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

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CONTENTS

APPENDECIES

Appendix A –Figures

Appendix B – Marine Mammal Monitoring Plan

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

CBBT	Chesapeake Bay Bridge-Tunnel
CTJV	Chesapeake Tunnel Joint Venture
dB	decibel
dB re 1µPa^{2}sec	decibels reference level 1 micropascal squared per second
District	Chesapeake Bay Bridge and Tunnel District
DQM	National Dredging Quality Management System
DTH	Down-the-hole
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FE	Federally Endangered
FR	Federal Register
GARFO	Greater Atlantic Regional Fisheries Office
HRSD	Hampton Roads Sanitation District
Hz	Hertz
IHA	Incidental Harassment Authorization
IWC	International Whaling Commission
JGR	Jet grout residuals
kHz	Kilohertz
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water
MMMP	Marine Mammal Monitoring Plan
MMPA	Marine Mammal Protection Act
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	NOAA National Marine Fisheries Service
NODS	Norfolk Ocean Disposal Site
PSO	Protected Species Observer
PTS	Permanent Threshold Shift
PTST	Parallel Thimble Shoal Tunnel
RMS SPL	Root mean squared sound pressure level
SE	State Endangered
SEL_{CUM}	Cumulative sound exposure level
SPL_{PEAK}	Peak sound pressure level
TBM	Tunnel boring machine
TSS	Total suspended sediment
USACE	U.S. Army Corps of Engineers
VDEQ	Virginia Department of Environmental Quality
VMRC	Virginia Marine Resources Commission
VPDES	Virginia Pollution Discharge Elimination System
ZOI	Zone of Impact

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. This consists of installing in-water piles 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 have already been completed. The actual boring of the tunnel and associated infrastructure are all that remain. Remaining work requiring an IHA is the removal of 158- 36” mooring and trestle piles.

An IHA is necessary as the pile removal 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 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. In accordance with 101(a)(5)(D) of the MMPA, an IHA may be granted to 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. The CTJV is here in accordance with the MMPA, respectfully submitting this IHA.

This IHA application follows the guidance and guidelines provided by NOAA (NOAA Fisheries 2015a). This 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 and provides sound thresholds for Level A and B harassment, and a methodology for calculating the distance from the activity that these sound thresholds are expected to be exceeded.

This IHA application, submitted by the CTJV, requests harassments for five species of marine mammals by Level B harassment: harbor seals (*Phoca vitulina*), gray seals (*Halichoerus grypus*), humpback whale (*Megaptera* novaeangliae), harbor porpoises (*Phocoena phocoena*) and

bottlenose dolphin (*Tursiops spp.*). The CTJV also requests takes for three species of marine mammals by Level A harassment: harbor seals (*Phoca vitulina*), gray seals (*Halichoerus grypus*), and harbor porpoises (*Phocoena phocoena*). The takes requested are associated with in-water round pile (36- inch diameter hollow steel) removal. Fin whales (*Balaenoptera physalus*) and North Atlantic right whales (*Eubalaena glacialis*) are expected to be rare at the PTST Project Area; therefore, no Level A or Level B harassments are requested for these species. Pile extraction operations will cease if individuals of these species are observed within the Level A or Level B harassment zones of impact.

Please Note:

The previous IHA Renewal application was submitted by the CTJV in September 2022 and an IHA Renewal was issued by NOAA with an effective date of 08 November 2022. This new IHA application was prepared to include quantities of piles and size that need to be removed subsequent to the piles installed under CTJV's previous IHAs. This new IHA application includes construction activities that are expected to be completed during the 12-month period from 01 January 2024 through 31 December 2024. Clarifications of remaining works are provided below in Section 1.3 and 2.2.

1.2 PURPOSE AND NEED

The purpose and need of the PTST Project are to:

- Address existing constraints to regional mobility based on current traffic volume along the Chesapeake Bay Bride-Tunnel (CBBT) facility
- Improve safety by minimizing one lane, two-way traffic in tunnel.
- Improve the ability to conduct necessary maintenance with minimal impact to traffic.
- Ensure a reliable southwest hurricane evacuation route for the residence of the eastern shore and/or northern evacuation route for residents of the eastern shore, Norfolk, and Virginia Beach.

Design and construct the Project to improve mobility with sufficient capacity to accommodate anticipated increases in traffic volumes, minimize lane closures due to oversized loads and ordinary maintenances, support economic vitality between the Eastern Shore and the rest of the Commonwealth, and enhance corridor safety over the 100-year projected life expectancy of the proposed structure.

1.3 PROJECT DESCRIPTION

The PTST Project consists of the construction of a two-lane parallel tunnel to the west of the existing Thimble Shoal Tunnel, connecting Portal Island Nos. 1 and 2 (Figure 1). All pile installation was completed under previous authorized IHAs. The pile removal requested in this application will occur in waters ranging in depth from less than 3 feet near the shore to approximately 28 feet, depending on the structure and location. Most of the piles will be in water depths of 12 to 15 feet.

Upon completion of the project, 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 were barged and trucked to Portal Island No. 1 and assembled within an entry/launch portal that was constructed on Portal Island No. 1. The machine both excavates material and constructs 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 is being transported offsite using a combination of trucks and barges and disposed of at an approved off-site, upland facility in accordance with the Dredged Material Management Plan (DMMP).

Precast concrete tunnel segments are transported to the TBM for installation. The TBM assembles 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.

A description of pile removal activities considered in this IHA request are provided Table 1.

1.4 ACTIVITIES TO BE COMPLETED DURING CALENDAR YEAR OF REQUESTED IHA

Below are the detailed description of the construction activities anticipated to take place during the 1-year time frame of the requested IHA. All work anticipated to be completed prior to the issuance of this IHA request or after the one-year duration of IHA have been omitted from this application.

1. The removal of 36” hollow steel piles on the temporary dock and trestle (97 total on Portal Island No.1).

2. The removal of 36” hollow steel piles on the trestle (34 total on Portal Island No.2).

3. The removal of 36" hollow steel mooring piles on both Island 1 & 2 (9 piles on Portal Island No. 1 and 18 total on Portal Island No. 2).

Pile removal will be conducted by initially using an impact hammer to break the friction on the previously installed piles, then switch to a vibratory hammer for extraction. If the pile cannot be removed with this method, the pile will then be cut off a minimum of three feet below the stabilized, post construction sediment-water interface per USACE Section 408 requirements.

The anticipated pile removal schedule for the period of January 2024 till December 2024 is provided in Table 1.

Table 1: Anticipated Pile Installation Schedule (January 2024 till December 2024)

Line	Pile Location	Pile Function	Pile Type	Installation/ Removal Method	Bubble Curtain Yes/No	Number of Piles Below MHW	Number of Days per Activity (Total)	Number of Piles/ Days per Activity (Per Hammer Type)	Anticipated Installation Date
1	Portal Island No. 1	Mooring dolphins	36-inch Diameter Hollow Steel Pipe Pile	Impact (if needed)	Yes	9	5	(2 Piles/Day)	**1 January through 28 February 2024**
				Vibratory (Removal)	Yes		5	(2 Piles/Day)	
2	Portal Island No. 1	Temporary Dock/ Trestle	36-inch Diameter Hollow Steel Interlocked Pipe Piles	Impact (if needed)	Yes	97	*49*	(2 Piles/Day)	**1 January through 30 April 2024**
				Vibratory (Removal)	Yes		*49*	(2 Piles/Day)	
3	Portal Island No. 2	Mooring dolphins	36-inch Diameter Hollow Steel Pipe Pile	Impact (if needed)	Yes	18	*9*	*(2 Piles/Day)*	**December 1-31, 2024**
				Vibratory (Removal)	Yes		*9*	(2 Piles/Day)	
4	Portal Island No. 2	Omega Trestle	36-inch Diameter Hollow Steel Interlocked Pipe Piles	Impact (if needed)	Yes	34	*17*	*(2 Piles/Day)*	**December 1-31, 2024**
				Vibratory (Removal)	Yes		*17*	*(2 Piles/Day)*	

For the calendar year of construction activity authorized in this IHA, it is assumed that none of the pile removal will be simultaneous. Removal will begin on Portal Island 1in January 2024 for 54 days then will not resume on Portal Island 2 until December 2024 for 26 days. Therefor no pile removal work will take place for 7 months of 2024 (May 1st - November 30th, 2024).

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 1 for the anticipated pile removal 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
  - Tunnel boring activities and placement of pre-cast tunnel sections within the design alignment.
  - 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
  - Completion of the PTST and roadway structures/connection between Portal Island Nos. 1 and 2.
  - Road resurfacing on Portal Island Nos. 1 and 2.
  - Construction of new buildings/structures associated with stormwater and facilities management of the portal islands and final tunnel structures.
  - Installation of new security fencing, installation of parking areas and adjacent bollards.
  - Replacement of decking at the fishing pier and limited substructure repair (if inspections deem it needed) at Portal Island No. 1.
  - Removal of temporary dock & trestle, piles, and moorings.

In-water activities occurring under the coverage of this IHA are limited to Island 2 jet grouting of the organic layer (Phase II), tunnel boring activities and management/ transport of TBM material via barge (Phase III) and removal of temporary dock and trestle, piles, and moorings (Phase IV). It is not anticipated that any additional in-water work will take place after pile removal is completed.

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. 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 2-3). 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 2).

Table 2 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 (2018). 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.

