also be reduced as there will be substantially less dredging. The reduced bored tunnel footprint stays within the environmental study area and after the Project is completed and temporarily impacted areas would be returned to their original conditions to the maximum extent possible. Direct disruption to the federal navigation channel would be substantially reduced or eliminated.

In addition to reducing the in-water impact area for the Project, the District has sought to minimize other impacts associated with the Project through the implementation of construction
best management practices and specific measures designed to reduce aquatic impacts. These measures include:

- Implementation of shutdown zones for marine mammals during in-water construction activities to avoid physical injury to marine mammals. This zone will be monitored by onsite by the construction supervisors and crews, PSOs, and relevant All project staff and Subconsultant’s must avoid direct physical interaction with marine mammals during construction activity. If a marine mammal comes within the shutdown zone of such activity, operations must cease and vessels must reduce speed to the minimum level required to maintain steerage and safe working conditions, as necessary to avoid direct physical interaction. Observations of marine mammals within a shutdown zone of in-water construction activities will be reported to the onsite construction supervisor. All construction personnel have undergone Project-specific training on these protocols.

- Containment of upland impacts:
  - Erosion and sediment controls implemented under the Virginia Erosion and Sediment Control Program.
  - Purchase of 5.11 pounds of phosphorus credits to reduce loading from Portal Island Nos. 1 and 2 by 20 percent.
  - Use of a package wastewater treatment plant on Portal Island No. 1 prior to discharge of wastewater in accordance with a VDPES permit.
  - Discharge of process waters to the HRSD sanitary sewer system following HRSD requirements.
  - Implementation of a Stormwater Pollution Prevention Plan and Spill Prevention Control and Countermeasure plan.
  - Construction and post-construction compliance with the Virginia Stormwater Management Program.

- Angling of construction lighting toward the island along with use of acorn-shaped lenses and 360-degree top shields around LED lightbulbs to minimize impacts to sea turtles and other aquatic life.

- During Berm Construction:
  - Dredging will be performed by mechanical means using clamshell or excavator instead of hydraulic dredging which could entrain marine life.
  - Placement of engineered/flowable fill within a containment structure or large geotextile bags and use of tremie pipes to directly place flowable fill within containment structure.
For the deepest portion of the flowable fill operation outside the sheet piling area and where forms are not feasible, flowable fill will be placed by means of low permeability (~0.66 cy/minute) bags made of geotextiles that will minimize turbidity while filling with the flowable fill.

Use of DTH hammer technology to directly drill through existing rock/armor stone will eliminate the need to remove and relocate stone to a subaqueous stockpile area, thus eliminating bottom impact and disturbance to adjacent subaqueous bottom.

Implementation of a Water Quality Monitoring Plan during in-water berm construction activities.

- During Dredging and Placement Activities:
  - Use of mechanical dredging instead of hydraulic, which reduces localized turbidity and potential entrainment of aquatic organisms.
  - Prevention of overfilling of bucket to minimize additional loss of material during ascent through the water column.
  - Verification that the bucket is completely closed prior to raising it to the surface.
  - If the bucket is not closed completely because of debris or obstructions, the operator will not drop the load at the water surface to dislodge the debris but will complete the dredge pass and place the debris on the barge or scow.
  - Pausing of the bucket after ascent through the water column to allow free water to drain prior to swinging the bucket to the barge.
  - Reduction of the bucket ascent rate, which reduces loss of residuals from the clamshell bucket.
  - Implementation of an approved Water Quality Monitoring Plan during dredging activities.
  - Dredged material will be disposed of at an approved offsite upland location via sealed trucks with mud locks or barges.
  - Because the dredging is expected to be conducted mechanically (bucket dredge), it is not anticipated that monitoring and precautions necessary to protect sea turtles will be required.

- During Tunnel Excavation Activities:
- Non-contact cooling water for the TBM will be recycled via a closed loop system throughout the tunneling process. Two to three times during the summer season, warm cooling water may need to be discharged to surface waters in accordance with VPDES permit conditions.

- Excavated material will be removed from the tunnel at a thick consistency (paste-like) via a conveyor system and placed directly into either a containment system or directly to barges. Decant water from the containment cell will be routed into the on-island water treatment system.