Table 2: Marine Mammal Species Known to Occur Within The CTJV Project Area

Species	Scientific ID	Stock Area	Nest	Nest CV	Nmin	Rmax	Fr	PBR	Total Annual M/SI	Annual Fish. M/SI (CV)	Strategic Status	NMFS Ctr.
Order Cetartiodactyla - Cetacea - Superfamily Mysticeti (baleen whales)												
Family Balaenidae												
North Atlantic Right Whale **7**	Eubalaena glacialis	Western North Atlantic	338	0	332	0.04	0	0.7	31.2 **a**	22 **a**	Y	NEC
Family Balaenopteridae (rorquals)												
Humpback Whale **5**	Megaptera novaeangliae	Gulf of Maine	1396	0	1380	0.065	1	22	12.15	7.75	N	NEC
Fin Whale **7**	Balaenoptera physalus	Western North Atlantic	6802	0.24	5573	0.04	0	11	1.8	1.4	Y	NEC
Superfamily - Odontoceti (toothed whales, dolphins, and porpoises)												
Family Delphinidae												
Bottlenose Dolphin	Tursiops truncatus	Western North Atlantic, Northern Migratory Coastal	6639	0.41	4759	0.04	1	48	12.2-21.5	12.2-21.5	Y	SEC
Bottlenose Dolphin	Tursiops truncatus	Western North Atlantic, Southern Migratory Coastal	3751	0.6	2353	0.04	1	24	0-18.3	0-18.3	Y	SEC
Bottlenose Dolphin	Tursiops truncatus	Northern North Carolina Estuarine System	823	0.06	782	0.04	1	7.8	7.2-30	7.0-29.8	Y	SEC
Family Phocoenidae (porpoises)												
Harbor Porpoise	Phocoena Phocoena	Gulf of Maine, Bay of Fundy	95543	0.31	74034	0.046	1	851	164	163 (0.13)	N	NEC
Order Carnivora - Superfamily Pinnipedia												
Family Phocidae (earless seals)												
Harbor Seal	Western North Atlantic	Western North Atlantic	61336	0.08	57637	0.12	1	1729	339	334 (0.09)	N	NEC
Gray Seal **6**	Halichoerus grypus	Western North Atlantic	27300	0.22	22785	0.128	1.0	1458	4453	1169 (0.10)	N	NEC

a. - Total annual average observed North Atlantic Right Whale mortality during the period 2016-2020 was 8.1animals and annual average observed fishery mortality was 5.7 animals. Numbers presented in this table (31.2 total mortality and 22 fishery mortality) are 2015-2019 estimated annual means, accounting for undetected mortality and serious injury.

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 on the basis of 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.

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 2 are the most recent available at the time of publication.

3.1 Species Not Expected To Be Incidentally Taken

All species that could potentially occur in the planned survey areas are included in Table 4. However, the temporal and/or spatial occurrence of North Atlantic right whale and fin whale is such that harassment takes are not expected to occur, and they are not discussed further beyond the explanation provided here.

Between 1998 and 2013, there were no reports of North Atlantic right whale strandings within the Chesapeake Bay and only four reported standings 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 harassment 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 has been documented this 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 downlisted from endangered to threatened; however, this downlisting 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, 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). Currently, 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 al. 2000). The mid-Atlantic region has been identified as a primary migratory corridor for North Atlantic right whales (Knowlton et al. 2002; Firestone et al. 2008). Seasonal north-south migration of the Western stock occurs between feeding and calving areas, but North Atlantic right whales could be seen anywhere off the Atlantic U.S. throughout the year (Hayes et al. 2019). Seasonal occurrence of right whales in mid-Atlantic waters is normally during November through April, with peaks in December and April (Winn et al. 1986; Firestone et al. 2008) when whales are migrating to and from breeding/feeding grounds.

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 month of January- March. However, no survey data is available for the summer months, as whales are not expected to be present at that time.

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 of Ft. Story), and two were stranded in Maryland near Ocean City (NOAA Fisheries 2015b). All of 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 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 because 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 Carolina (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 life span 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 haul out 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 hauled outs (<6 percent of total sightings). The majority of hauled out 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). Haul out 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 pinnepeds 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, CTJV is requesting an IHA for the non-lethal take by harassment of small numbers of marine mammals, incidental to in-water pile removal associated with the Project. CTJV is requesting an IHA for the incidental Level B harassment of five marine mammal species: harbor seal, gray seal, bottlenose dolphin, harbor porpoise, and humpback whale; and Level A harassment of three species: harbor seal, gray seal and harbor porpoise. Level A and Level B harassment may result due to noise from in-water pile removal using impact and vibratory extraction. 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 January 2024 to December 2024.

5.2 TAKE AUTHORIZATION REQUEST

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 removal.

The noise created during the removal of piles has been calculated using the exposure to both underwater and airborne sound disturbance. Zones of Impact (ZOI)s for harassment have been calculated according to the 2016-2020 NOAA guidance and as described in Section 6.

If any marine mammal species without an authorized take appears to be crossing into the Level A ZOIs, pile removal activities will cease immediately until the animal(s) depart on their own. If North Atlantic right whale or fin whale appear to be crossing into the Level B ZOI, in-water pile removal activities will cease immediately until the animal(s) depart the ZOI on its (their) own.

The methodology described in Section 6 estimates potential noise exposures of marine mammals resulting from pile removal in the marine environment by vibratory and impact hammers. Modeling of potential exposures estimates tends to overestimate exposures because all animals are assumed to be available to exposure while piles are being 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 harassment most likely to occur is that associated with Level B harassment as the result of noise from pile removal. No serious injury or lethal takes are expected because of the proposed pile 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 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 harassment and the use of bubble curtains for steel pipe piles located in deeper waters (greater than 10 feet) removed with impact and vibratory hammers. These mitigation measures decrease the likelihood that marine mammals will be exposed to SPLs that could cause harassment. Table 3 summarized the actions that will be implemented if a marine mammal is encountered.

Table 3: Summary of Marine Mammals and Action During Project Activity

Common Name	Scientific Name	Status*	Take Requested	Action during Project Activity
Fin whale	*Balaenoptera physalus*	FE/SE	No	Shutdown if observed approaching or within ZOIs A or B
Humpback whale	*Megaptera novaeangliae*		Yes	Record take for Level B; Shutdown if observed approaching or within Level A ZOI
North Atlantic right whale	*Eubalaena glacialis*	FE/SE	No	Shutdown if observed approaching or within ZOIs A or B
Bottlenose dolphin	*Tursiops truncatus.*		Yes	Record take for Level B; Shutdown if observed approaching or within Level A ZOI
Harbor porpoise	*Phocoena phocoena*		Yes	Record take for Level B; Shutdown if observed approaching or within Level A ZOI
Harbor seal	*Phoca vitulina*		Yes	Record take for Level B; Shutdown if observed approaching or within Level A ZOI
Gray seal	*Halichoerus grypus*		Yes	Record take for Level B; Shutdown if observed approaching or within Level A ZOI

6. TAKE ESTIMATES FOR MARINE MAMMALS

This section discusses the size of the ZOIs for the installation of 36" steel piles (using an impact 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 driving installation. Hollow steel round pile removal is expected to occur from January through April and in December 2024.

Authorized takes will primarily be by Level B harassment, as use of the acoustic sources has the potential to result in disruption of behavioral patterns for individual marine mammals. There is also some potential for auditory injury (Level A harassment) to result, for phocids (harbor seals) because predicted auditory injury zones are larger than for mid-frequency species and otariids. Auditory injury is unlikely to occur for mid-frequency cetaceans and otariids. The planned mitigation and monitoring measures (Section 9) are expected to minimize the severity of such taking to the extent practicable. With implementation of the planned mitigation and monitoring measures, no Level A harassment is anticipated or authorized for low-frequency cetaceans

(humpback whales and gray whales) or bottlenose dolphins. As described previously, no mortality is anticipated or authorized for this activity.

Authorized harassments 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 present the harassment take estimates.

6.1 NOAA/ NMFS FISHERIES SERVICE ACOUSTIC CRITERIA

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 4 & 5). This 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 4: Level A Harassment Thresholds for Marine Mammals that May Occur in the Project Area

	Level A Harassment[1]		
	PTS Onset Acoustic Thresholds (SEL_{CUM}) (dB re 1µPa²sec)		**Peak Sound Threshold (SPL_{PEAK}) (dB re 1µPa)**
Functional Hearing Group	**Impulsive (Impact Pile Driving)**	**Non-Impulsive (Vibratory Pile Driving)**	**Impulsive (Impact Pile Driving)**
Low-Frequency Cetaceans (e.g., fin whale, humpback whale, North Atlantic right whale)	183	199	219
Mid-Frequency Cetaceans (e.g., bottlenose dolphin)	185	198	230
High-Frequency Cetaceans (e.g., harbor porpoise)	155	173	202
Phocid Pinnipeds (e.g., harbor seals and gray seals)	185	201	218

[1]NOAA Fisheries 2016h updated guidance
SEL_{CUM}– Cumulative Sound Exposure Level. A measure of the cumulative sound exposure over time. A function of the sum of the SELs for one 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 the action. In a sinusoidal sound pressure wave, this is the absolute value of the maximum variation from the neutral position of the wave.
dB re 1µPa²sec—decibels reference level 1 micropascal squared per second

Table 5: Level B Harassment Thresholds for Marine Mammals that May Occur in the Project Area

	Level B Harassment	
	RMS SPL (dB re 1µPa)	RMS SPL (dB re 1µPa)
Functional Hearing Group	**Impulsive (Impact Pile Driving/ Removal)**	**Non-Impulsive (Vibratory Pile Driving/Removal)**
Low-Frequency Cetaceans (e.g., fin whale, humpback whale, North Atlantic right whale)	160	120
Mid-Frequency Cetaceans (e.g., bottlenose dolphin)	160	120
High-Frequency Cetaceans (e.g., harbor porpoise)	160	120
Phocid Pinnipeds (e.g., harbor seals and gray seals)	160	120

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 2018a). 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 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 uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 µPa (rms) for continuous (*e.g.,* vibratory pile-driving/ removal) and above 160 dB re 1 µPa (rms) for non-explosive impulsive (*e.g.,* impact pile driving/ removal) or intermittent (*e.g.,* scientific sonar) sources. CTJV's planned activity includes the use of continuous (vibratory pile extraction) and impulsive (impact pile extracting/driving) sources, and therefore the 120 and 160 dB re 1 µPa (rms) thresholds are applicable. Given that a bubble curtain will be utilized for all vibratory and impact pile extraction, updated Caltrans guidance allows a 5 dB reduction.

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 6. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance.

Table 6: Thresholds Identifying the Onset of Permanent Threshold Shift

	PTS Onset Acoustic Thresholds* **(Received Level)**	
Hearing Group	**Impulsive**	**Non-impulsive**
Low-Frequency (LF) Cetaceans	*Cell 1* $L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	*Cell 2* $L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	*Cell 3* $L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	*Cell 4* $L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	*Cell 5* $L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	*Cell 6* $L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	*Cell 8* $L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{pk,flat}$: 232 dB	*Cell 10* $L_{E,OW,24h}$: 219 dB

	$L_{E,OW,24h}$: 203 dB	

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

Note: Peak sound pressure (L_{pk}) has a reference value of 1 µPa, and cumulative sound exposure level (L_E) has a reference value of 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.