- The conveyor system will be completely enclosed which will eliminate material exposure to rain events during conveyance and will contain any spills. When directed to the conveyor dock, the conveyor will transport the material directly to a barge that will be positioned at the temporary dock.

- Construction materials (excavated tunnel material and jet grout residuals) will be disposed of at approved offsite upland locations and transported via lined trucks or barges.

- Tunneling will be temporarily ceased if for any reason excavated material management and process water management and disposal cannot keep pace with tunneling progress.

- During Pile Installation:
  
  - Installation of hollow steel pipe piles using a combination of DTH hammer through existing stone, followed by impact hammer to the target tip elevation.
  
  - Installation of 36 & 42-inch hollow steel pipe pile will be by vibratory or impact hammer with bubble curtain.
  
  - Minimization of underwater pressure waves from pile driving:
    
    - Implementing a ramp up/soft start protocol during use of an impact hammer to allow mobile marine organisms more time to avoid the marine mammal harassment zones of impact.
  
- Soft Start: The use of soft-start procedures is believed to provide additional protection to marine mammals by providing warning and/or giving marine mammals a chance to leave the area prior to the hammer operating at full capacity.

  - For impact pile driving, provide an initial set of strikes from the hammer at reduced energy, with each strike followed by a 30-second waiting period. This procedure shall be conducted a total of three times before impact pile driving begins.
- Soft start shall 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.
- Soft start is not required during vibratory or DTH pile driving activities.

- Use of bubble curtains system is implemented during impact and vibratory driving of 36 and 42-in steel piles, except in water less than 10 ft. in depth. The use of this sound attenuation device will reduce SPLs and the size of the harassment zones of influence for Level A and Level B harassment. 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.
  - For situations on the berm construction, where there can only be 3 sides of the pile in bubble (for the progression of the interlocked pipe piles) CTJV has previously had 3-sided bubble curtain design approved by NOAA and USACE (Figure 10; Appendix A).
  - The lowest bubble ring shall 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 shall ensure 100 percent mudline and/or rock bottom contact. No parts of the ring or other objects shall prevent full mudline and/or rock bottom contact.
  - The bubble curtain shall be operated such that there is proper (equal) balancing of air flow to all bubblers.
  - The applicant shall require that construction contractors train personnel in the proper balancing of air flow to the bubblers and corrections to the attenuation device to meet the performance standards. This shall occur prior to the initiation of pile driving activities.

- Pre-Activity Monitoring:
  - Begins prior to the start of daily in-water construction activity, or whenever a break in pile driving of 30 minutes or longer occurs, PSOs will observe the shutdown and harassment monitoring zones for a period of 30 minutes.
  - The shutdown zone will be cleared when a marine mammal has not been observed within the zone for that 30-minute period.
  - If a marine mammal is observed within the shutdown zone, a soft start cannot proceed until the animal has left the zone or has not been observed for 15 minutes.
  - If the Level B harassment zone has been observed for 30 minutes and non-permitted species are not present within the zone, soft start procedures can
commence, and work can continue even if visibility becomes impaired within the Level B harassment monitoring zone.

- When a marine mammal permitted for take by Level B harassment is present in the Level B harassment zone, activities may begin, and Level B harassment take will be recorded.

- If work ceases for more than 30 minutes, the pre-activity monitoring of both the Level B harassment and shutdown zone will commence again.

- Implementation of an MMMP during pile driving activities.

### 9.2 MONITORING AND SHUTDOWN OF DISTURBANCE ZONES

The following measures would apply to CTJV’s mitigation requirements: Establishment of Shutdown Zone—For all pile driving and drilling activities, CTJV would establish a shutdown zone. The purpose of a shutdown zone is generally to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). These shutdown zones would be used to prevent incidental Level A harassment from pile driving. Shutdown zones for species proposed for authorization are as follows: • 200 meters for harbor porpoise and bottlenose dolphin. • 150 meters for harbor seal and gray seal. • For humpback whale, shutdown distances are shown in Table 12 under low-frequency cetaceans and are dependent on activity type. Establishment of Monitoring Zones for Level A and Level B Harassment—CTJV would establish monitoring zones based on calculated Level A harassment isopleths associated with specific pile driving activities and scenarios. These are areas beyond the established shutdown zone in which animals could be exposed to sound levels that could result in Level A harassment in the form of PTS.