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 removal noise from the Project. The Project may affect marine mammals by generating noise associated with the removal of piles using vibratory hammers and impact 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 AMBIET 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 system 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 (GeoSpectrum 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 this period 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.

However, NMFS prefers that a larger data set be used to establish a different ambient noise value, so the NMFS default value, 120 dB, will be used to represent the ambient noise level in the Project area.

6.2.2 UNDERWATER NOISE LEVELS

6.2.2.1 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 removal 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 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:

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

TL = transmission loss in dB

B = transmission loss coefficient; for practical spreading equals 15

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

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

This formula neglects loss due to scattering and absorption, which is assumed to be zero here. The degree to which underwater sound propagates away from a sound source is dependent on a variety of factors, most notably the water bathymetry and presence or absence of reflective or absorptive conditions including in-water structures and sediments. Spherical spreading occurs in a perfectly unobstructed (free-field) environment not limited by depth or water surface, resulting in a 5 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 the pile extraction sounds is greatly influenced by factors such as the type of piles, hammers, and the physical environment in which the activity takes place. To calculate distances to the Level A harassment and Level B harassment thresholds for the 36-inch hollow steel piles being removed in this project, the CTJV used acoustic monitoring data from other locations as described in Caltrans 2015- 2020 for impact and vibratory driving. NOAA treats installation and removal of piles in the same capacity. As done previously, the CTJV will continue to employ bubble curtains during impact and vibratory removal of 36” steel piles and, therefore, will reduce the source level by 5 dB.

6.3 ESTIMATED EXTENT OF ACTIVITY

The 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. Separate ZOIs were calculated for impact and vibratory pile removal (non-impulsive, stationary, continuous) for 36-inch hollow round steel piles. Table 7 provides output for all proposed methods of removing 36” 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 the Compendium of Pile Driving Sound Data (Caltrans 2020) for similar piles size and types are shown in Table 7. Use of a bubble curtain is expected to reduce sound levels by 5 decibels for pile removal 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 each of the sound mitigation methods, 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 removal scenario of the PTST Project (Table 7).

Table 7: The Sound Levels (dB Peak, dB RMS, and dB sSEL) Expected to Be Generated In Water By Each Hammer Type/Mitigation Measure At The PTST Project

Type of Pile	Hammer Type	Estimated Peak Noise Level (dB Peak)	Estimated Pressure Level (dB RMS)	Estimated Single Strike Sound Exposure Level (dB sSEL)	Pile Function
36- Inch Steel Pipe	Impact with Bubble Curtain [a]	205	188	178	Mooring and Temp. Dock Pile Removal
	Vibratory with Bubble Curtain [b]	175	165	198	

NOTE: sSEL = Single Strike Exposure Level; dB = decibel; N/A = not applicable

[a]A 5 dB reduction was assumed for an encased bubble curtain (ICF Jones and Stokes 2009, NAVFAC 2014) using the Greater Atlantic Regional Fisheries Office (GARFO) spreadsheet tool from the highest levels reported in the proxy project that reported unattenuated sound levels.

[b]Caltrans. 2015. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Using vibratory driving of 36" steel pile as surrogate data

6.3.1 Calculation of Disturbance ZOIs for In-water Noise

6.3.1.1 Level A

Impact Hammer Pile Extraction – The Impact Pile Extraction (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 were done with 2023 NOAA guidance to use 210 dB Peak, 183 dB SEL and 193 dB RMS (Caltrans 2015 & 2020).

As required by NOAA Fisheries, the use of the impact pile driving/ removal inputs for the sound pressure level of the source (dB RMS SEL), the expected activity duration in hours per 24-hour period, pulse duration (seconds), number of strikes in a 1-hour period or number of strikes per pile, the propagation of the sound (unitless constant), and the distance from the source at which the sound pressure level was measured are used to calculate harassment zones. Our calculations used the RMS SEL's that were given in Table 7 for impact hammer with bubble curtain and vibratory hammer with bubble curtain. Model inputs are provided in Table 8 and outputs are provided in Table 9.

Vibratory Hammer Pile Extraction – Per Caltrans 2015 guidance, sound produced from a vibratory hammer with bubble curtain used on a 36-inch diameter pile would resulted in mean 170 dB RMS. The use of a 5 dB reduction is factored in for an input of 165dB. Model inputs are provided in Table 8 and outputs are provided in Table 9.

NMFS User Manual calculations can also be found on Figure 4-5: Appendix A.

Table 8. User Spreadsheet Input Parameters Used for Calculating Harassment Isopleths

Model Parameter	Method	
	Vibratory[a] (with Bubble Curtain)	Impact[a] (with Bubble Curtain)
Weighting Factor (kHz)	2.5	2
RMS (dB)	165	188
Peak/SELss (dB)	175	205/ 178
Number of piles/ days	2	2
Duration to drive a pile (minutes)	15	10
Propagation	15	15
Distance from source (meters)	10	10
Strikes per pile	1,800	240

* Source level reduced by 5 dB to account for use of bubble curtain
a- Source: NOAA Guidance 2023
dB = decibel; na = not applicable; RMS = root mean square pressure level; SEL = single strike sound exposure level

Table 9: In-Water Area from Pile Driven to Level A and Level B Harassment Zones for Cetaceans, Pinnipeds and Otariids

Driving Scenerio	Radii/ Island	Level A Harassment Zones															Level B Harassment Zones		
		Low-Frequency Cetaceans			Mid-Frequency Cetaceans			High-Frequency Cetaceans			Phocid Pinnipeds			Otariids					
		Radius (m)	Island 1	Island 2	Radius (m)	Island 1	Island 2	Radius (m)	Island 1	Island 2	Radius (m)	Island 1	Island 2	Radius (m)	Island 1	Island 2	Radius (m)	Island 1	Island 2
Vibratory w/ Bubble Curtain (2 piles/day)		8	1	1	1	1	1	12	1	1	5	1	1	1	1	1	10,000	315	315
Impact w/ Bubble Curtain (2 piles/day)		285	37	37	11	1	1	339	52	52	153	11	11	12	1	1	736	1.38	1.32

6.3.1.2 Level B (In-Water)

The underwater practical spreading loss equation (Equation 1) was used to determine the Level B harassment ZOI for marine mammals. Level B ZOI are shown on Table 10.

$$TL = GL\ X\ \log_{10}\frac{R_2}{R_1} \qquad \text{(Equation 1)}$$

Where:
TL= Transmission (propagation) loss constant; the transmission in 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

Table 10: Radial Distance (meters) from Pile Removal to Level B Sound Thresholds for Cetaceans and Pinnipeds

Hearing Group	Hammer Type		Cetaceans/ Pinnipeds		Pile Location in the PTST Project
Sound Threshold (dB)			120 (continuous)		
			160 (impact)		
	--	Pile Type	Island 1	Island 2	
PTS Isopleth to Threshold (meters)	Impact with Bubble Curtain	36- in. Steel	736	736	Temp Dock and Mooring Piles
	Vibratory with Bubble Curtain	36-in. Steel	10,000	10,000	Temp Dock and Mooring Piles

6.3.1.4 Calculation of Disturbance ZOIs for Airborne Noise

Pinnipeds (harbor seals and gray seals) can be affected by in-air noise when they are hauled out. Loud noises can cause hauled-out pinnipeds to panic back into the water, leading to disturbance and possible injury. For in-air sound exposure of hauled-out pinnipeds, NMFS uses criteria for Level B harassment of 90 dB re 20 µPa rms for harbor seals and 100 dB re 20 µPa rms for all other pinnipeds.
The spherical spreading model was used to estimate noise threshold distances from the maximum anticipated in-air noise source level. The equation uses ambient sound level with NMFS defined noise thresholds as follows:

The spherical spreading loss equation (Equation 2) was used to determine the Level B harassment ZOIs for marine mammals. The ZOIs are shown in Table 11.

$$TL = GL\ X\ \log_{10}\frac{R_2}{R_1} \qquad \text{(Equation 2)}$$

Where:
TL= Transmission (Propagation) loss constant; the transmission loss constant is assumed to be 20 in air
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.

Literature estimates were used to estimate the amount of in-air sound produced from impact driving/ removal a pile above the MHW line (Laughlin 2010a, b). Hollow steel piles that were 30 inches in diameter were used as a close proxy to the 36-inch-diameter hollow steel piles that will be removed at the PTST Project.

Given the maximum source level of 98 dBA for in-air noise during impact pile removal of 36-inch steel piles, the calculated isopleths for in-air noise can be used for all pile sizes and types associated with the Project. Based on this model, in-air noise from impact removal of 36-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 11).

Table 11. Radial distance (meters) from pile driven above MHW to PTS sound thresholds for Harbor Seals and Gray Seals

Source	Sound Level	Level A Harassment Zone (m)	Level B Harassment Zone (m)
			Harbor Seals/ Gray Seals
Impact Hammer 36-inch Pile	97 dBLMAX at 92m[a]	1,828	159
Vibratory Hammer 36-inch Pile	98 dB $_{LMAX}$ @15.24m[b]	4.8	10,000

[a]Laughlin 2007
[b] Laughlin 2010

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 harassment takes are requested for the following five species for the calendar 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 removal activities.

There are 5 months of in-water construction anticipated during the proposed IHA. Using an average group size of two animals, 5 months of pile removal activities over a 12-month period would result in the take of 3 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

Since insufficient data was able to be collected from current CTJV Parallel Thimble Shoal project, the expected number of bottlenose dolphin in the Project Area was estimated using a 2016 report on the occurrence, distribution, and density of marine mammals near Naval Station Norfolk and Virginia Beach, Virginia (Engelhaupt et al. 2016). This report provides seasonal densities of bottlenose dolphins for inshore areas in the vicinity of the Project and along the coast of Virginia Beach. Like most of the wildlife, bottlenose dolphins do not use habitat uniformly. The heterogeneity in available habitat, dietary items and protection likely results in some individuals preferring ocean and others estuary (Ballance,1992; Gannon and Waples 2004). Although clearly dolphins have the ability to move between these habitat types Gannon and Waples (2004) suggest individuals prefer one habitat over the other based on gut contents of dietary items. Therefore, a subset of survey data from Engelhaupt et al. 2016 was used to determine seasonal dolphin densities within the project area. A spatially refined approach was used by plotting dolphin sightings within 12km of the project location. Densities were determined following methodology outlined Engelhaupt et al. 2016 and Miller et al. 2019 using the package DISTANCE in R statistical software (R. Core Team 2018). Calculated densities by season are provided in Table 12.

Table 12: Densities (individual/km^2) of Bottlenose Dolphin from Inshore Areas of Virginia

Season	12km distance around the project area
Spring	1.0
Winter	0.63

Total number of takes for bottlenose dolphin were calculated using the seasonal density (Table 12) of animals (individuals/km2). Construction project specific dolphin densities were calculated within the respective Level A and B ZOIs and seasons. Level B ZOIs were used to calculate dolphin takes, these correspond to the specific construction project and hammer type (Table 13).

Table 13 :Refined In-Water Area Used for Calculating Dolphin Takes Per Construction Components Per Hammer Type (km^2)

Construction Component	Vibratory Hammer*	Impact Hammer*
Radius (m)	10000	736
PI 1 Actual Area	314	1.70
PI 1Refined Area** (km2)	212	1.38
PI 2 Actual Area	314	1.7
PI 2 Refined Area** (km2)	202	1.32

* = Use of bubble curtain

** Total area based on isopleth of a circle minus land interference

To estimate potential exposure of the Project site, sighting rates (numbers of dolphins per day) were determined for each of the four seasons (Table 12) from sightings located in the inshore Chesapeake Bay zone (the Chesapeake Bay waters near Naval Station Norfolk). Densities were then used to calculate the monthly takes based on the number of pile removal days per month. These were broken out by month as shown in Table 14. The Level B harassment area for each pile and driving type was multiplied by the appropriate seasonal density and the anticipated number of days per activity per month to derive the total number of takes for each activity.

Table 14: Estimated Takes of Bottlenose Dolphin By Level B harassment By Month and Driving Activity

Month	January	February	March	April	December	Totals:
Dolphin Density (/km2)	0.63	0.63	1	1	0.63	
Impact: Portal Island 1 Mooring Dolphins (9 Piles)						
Refined Area (/km2)	1.38	1.38	1.38	1.38	1.38	
Driving Days	2	3	0	0	0	
Dolphin Harassments	2	3	-	-	-	5
Vibratory :Portal Island 1 Mooring Dolphins (9 Piles)						
Refined Area (/km2)	212	212	212	212	212	
Driving Days	2	3	0	0	0	
Dolphin Harassments	268	401	-	-	-	669
Impact:Portal Island 2 Mooring Dolphins (18 Piles)						
Refined Area (/km2)	1.32	1.32	1.32	1.32	1.32	
Driving Days	0	0	0	0	9	
Dolphin Harassments	-	-	-	-	8	8
Vibratory: Portal Island 2 Mooring Dolphins (18 Piles)						
Refined Area (/km2)	202	202	202	202	202	
Driving Days	0	0	0	0	9	
Dolphin Harassments	-	-	-	-	1,146	1,146
Impact: Portal Island 1 Trestle/ Dock Removal (97 Piles)						
Refined Area (/km2)	1.38	1.38	1.38	1.38	1.38	
Driving Days	13	15	13	8	0	
Dolphin Harassments	12	14	18	12	-	56
Vibratory: Portal Island 1 Trestle/ Dock Removal (97 Piles)						
Refined Area (/km2)	212	212	212	212	212	
Driving Days	13	15	13	8	0	
Dolphin Harassments	1,737	2,004	2,756	1,696	-	8,193
Impact: Portal Island 2 Trestle Removal (34 Piles)						
Refined Area (/km2)	1.32	1.32	1.32	1.32	1.32	
Driving Days	0	0	0	0	17	
Dolphin Harassments	-	-	-	-	15	15
Vibratory: Portal Island 2 Trestle Removal (34 Piles)						
Refined Area (/km2)	202	202	202	202	202	
Driving Days	-	-	-	-	17	-
Dolphin Harassments	-	-	-	-	2,164	2,164
Total Takes						12,256

Since the largest Level A harassment isopleth is 122 meters for Mid-Frequency Cetaceans during impact driving and the mandatory shutdown zone is 200 meters, CTJV is not requesting any Level A harassments in this application.

CTJV requests a total of 12,256 Level B harassment exposures for bottlenose dolphins under this IHA application. 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 will belong to either of these stocks. Additionally, a subset of these takes would likely be comprised of Chesapeake Bay resident dolphins, although the size of that population is unknown. It is assumed that an animal will be taken once over a 24-hour period; however, the same individual may be taken multiple times over the duration of the Project. Therefore, both the number of takes for each stock and the affected population percentages represent the maximum potential take numbers.

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 Mammal Observers in the Project area during the construction. Density data for this species within the Project vicinity do not exist or were not calculated because sample sizes were too small to produce reliable estimates of density. Harbor porpoise sighting data collected by the U.S. Navy near Naval Station Norfolk and Virginia Beach from 2012 to 2015 (Engelhaupt et al. 2014, 2015, 2016) did not produce high enough sample sizes to calculate densities. One group of two harbor porpoises was seen during spring 2015 (Engelhaupt et al. 2016). Harbor Porpoises are not expected to be present in the summer, fall or winter.

This analysis assumes that there are 2 porpoises exposed to Project-related underwater noise each month during the spring (March–May) for a total of 6 harbor porpoises (i.e., 1 group of 2 individuals per month x 3 months per year = 6 harbor porpoises). Assuming an average group size of two results in a total estimated take of 6 porpoises. Harbor porpoises are members of the high-frequency hearing group which would have Level A isopleths as large as 4,068 meters during impact removal of 36” steel pile. Given the relatively large Level A harassment zones during impact driving, NMFS previously assumed 40 percent of porpoises are taken by Level A harassment and authorized the take of 3 porpoises by Level A take and 6 porpoises by Level B take.

6.4.4 Harbor Seal

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 CBBT rock armor and portal islands from November 2014 through April 2019 (Rees et al. 2016;

Jones et al. 2018; Jones and Rees 2020). The number of harbor seals sighted by month from 2014 through 2022, on this project, ranged from 0 to 170 individuals (Table 15). Harbor seals are not expected to be present in the Chesapeake Bay during the months of June through October.

Table 15: Summary of Historical Harbor Seal Sightings by Month from 2014 to 2022 at the Chesapeake Bay Bridge Tunnel

Number of Individual Harbor Seals										
Month	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Monthly Average**
January	-	-	33	120	170	7	18	49	34	61.6
February	-	39	80	106	159	21	0	43	14	57.8
March	-	55	61	41	0	18	6	26	37	30.5
April	-	10	1	3	3	4	0	6	1	3.5
May	-	3	0	0	0	-		0	0	0.5
June	Seals not expected to be present									0
July	Seals not expected to be present									0
August	Seals not expected to be present									0
September	Seals not expected to be present									0
October	Seals not expected to be present									0
November	1	0	1	0	3	-	-	1	1	1.0
December	4	9	24	8	29	-	4	11	11	12.5

Source: Rees et al. 2016; Jones et al. 2018, Jones and Rees 2020, Jones and Reese 2022, Jones and Reese 2023

Note: Seal counts began in November 2014 and were collected for nine field seasons (2014/2015, 2015/2016, 2016/2017, 2017/2018, 2018/2019), 2020/2021and 2021/2022 ending in April 2019. In January 2015, no surveys were conducted.

Seal density data are in the format of seal per unit time; therefore, seal take requests were calculated as total number of potential seals per pile driving day (8 hours) multiplied by the number of driving days per month. For example, in December seal density data is reported at 12.5 seals per day * 26 workdays in December, resulting in the potential of 325seals being impacted for that month. The anticipated number of seals impacted were summed (2,714). The largest Level A isopleth for phocid species is approximately 1,828 meters which would occur when piles were being removed via impact hammer. The smallest Level A harassment zone during impact driving is 4.8 meters which would occur when piles are removed via vibratory hammer with a bubble curtain. NMFS authorized a shutdown zone for harbor seals of 150 meters since seals are common in the project area and are known to approach the shoreline. A larger shutdown zone would likely result in multiple shutdowns and impede the project schedule. From the previously issued IHA, NMFS assumed that 40 percent of the exposed seals will occur within the Level A zone specified for a given scenario and the remaining impacted seals would result in Level B takes. Therefore, the total number of requested Level A takes is 1,086 and total Level B takes is 1,628 harbor seals (Table 16).

Table 16: Calculation of the Number of Harbor Seal Takes

Month	Estimated Seals per Work Day	Total Pile Driving Days per Month (includes upland driving)	Total Number of Requested Takes
Jan-24	61.6	15	924
Feb-24	57.8	18	1040.4
Mar-24	30.5	13	396.5
Apr-24	3.5	8	28
May-24	0.5	0	0
Jun-24	Seals not expected to be present.		
Jul-24	Seals not expected to be present.		
Aug-24	Seals not expected to be present.		
Sep-24	Seals not expected to be present		
Oct-24	Seals not expected to be present.		
Nov-24	1	0	0
Dec-24	12.5	26	325
		Total Takes:	2,714

6.4.5 Gray Seal

The number of gray seals expected to be present at the PTST project area was estimated using the same methodology as was used for the harbor seal. Survey data collected by the U.S. Navy at the portal islands from 2015 through 20226 was utilized (Rees et al. 2016; Jones et al. 2018; Jones and Rees 2023). A maximum of 1 harbor seal was seen during the months of February 2015, 2016, and 2022. Given this information NMFS assumed that a single gray seal would be taken per workday in February 2024.The anticipated numbers of monthly takes were calculated following the same approach as for harbor seals, and the monthly takes were then summed (table 12). Although the project has not recorded any gray seal sightings to date, NMFS assumed that 40 percent would be taken by Level A harassment. Therefore, NMFS is proposing to authorize the take of 7 gray seals by Level A harassment and 11 gray seals by Level B harassment for a total of 18 proposed takes.