The proposed Level A (Shutdown Zone) and Level B ZOI (Table 21) will be monitored during all phases of construction.

**Table 21: Required Shutdown Zone Actions During Construction**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Shutdown Action During Project Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fin whale</td>
<td>Shutdown if observed approaching or within ZOIs A or B</td>
</tr>
<tr>
<td>Humpback whale</td>
<td>Shutdown if observed approaching or within Level A ZOI</td>
</tr>
<tr>
<td>North Atlantic right whale</td>
<td>Shutdown if observed approaching or within ZOIs A or B</td>
</tr>
<tr>
<td>Bottlenose dolphin</td>
<td>Record takes for Level B, Shutdown if observed approaching 200 meters</td>
</tr>
</tbody>
</table>

Chesapeake Tunnel Joint Venture  
Virginia Beach, Virginia  
Request for an Incidental Harassment Authorization  
Parallel Thimble Shoal Tunnel Project
9.3 MARINE MAMMAL OBSERVATION AND PROTECTION

Observations shall be conducted onsite during pile driving activities. Observers will have the authority to shut down pile driving activities if marine mammals are observed entering the designated shutdown harassment zones. Monitoring shall be conducted by NMFS-approved Protected Species Observers (PSO). Trained observers shall be placed from the best vantage point(s) practicable to monitor for marine mammals and implement shutdown or delay procedures when applicable through communication with the equipment operator. For the work covered under this IHA, PSOs will be located on the end of the fishing pier and from land near Fort Story in Virginia Beach, to observe all impacted areas for pile driving on Island 1. On Portal Island 2, the PSOs will be located on the trestle and from land near Fort Story in Virginia Beach, to observe pile driving on Island 2. When there is driving occurring on both islands, there will be PSOs located on both islands, in the areas mentioned above. Figure 19, Appendix A shows locations that POSs will be located.

Observer training must be provided prior to project start, and shall include instruction on species identification (sufficient to distinguish the species in the project area), description and categorization of observed behaviors and interpretation of behaviors that may be construed as being reactions to the specified activity, proper completion of data forms, and other basic components of biological monitoring, including tracking of observed animals or groups of animals such that repeat sound exposures may be attributed to individuals (to the extent possible).

Monitoring shall be conducted 30 minutes before, during, and 30 minutes after pile driving activities. In addition, observers shall record all incidents of marine mammal occurrence, regardless of distance from activity, and shall document any behavioral reactions in concert with distance from piles being driven. Pile driving activities include the time to install a single pile or series of piles, if the time elapsed between uses of the pile driving equipment is no more than 30 minutes.

CTJV shall be required to station PSOs at locations offering the best available views of the monitoring harassment zones. At least one PSO must be in close proximity to each pile driving rig during active operation of single or multiple, concurrent driving devices. A minimum of one additional PSOs is required at each active driving rig if the Level B harassment zone and shutdown zones cannot reasonably be observed by one PSO.
PSOs shall scan the waters using binoculars, and/or spotting scopes, and shall use a handheld GPS or range-finder device to verify the distance to each sighting from the project site. All PSOs shall be trained in marine mammal identification and behaviors and are required to have no other project-related tasks while conducting monitoring. In addition, monitoring will be conducted by qualified observers, who will be placed at the best vantage point(s) practicable to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the hammer operator. CTJV shall adhere to the following PSOs qualifications:

- Independent observers (i.e., not construction personnel) are required.
- At least one observer must have prior experience working as an observer.
- Other observers may substitute education (degree in biological science or related field) or training for experience.
- Where a team of three or more observers are required, one observer shall be designated as lead observer or monitoring coordinator. The lead observer must have prior experience working as an observer.
- CTJV shall submit observer CVs for approval by NMFS.

Additional standard observer qualifications include:

- 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 and times when in-water construction activities were suspended to avoid potential incidental injury from construction sound of marine mammals observed within a defined shutdown zone; and marine mammal behavior; and
- 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.