Table 17: Summary of Historical Harbor Seal Sightings by Month from 2015, 2016 and 2022 at the Chesapeake Bay Bridge Tunnel

Number of Individual Gray Seals				
Month	**2015**	**2016**	**2022**	**Monthly Average**
January	0	0	0	0.0
February	1	1	1	1.0
March	0	0	0	0.0
April	0	0	0	0.0
May	0	0	0	0.0
June	Seals not expected to be present.			0
July	Seals not expected to be present.			0
August	Seals not expected to be present.			0
September	Seals not expected to be present.			0
October				0
November	0	0	0	0.0
December	0	0	0	0.0
Source: Rees et al. 2016; Jones et al. 22021-22				
No data available for gray seals from 2017-2021				

Table 18: Calculation of the Number of Gray Seal Takes

Month	Estimated Seals per Work Day	Total Pile Driving Days per Month (includes upland driving)	Total Number of Requested Takes
January 2024	0	15	0
February 2024	1	18	18
March 2024	0	13	0
April 2024	0	8	0
May 2024	0	0	0
June 2024	Seals not expected to be present.		
July 2024	Seals not expected to be present.		
August 2024	Seals not expected to be present.		
September 2024	Seals not expected to be present		
October 2024	Seals not expected to be present.		
November 2024	0	0	0
December 2024	0	26	0
		Total Takes:	18

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 a Level A or Level B harassment during the calendar year of project construction under this requested IHA (Table 19).

Table 19: Number of Level A and B Takes Requested Per Species

Species	Stock	Level A Harassment Requests	Level B Harassment Requests
Humpback Whale	Gulf of Maine	**0**	**3**
Harbor Porpoise	Gulf of Maine/ Bay of Fundy	**3**	**6**
Bottlenose Dolphin	WNA Coastal, Northern Migratory	**0**	**6,028**
	WNA Coastal, Southern Migratory	**0**	**6,028**
	NNCES	**0**	**200**
Harbor Seal	Western North Atlantic	**1,086**	**1,628**
Gray Seal	Western North Atlantic	**7**	**11**

Due to the variable spatial distribution and limited abundance of some of the marine mammal species identified, and the implementation of mitigation measures as described in Section 9, there is a negligible chance that pile removal could result in serious injury or death of marine mammals. The exposure estimates do not account for the potential for marine mammals to avoid the Project area due to increased noise levels, and therefore are likely overestimates of the

numbers of potential exposures to Level A and B harassment. In addition, the exposure estimates are based on a conservative area of ensonification and a conservative estimation of marine mammal abundance; therefore, these estimates in Table 18 are likely a significant overestimate of the actual take by acoustic harassment previously encountered on the Project (Table 20). It is also assumed that an animal will be taken once over a 24-hour period; however, the same individual may be taken multiple times over the duration of the Project. Therefore, both the number of takes and the affected population percentages represent the maximum potential take numbers.

Table 20 : Marine Mammal Takes Encountered Under 2020/2021 Issued IHA For The PTST Project

Species	Stock	Level A Harassments Authorized in 2020 IHA	Level B Harassments Authorized in 2020 IHA	Level A Harassments Occurred Under 2020 IHA	Level B Harassments Occurred Under 2020 IHA	Level A Harassments Authorized in 2021 IHA	Level B Harassments Authorized in 2021 IHA	Level A Harassments Occurred Under 2021 IHA	Level B Harassments Occurred Under 2021 IHA
Humpback Whale	Gulf of Maine	-	12	-	-	0	12	0	0
Harbor Porpise	Gulf of Maine/ Bay of Fundy	5	7	-	-	5	7	0	0
Bottlenose Dolphin	WNA Coastal, Northern Migratory	142	14,095	-	5	0	43203	0	394
	WNA Coastal, Southern Migratory	142	14,095	-	-	0	43203	0	0
	NNCES	2	198	-	-	0	250	0	0
Harbor Seal	Western North Atlantic	1,296	2,124	-	-	1154	1730	0	4
Gray Seal	Western North Atlantic	1	3	-	-	16	24	0	0

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, bottlenose dolphins, and harbor porpoises may be found in shallower areas; however, it is unlikely that bottlenose dolphins and 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 because pile removal 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/ extraction) and greater than 120 dB re 1 μPa rms for non-impulsive noise (e.g., vibratory pile extraction).

Table 9 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 removal activities. Use of a soft start will occur prior to pile removal 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 5 dB within the water.

The impact removal of each hollow steel pile is expected to take approximately 1 hour (including the time it takes to position and set-up the hammer and bubble curtain, and disassembly), and a maximum of two hollow steel piles will be removed via impact and vibratory hammer per day, per portal island. Species are expected to move away from these harassment zones during the soft start/ramp up procedures. For impact hammer pile removal, the hammer will be initially raised no 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 removal activity will cease, in accordance with the MMMP (Figures 6-10). 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 removal 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 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 because 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— All pile driving associated with the project is completed to date. The removal of piles could have disturbed the 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 or directly to the ocean side of the Project Area via a VPDES permit, managed in accordance with a discharge permit from VDEQ, and complies 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 or have occurred to date.

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 geo-textile 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 the course of 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/ removal 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 removal is occurring. The Project will continue to employ a soft start

and ramp up of impact pile removal activities to allow mobile species to leave the area before impact pile removal occurs at full intensity.

7.6 CONCLUSIONS REGARDING IMPACTS TO SPECIES OR STOCKS

Sound resulting from pile removal 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.

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 takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS's implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing

anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

Pile removal 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 extraction. Potential takes could occur if individuals are present in the ensonified zone when pile removal 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, the use of vibratory and impact hammers will be the primary methods of pile removal. The use of the impact hammer on pile removal produces short, sharp pulses with higher peak levels and much sharper rise time to reach those peaks. When impacting, implementation of bubble curtains, soft start and shutdown zones significantly reduces any possibility of injury. Given sufficient notice through use of soft starts, marine mammals are expected to move away from a sound source that is annoying prior to it becoming potentially injurious.

The use of 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 removal 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 removal 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, on the basis of reports in the literature as well as monitoring from other similar activities, will likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring) (*e.g.*, Thorson and Reyff 2006). Individual animals, even if taken multiple times, will most likely move away from the sound source and be temporarily displaced from the areas of pile removal, although even this reaction has been observed primarily only in association with impact pile driving/ removal. The pile driving activities analyzed here are similar to, or less impactful than, numerous other construction activities conducted along both Atlantic and Pacific coasts, which have taken place with no known long-term adverse consequences from behavioral harassment. Furthermore, many projects similar to this one are

also believed to result in multiple takes of individual animals without any documented long-term adverse effects. Level B harassment will be minimized through use of mitigation measures described herein and, if sound produced by project activities is sufficiently disturbing, animals are likely to simply avoid the area while the activity is occurring.

In addition to the expected effects resulting from authorized Level B harassment, we anticipate that small numbers of harbor porpoises, harbor seals and gray seals may sustain some limited Level A harassment in the form of auditory injury. However, animals 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 removal (*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 (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 ensonifed 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 Unmitigable Adverse Impact Analysis and Determination

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

7.9 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 our 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 determined that the issuance of this IHA to CTJV qualifies to be categorically excluded from further NEPA review.

7.10 Endangered Species Act (ESA)

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq*.) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

No incidental take of ESA-listed species is authorized or expected to result from this activity. Therefore, NMFS has determined that formal consultation under section 7 of the ESA is not required for this action.

8. MITIGATION MEASURES

8.1 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 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 a 10-meter shutdown zone 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 10 meters 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 10 meters 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 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.
    - 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 Removal:
    - Removal of hollow steel pipe piles using a impact hammer with bubble curtain to break the tension of the previously installed pile.
    - Removal of 36" hollow steel pipe pile will be by vibratory 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 are 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 removal, 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 removal 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 removal activities.

- Use of bubble curtains system is implemented during impact and vibratory removal of 36-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: Use of bubble curtains system is implemented during impact and vibratory driving/ removal of 36-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 harassment 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.
    - 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.

8.2 MONITORING AND SHUTDOWN OF DISTURBANCE ZONES

The following measures would apply to CTJV's mitigation requirements: Establishment of Shutdown Zone— For all pile removal 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. 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

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

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

8.3 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 on the island that work is be preformed. Having a PSO located at Fort Story in Virginia Beach is no longer necessary, as all DTH work wich required them at that location has been completed under the previous IHA. Figure 11, Appendix A shows locations that PSOs 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 PSOs must be near each pile driving rig during active operation of driving devices. A minimum of one additional PSOs may be required at each active driving rig if the Level B harassment zone and shutdown harassment 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 of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any. PSOs s 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/ removed 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), 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.

9. ARCTIC SUBSISTENCE PLAN OF COOPERATION

The Project is not located in the Arctic; therefore, this is not applicable.

10. MONITORING AND REPORTING

10.1 MONITORING PLAN

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

10.2 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 the course of 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

In the event that 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.

11. 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.

12. REFERENCES

Aschettino, J., A. Engelhaupt, and D. Engelhaupt. 2015. *Mid-Atlantic Humpback Whale Monitoring, Virginia Beach, VA*: Annual Progress Report. Draft Report. Prepared for U.S. Fleet Forces Command. Submitted to Naval Facilities Engineering Command Atlantic, Norfolk, Virginia, under Contract No. N62470-10-3011, Task Order 054, issued to HDR Inc., Virginia Beach, Virginia. 18 June 2015.

Aschettino, Jessica M., Dan Engelhaupt, Amy Engelhaupt, and Michael Richlen. 2017. *Mid-Atlantic Humpback Whale Monitoring, Virginia Beach, Virginia: 2016/17 Annual Progress Report*. Prepared for: Naval Facilities Engineering Command Atlantic.

Aschettino, Jessica M., D. Engelhaupt, A. Engelhaupt, M. Richlen and A. DiMatteo. 2018. *Mid-Atlantic Humpback Whale Monitoring, Virginia Beach, Virginia: 2017/18 Annual Progress Report*. Prepared for: Naval Facilities Engineering Command Atlantic.

Aschettino, J.M., D. Engelhaupt, A. Engelhaupt, M. Richlen, and M. Cotter. 2020. *Mid-Atlantic Humpback Whale Monitoring, Virginia Beach, Virginia: 2019/20 Annual Progress Report.* Prepared for U.S. Fleet Forces Command. Submitted to Naval Facilities Engineering Command Atlantic, Norfolk, Virginia, under Contract N62470-15-8006, Task Order 20F4011, issued to HDR, Inc., Virginia Beach, Virginia. May 2020.

Aschettino, J.M., D. Engelhaupt, A. Engelhaupt, M. Richlen, and M. Cotter. 2021. *Mid-Atlantic Humpback Whale Monitoring, Virginia Beach, Virginia: 2019/20 Annual Progress Report.* Prepared for U.S. Fleet Forces Command. Submitted to Naval Facilities Engineering Systems Command Atlantic, Norfolk, Virginia, under Contract N62470-15-8006, Task Order 20F4011, issued to HDR Inc., Virginia Beach, Virginia. May 2021.

Aguilar, A. 1986. A review of Old Basque whaling and its effect on the right whales (*Euhalaena glacialis*) of the North Atlantic. Report of the International Whaling Commission (special issue) 10: 191-199.

Barco, S, and W. M. Swingle. 2014. Marine Mammal Species Likely to be Encountered in the Coastal Waters of Virginia from Analysis of Stranding Data. VAQF Scientific Report #2014-07a. Prepared for the Virginia Department of Mines, Minerals and Energy.

Barlow, J., and P.J. Clapham. 1997. A New Birth-Interval Approach to Estimating Demographic Parameters of Humpback Whales. Ecology, 78: 535-546.

Bérubé, M., A. Aguilar, D. Dendanto, F. Larsen, G. Notarbartolo di Sciara, R. Sears, J. Sigurjónsson, J. Urban-R. And P.J. Palsbøll. 1998. Population genetic structure of North Atlantic, Mediterranean and Sea of Cortez fin whales, *Balaenoptera physalus* (Linnaeus 1758): analysis of mitochondrial and nuclear loci. *Mol. Ecol*.

Best, P.B. J.L. Bannister, R.L. Brownell, Jr. and G.P. Donovan (eds.). 2001. Right whales: worldwide staus. J. Cetacean Res. Manage. (Special Issue). 2. 309pp.

Balance, Lisa T. 1992. Habitat use patterns and ranges of the bottlenose dolphin in the Gulf of California, Mexico. Marine Mammal Science 8: 262 – 274.Blaylock, R.A. 1985. The marine mammals of Virginia. Virginia Institute of Marine Science Sea Grand Education Series 35.

Burton, W.H. 1993. Effects of bucket dredging on water quality in the Delaware River and the potential for effects on fisheries resources. Versar, Inc., 9200 Rumsey Road, Columbia, Maryland 21045.

Caltrans. 2015. *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish*. Available online: http://www.dot.ca.gov/hq/env/bio/files/bio_tech_guidance_hydroacoustic_effects_110215.pdf

Caswell, H. M. Fujiwara, and S. Brault. 1999. Declining Survival Probability Threatens the North Atlantic Right Whale. Proc. Nat. Acad. Sci. 96:3308-3313.

Chesapeake Bay Bridge and Tunnel (CBBT) District. 2015. Parallel Thimble Shoal Tunnel ocean engineering report. Prepared by COWI Marine North America. 122 pp.

Clapham, P.J., (ed.) 2002. *Report of the working group on survival estimation for North Atlantic right whales*. Available from the Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA 02543.

Clapham, P.J. and C.A. Mayo. 1990. Reproduction of humpback whales (*Megaptera novaengliae*) deserved in the Gulf of Maine. Rep. Int. Whal. Commn. Special Issue 12: 171-175.

Clapham, P.J., P.J. Palsboll, D.K. Mattila, and O. Vasquez. 1992. Composition and dynamics of humpback whale competition groups in the West Indes. Behaviour 122: 182-194.

Clapham, P.J., S.B. Young, and R.L. Brownell. 1999. Baleen whales: Conservation issues and the status of the most endangered populations. Mammal Rev. 29(1)35-60.

Clark, C.W. 1995. Application of U.S. Navy underwater hydrophone arrays for scientific research on whales. Rep Int. Whal. Commn. 45:210-212

Cole, T.V.; Hartley, D.L.; Merrick, R.L. 2005. Mortality and serious injury determinations for large whale stocks along the eastern seaboard of the United States, 1999-2003. U.S. Dept. Commerce, Northeast Fish. Sci. Cent. Ref. Doc. 05-08; 18 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026

Denes, S.L., G.J. Warner, M.E. Austin and A.O. MacGillivray. 2016. Hydroacoustic pile driving noise study – comprehensive report. U.S. Department of Transportation, Federal Highway Administration. Report No. 490000(135).

Erbe, C. 2002. Hearing abilities of baleen whales. DRDC Atlantic CR 2002-065.

FHWA 2012. Biological Assessment for the Tappan Zee Pile Installation Demonstration Project. January 2012. 105 pp.

Funk, W.H. 2017. *Experts Trying to Explain Recent Deaths of 5 Whales Off VA Coast.* Bay Journal. http://www.bayjournal.com/article/experts_trying_to_explain_recent_deaths_of_5_whales_off_va_coast. 10 April.

Gannon, D. P. and D. M. Waples. 2004. Diets of coastal bottlenose dolphins from the U.S. Mid-Atlantic Coast differ by Habitat. Marine Mammal Science 20: 527 – 545. Hain, J.H.W., M.J. Ratnaswany, R.D. Kenney, and H.E. Winn. 1992. The Fin Whale, *Balaenoptera physalus*, in Waters of the Northeastern United States Continental Shelf. Rep. Int. Whal. Comm. 42: 653-669.

Hayes, S.A., E. Josephson, K. Maze-Foley, and P. Rosel. 2020. US Atlantic and Gulf of Mexico Marine MammalStock Assessments- 2019. NOAA Tech Memo NMFS-NE 264

ICF Jones and Stokes and Illingworth and Rodkin, Inc (ICF Jones and Stokes). 2009. *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish.* Prepared for California Department of Transportation. February. Available online: http://www.dot.ca.gov/hq/env/bio/files/Guidance_Manual_2_09.pdf

Kastak, David and Ronald J. Schusterman. 1995. *Aerial and Underwater Hearing Thresholds for 100 Hz Pure Tones in Two Pinniped Species.* Sensory Systems of Aquatic Mammals.

Kastelein, R.A., M. Janssen, W.C. Verboom, and D. de Haan. 2005. Receiving beam patterns in the horizontal plane of a harbor porpoise (*Phocoena phocoena*). Journal of the Acoustical Society of America 118(2): 1172-1179.

Kenney, R. D. 2002. North Atlantic, North Pacific and southern right whales. Pages 806-813 In W. F. Perrin, B. Wursig, J. G. M. Thewissen (eds.), Encyclopedia of marine mammals. Academic Press, San Diego, CA.

Knowlton, A.R., S.D. Kraus, and R.D. Kenney. 1994. Reproduction in North Atlantic right whales (*Eubalaena glacialis*). Can. J. Zool. 72: 1297-1305.

Kraus, S.D., M.W. Brown, H. Caswell, C.W. Clark, M. Fujiwara, P.K. Hamilton, R.D. Kenney, A.R. Knowlton, S. Landry, C.A. Mayo, W.A. McLellan, M.J. Moore, D.P. Nowacek, D.A. Pabst, A.J. Read and R.M. Rolland. 2005. North Atlantic right whales in crisis. Science 309: 561-562.

Laughlin, J.. 2010a. *Airborne Nosie Measurements (A-weighted and un-weighted) during Vibratory Pile Installation.* Washington State Department of Transportation. Memorandum. Available online: https://www.wsdot.wa.gov/NR/rdonlyres/8D088EE1-8BE9-4A59-8296-451E58CCDDB5/0/AirborneVibratoryTechMemo.pdf

Laughlin, J. 2010b. WSF Vashon test pile project: underwater sound levels associated with driving steel piles at the Vashon Ferry Terminal. Office of Air Quality and Noise, Washington State Department of Transportation, Seattle, Washington.

Mizroch, S.A. and A.E. York. 1984. Have pregnancy rates of Southern Hemisphere fin whales, *Balaenoptera physalus,* increased? Reports of the International Whaling Commission, Special Issue No. 6:401-410.

Miller, D. L., E. Rexstad, L. Thomas, L. Marshall, J.L. Laake. 2019. Distance Sampling in R. Journal of Statistical Software 89: 1 – 28.

Movebank. 2020. Movebank for Animal Tracking Data. Accessed 1 May 2020. https://www.movebank.org/

Naval Facilities Engineering Command (NAVFAC). 2014. Proxy source sound levels and potential bubble curtain attenuation for acoustic modeling of nearshore marine pile driving at navy installations in Puget Sound. Final Report.

Naval Facilities Engineering Command (NAVFAC). 2016. Pile-Driving Noise Measurements at Atlantic Fleet Naval Installations: 28 May 2013- 28 April 2016. Final Report, Contract No. N62470-10-D-3011.

NOAA Fisheries. 1991. Final recovery plan for the humpback whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 105 pp.

NOAA Fisheries. 1998. Draft Recovery Plans for the fin whale (*Balanoptera physalus*) and sei whale (*Balaenoptera borealis*). Prepared R.R. Reeves,G.K. Silber, and P.M. Payne for the National Marine Fisheries Service, Silver Spring, Maryland July 1998.

NOAA Fisheries. 2006a. Humpback Whales. Online: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/humpback_whale.doc. Accessed: 5 April 2006.

NOAA Fisheries. 2006b. Review of the status of right whales in the North Atlantic and North Pacific Oceans. December 2006. 68 pp. http://www.fisheries.noaa.gov/pr/pdfs/statusreviews/rightwhale2006.pdf

NOAA Fisheries. 2015a. Marine mammal acoustic thresholds for Level B harassment. http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/threshold_guidance.html

NOAA Fisheries. 2015b. http://www.fisheries.noaa.gov/pr/sars/pdf/stocks/atlantic/2015/f2015_humpback.pdf. Accessed on 16 December 2016.

NOAA Fisheries. 2015c. http://www.fisheries.noaa.gov/pr/sars/pdf/stocks/atlantic/2015/f2015_rightwhale.pdf. Accessed on 16 December 2016.

NOAA Fisheries. 2015d. *Fin whale (Balaenoptera physalus): Western North Atlantic Stock.* https://www.nefsc.noaa.gov/publications/tm/tm231/39_finwhale_F2014July.pdf

NOAA Fisheries. 2016a. Common bottlenose dolphin (*Tursiops truncatus truncatus*): Western North Atlantic northern migratory coastal stock. http://www.fisheries.noaa.gov/pr/sars/pdf/stocks/atlantic/2015/f2015_bodonmig.pdf. Accessed on 1 March 2017.

NOAA Fisheries. 2016b. Gray seal (*Halichoerus grypus grypus*): Western North Atlantic stock. http://www.fisheries.noaa.gov/pr/sars/pdf/stocks/atlantic/2015/f2015_grayseal.pdf. Accessed on 1 March 2017.