Observers will be required to use approved data forms. Among other pieces of information, CTJV shall keep recorded detailed information about any implementation of shutdowns, including the distance and direction of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any. PSOs shall attempt to distinguish between the number of individual animals taken and the number of incidences of take. Required sighting forms shall include the following information be collected:

1. Dates and times (begin and end) of all marine mammal monitoring.

2. Construction activities occurring during each daily observation period, including: The number and type of piles that were driven and the method (e.g., impact, vibratory, down-the-hole).
3. Total duration of driving time for each pile (vibratory driving) and number of strikes for each pile (impact driving); and for down-the-hole drilling, duration of operation for both impulsive and non-pulse components.

4. PSO locations during marine mammal monitoring.

5. Environmental conditions during monitoring periods (at beginning and end of PSO shift and whenever conditions change significantly), including Beaufort Sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance.

6. Upon observation of a marine mammal, the following information:
   - Name of PSO who sighted the animal(s) and PSO location and activity at time of sighting.
   - Time of sighting.
   - Identification of the animal(s) (e.g., genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species.
   - Distance and location of each observed marine mammal relative to the pile being driven for each sighting.
   - Estimated number of animals (min/max/best estimate).
   - Estimated number of animals by cohort (adults, juveniles, neonates, group composition, etc.).
   - Animal’s closest point of approach and estimated time spent within the harassment zone.
   - Description of any marine mammal behavioral observations (e.g., observed behaviors such as feeding or traveling), including an assessment of behavioral responses thought to have resulted from the activity (e.g., no response or changes in behavioral state such as ceasing feeding, changing direction, flushing, or breaching).
   - Number of marine mammals detected within the harassment zones, by species; and
   - Detailed information about implementation of any mitigation (e.g., shutdowns and delays), a description of specific actions that ensued, and resulting changes in behavior of the animal(s), if any.

A detailed MMMP is provided in Appendix B.

10. ARCTIC SUBSISTENCE PLAN OF COOPERATION

The Project is not located in the Arctic; therefore, this is not applicable.
11. MONITORING AND REPORTING

11.1 MONITORING PLAN

A MMMP developed for this project is provided in Appendix B. This plan will be implemented during in-water pile driving activities.

11.2 REPORTING

A draft report shall be submitted to NMFS within 90 days of the completion of marine mammal monitoring, or 60 days prior to the requested date of issuance of any future IHA for projects at the same location, whichever comes first. The report will include marine mammal observations pre-activity, during-activity, and post-activity during pile driving days (and associated PSO data sheets) and will also provide descriptions of any behavioral responses to construction activities by marine mammals and a complete description of all mitigation shutdowns and the results of those actions and an extrapolated total take estimate based on the number of marine mammals observed during construction. A final report must be submitted within 30 days following resolution of comments on the draft report. The report will include:

- Summary of the activity (dates, times, and specific locations)
- Summary of mitigation implementation
- Detailed monitoring results and a comprehensive summary addressing goals of monitoring plan, including:
  - Number, species, and any other relevant information regarding marine mammals observed and estimated exposed/taken during activities
  - Description of the observed behaviors (in both presence and absence of activities)
  - Environmental conditions when observations were made
- Assessment of the implementation and effectiveness of prescribed mitigation and monitoring measures.

11.2.1 Reporting Injured or Dead Marine Mammals

If personnel involved in the construction activities discover an injured or dead marine mammal, CTJV shall 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. 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.

12. SUGGESTED MEANS OF COORDINATION

The data recorded during the MMMP for the proposed project will be provided to NOAA Fisheries with the completion of the monitoring report. This report will provide detailed information on the use of the site by fin whales, humpback whales, North Atlantic right whales, bottlenose dolphins, harbor porpoises, harbor seals, and gray seals. Information on any other species of marine mammal encountered at the Project site will also be included. This report will also provide NOAA Fisheries—as well as future applicants—information about the reaction of these species to these types of activities.
13. REFERENCES


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Appendix A: Model Screenshots
Appendix B: Marine Mammal Monitoring Plan
Appendix C: JASCO Sound Source Characterization of Down-the-Hole Hammering Report