NOAA Fisheries. 2016c. Harbor porpoise (*Phocoena phocoena phocoena*): Gulf of Maine/Bay of Fundy stock. http://www.fisheries.noaa.gov/pr/sars/pdf/stocks/atlantic/2015/f2015_harborporpoise.pdf. Accessed on March 1, 2017.

NOAA Fisheries. 2016d. Harbor seal (*Phoca vitulina concolor*): Western North Atlantic stock. http://www.fisheries.noaa.gov/pr/sars/pdf/stocks/atlantic/2015/f2015_harborseal.pdf. Accessed on 1 March 2017.

NOAA Fisheries. 2016e. http://www.fisheries.noaa.gov/pr/sars/pdf/stocks/atlantic/2015/f2015_finwhale.pdf. Accessed on 16 December 2016.

NOAA Fisheries. 2016f. Humpback whale stock (*Megaptera movaeangliae*): Gulf of Maine stock. http://www.nmfs.noaa.gov/pr/sars/pdf/stocks/atlantic/2015/f2015_humpback.pdf. Accessed on 1 March 2017.

NOAA Fisheries. 2016g. Interactive North Atlantic right whale sightings map. http://www.nefsc.noaa.gov/psb/surveys/. Accessed on 16 December 2016.

NOAA Fisheries. 2016h. Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing. NOAA Technical Memorandum NMFS-OPR-55. July 2016. 189 pp.

NOAA Fisheries. 2017b. http://www.fisheries.noaa.gov/pr/species/mammals/dolphins/bottlenose-dolphin.html. Accessed on 1 March 2017.

NOAA Fisheries. 2017c. http://www.fisheries.noaa.gov/pr/species/mammals/porpoises/harbor-porpoise.html. Accessed on 1 March 2017.

NOAA Fisheries. 2017d. http://www.fisheries.noaa.gov/pr/species/mammals/seals/gray-seal.html. Accessed on 1 March 2017.

NOAA Fisheries. 2017e. http://www.fisheries.noaa.gov/pr/species/mammals/seals/harbor-seal.html. Accessed on 1 March 2017.

NOAA Fisheries. 2017f. http://www.fisheries.noaa.gov/pr/species/mammals/whales/fin-whale.html. Accessed on 24 February 2017.

NOAA Fisheries. 2017g. http://www.fisheries.noaa.gov/pr/species/mammals/whales/humpback-whale.html. Accessed on 1 March 2017.

NOAA Fisheries. 2017h. http://www.fisheries.noaa.gov/pr/species/mammals/whales/north-atlantic-right-whale.html. Accessed on 1 March 2017.

NOAA Fisheries. 2017i. http://cetsound.noaa.gov/cda. Accessed on 24 March 2017.

NOAA Fisheries. 2018. Final Update on North Atlantic Right Whale off Virginia. Press Release accessed on 24 April 2019 at https://www.greateratlantic.fisheries.noaa.gov/mediacenter/2018/01/28_january_28_update.html.

Paulus, Sokolowski and Sartor Engineering, PC. 2008. Noise and Vibration Management Plan; Noise and Vibration Related to the Installation to the Installation of Sheet Piles for the Rockaway Park Former Manufactured Gas Plant Site. Rockaway Park, Queens, NY.

Perry, S.L., D.P. DeMaster, and G.K. Silber. 1999. The great whales: History and Status of Six Species Listed as Endangered Under the U.S. Endangered Species Act of 1973. Mar. Fish. Rev. Special Edition. 61(1): 59-74.

Pettis, H.M., Pace III, R. M., and Hamilton, P.K., "North Atlantic Right Whale Consortium 2020 Annual Report Card," Report to the North Atlantic Right Whale Consortium (2020). Available at: https://www.narwc.org/uploads/1/1/6/6/116623219/2020narwcreport_cardfinal.pdf.

R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

Rees, D.R., D.V. Jones, and B.A. Bartlett. 2016. Haul-out counts and photo-identification of pinnipeds in Chesapeake Bay, Virginia: 2015/2016 annual progress report. Final Report. Prepared for U.S. Fleet Forces Command, Norfolk, Virginia. 15 November 2016.

Seipt, I., P.J. Clapham, C.A. Mayo, and M.P. Hawvermale. 1990. Population Characteristics ofIndividually Identified Fin Whales, Balaenoptera physalus, in Massachusetts Bay. Fish. Bull. 88:271-278.

Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Green Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack. 2007. Marine mammal noise esposure criteria: initial scientific recommendations. Aquatic Mammals 33(4): 415-426.

Swingle, W.M., S.G. Barco, T.D. Pitchford, W.A. McLellan and D.A. Pabst. 1993. Appearance of Juvenile Humpback Whales Feeding in the Nearshore Waters of Virginia. Mar.Mamm. Sci. 9: 309-315.

Swingle, W.M., C. M. Trapani, L. R. D'Eri, and M.C. Lynott. 2012. Marine Mammal and Sea Turtle Stranding Response 2011 Grant Report. Final Report to the Virginia Coastal Zone Management Program, NOAA NA11NOS4190122, Task 49. VAQF Scientific Report 2013-01. Virginia Beach, VA. 39 pp.

Swingle, W.M., C. M. Trapani, L. R. D'Eri, and M.C. Lynott. 2013. Marine Mammal and Sea Turtle Stranding Response 2012 Grant Report. Final Report to the Virginia Coastal Zone Management Program, NOAA NA11NOS4190122, Task 49. VAQF Scientific Report 2013-01. Virginia Beach, VA. 39 pp.

Swingle, W. M., M. C. Lynott, E. B. Bates, L.R. D'Eri, G.G. Lockhart, K.M. Phillips, and M.D. Thomas. 2014. Virginia Sea Turtle and Marine Mammal Stranding Network 2013 Grant Report. Final Report to the Virginia Coastal Zone Management Program, NOAA CZM Grant #NA11NOS4190122, Task 49. VAQF Scientific Report 2013-01. Virginia Beach, VA. 53 pp.

Swingle, W.M., M.C. Lynott, E.B. Bates, G.G. Lockhart, K.M. Phillips, K.R. Rodrique, S.A. Rose, and K.M. Williams. 2015. Virginia Sea Turtle and Marine Mammal Stranding Network 2014 Grant Report. Final Report to the Virginia Coastal Zone Management Program, NOAA CZM Grant #NA11NOS4190122, Task 49. VAQF Scientific Report 2013-01. Virginia Beach, VA. 44 pp.

Swingle, W.M., S.G. Barco, E.B. Bates, G.G. Lockhart, K.M. Phillips, K.R. Rodrique, S.A. Rose, and K.M. Williams. 2016. Virginia Sea Turtle and Marine Mammal Stranding Network 2015 Grant Report. Final Report to the Virginia Coastal Zone Management Program, NOAA CZM Grant #NA11NOS4190122, Task 49. VAQF Scientific Report 2013-01. Virginia Beach, VA. 51 pp.

Tolliver, L. 2017. *Perfect Storm Behind String of Dead Humpback Whales Washing Up in Hampton Roads.* The Virginian-Pilot. https://pilotonline.com/news/local/environment/perfect-storm-behind-string-of-dead-humpback-whales-washing-up/. 16 February.

U.S. Army Corps of Engineers (USACE). 2001. Monitoring of Boston Harbor confined aquatic disposal cells. Compiled by L.Z. Hales, ACOE Coastal and Hydraulics Laboratory. ERDC/CHL TR-01-27.

U.S. EPA (Environmental Protection Agency). 1986. Quality Criteria for Water. EPA 440/5-86-001.

Waring, G. T., D.L. Palka, P.J. Clapham, S. Swartz, M. Rossman, T. Cole, K.D. Bisack, and L.J. Hansen. 1998. *U. S. Atlantic and Gulf of Mexico marine mammal stock assessments - 1998.* NOAA Tech. Memo. NMFS-NE-153.

Waring, G. T., J. M. Quintal and S.W. Swartz (eds). 2000. U. S. Atlantic and Gulf of Mexico marine mammal stock assessments - 2000. NOAA Tech. Memo. NMFS-NE-162.

Waring, G. T., J. M. Quintal and C. P. Fairfield. (Eds.). 2002. *U. S. Atlantic and Gulf of Mexico marine mammal stock assessments - 2002.* NOAA Tech. Memo. NMFS-NE-169.

Washington Department of Transportation. 2017. Biological Assessment Preparation Advanced Training Manual Version 4-2017, Chapter 7. https://www.wsdot.wa.gov/NR/rdonlyres/448B609A-A84E-4670-811B-9BC68AAD3000/0/BA_ManualChapter7.pdf

Whitt, Amy D., James A. Powell, Alec G. Richardson, and Jennifer R. Bosyk. 2015. *Abundance and distribution of marine mammals in nearshore waters off New Jersey, USA.* Journal of Cetacean Research and Management15: 45–59.

Wiley, D.N., R.A. Asmutis, T.D. Pitchford, and D.P. Gannon 1995. *Stranding and mortality of humpback whales, Megaptera novaeangliae, in the mid-Atlantic and southeast United States, 1985-1992*. Fish. Bull. 93: 196-205.

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Appendix A: Figures

Figure 1: Project Location Map Chesapeake Bay Bridge Tunnel District Thimble Shoal Parallel Tunnel

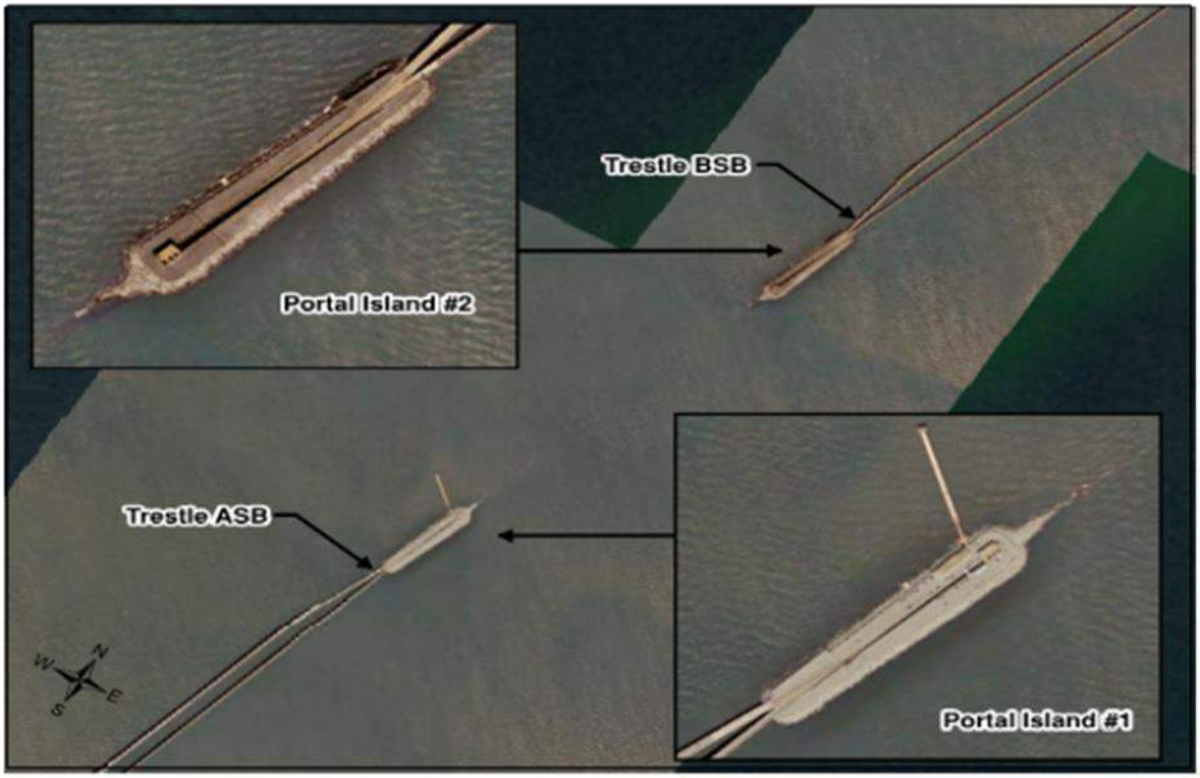

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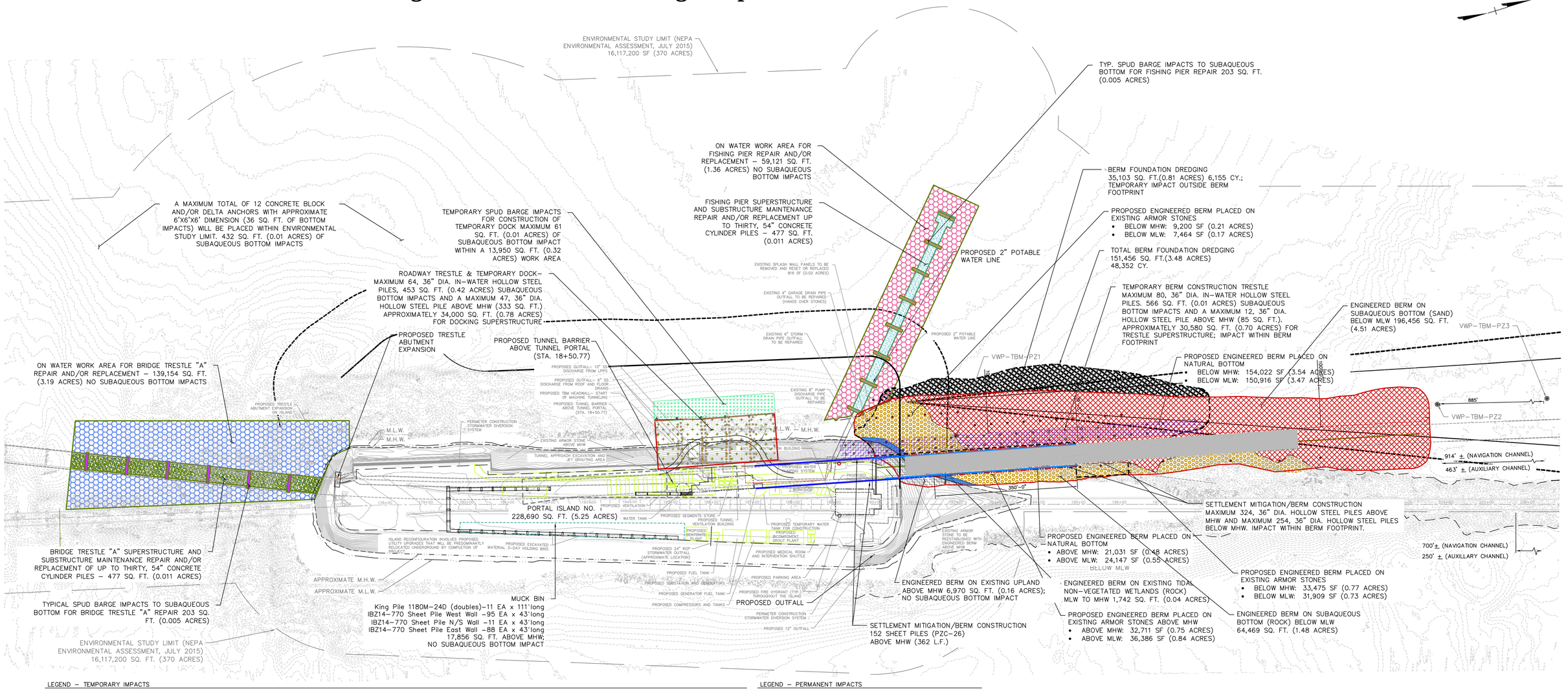
Figure 2. Permit Level Design Impact Area Plan- Portal Island No. 1



LEGEND – TEMPORARY IMPACTS

- SUBAQUEOUS ROCK STOCKPILE AREA 133,158 SQ. FT. (3.06 ACRES), AREA OUTSIDE BERM FOOTPRINT 24,068 SQ. FT. (0.55 ACRES)
- ROADWAY TRESTLE & TEMPORARY DOCK– MAXIMUM 64, 36" DIA. IN–WATER HOLLOW STEEL PILES, 453 SQ. FT. (0.42 ACRES) SUBAQUEOUS BOTTOM IMPACTS AND A MAXIMUM 47, 36" DIA. HOLLOW STEEL PILE ABOVE MHW (333 SQ. FT.) APPROXIMATELY 34,000 SQ. FT. (0.78 ACRES) FOR DOCKING SUPERSTRUCTURE
- LOCATION TO BE DETERMINED — A MAXIMUM TOTAL OF 12 CONCRETE BLOCK AND/OR DELTA ANCHORS WITH APPROXIMATE 6'X6'X6' DIMENSION (36 SQ. FT. OF BOTTOM IMPACTS) WILL BE PLACED WITHIN ENVIRONMENTAL STUDY LIMIT. 432 SQ. FT. (0.01 ACRES) OF SUBAQUEOUS BOTTOM IMPACTS
- TYPICAL SPUD BARGE IMPACTS TO SUBAQUEOUS BOTTOM FOR FISHING PIER REPAIR 203 SQ.FT. (0.005 ACRES)
- TYPICAL SPUD BARGE IMPACTS TO SUBAQUEOUS BOTTOM FOR BRIDGE TRESTLE "A" REPAIR 203 SQ. FT. (0.005 ACRES)
- SETTLEMENT MITIGATION/BERM CONSTRUCTION MAXIMUM 324, 36" DIA. HOLLOW STEEL PILES ABOVE MHW AND MAXIMUM 254, 36" DIA. HOLLOW STEEL PILES BELOW MHW. IMPACT WITHIN BERM FOOTPRINT.
- SETTLEMENT MITIGATION/BERM CONSTRUCTION 152 SHEET PILES (PZC–26) ABOVE MHW (362 L.F.)
- PIEZOMETER (VWP–TBM–PZ#) 3 PIEZOMETER TOTAL OF 3 SQ. FT. BOTTOM IMPACTS
- TYPICAL MOORING CLUSTERS (A.K.A BREASTING DOLPHINS)–EACH CONSISTING OF FIVE 36" DIA HOLLOW STEEL PILES 250 SQ. FT. OF SUBAQUEOUS BOTTOM IMPACT PER CLUSTER (4 CLUSTERS = TOTAL 1,000 SQ. FT. (0.02 ACRES) SUBAQUEOUS BOTTOM IMPACTS)
- MUCK BIN King Pile 1180M–24D (doubles)–11 EA x 111'long IBZ14–770 Sheet Pile West Wall –95 EA x 43'long IBZ14–770 Sheet Pile N/S Wall –11 EA x 43'long IBZ14–770 Sheet Pile East Wall –88 EA x 43'long 17,856 SQ. FT. ABOVE MHW; NO SUBAQUEOUS BOTTOM IMPACT
- TEMPORARY BERM CONSTRUCTION TRESTLE MAXIMUM 80, 36" DIA. IN–WATER HOLLOW STEEL PILES. 566 SQ. FT. (0.01 ACRES) SUBAQUEOUS BOTTOM IMPACTS AND A MAXIMUM 12, 36" DIA. HOLLOW STEEL PILE ABOVE MHW (85 SQ. FT.). APPROXIMATELY 30,580 SQ. FT. (0.70 ACRES) FOR TRESTLE SUPERSTRUCTURE; IMPACT WITHIN BERM FOOTPRINT
- BERM FOUNDATION DREDGING 35,103 SQ. FT.(0.81 ACRES) 6,155 CY.; TEMPORARY IMPACT OUTSIDE BERM FOOTPRINT
- TEMPORARY SPUD BARGE IMPACTS FOR CONSTRUCTION OF TEMPORARY DOCK MAXIMUM 61 SQ. FT. (0.001 ACRES) OF SUBAQUEOUS BOTTOM IMPACT WITHIN A 13,950 SQ. FT. (0.32 ACRES) WORK AREA

LEGEND – PERMANENT IMPACTS

- ENGINEERED BERM ON SUBAQUEOUS BOTTOM (SAND) BELOW MLW 196,456 SQ. FT. (4.51 ACRES)
- ENGINEERED BERM ON SUBAQUEOUS BOTTOM (ROCK) BELOW MLW 64,469 SQ. FT. (1.48 ACRES)
- ENGINEERED BERM ON EXISTING TIDAL NON–VEGETATED WETLANDS (ROCK) MLW TO MHW 1,742 SQ. FT. (0.04 ACRES)
- BRIDGE TRESTLE "A" SUPERSTRUCTURE AND SUBSTRUCTURE MAINTENANCE REPAIR AND/OR REPLACEMENT OF UP TO THIRTY, 54" CONCRETE CYLINDER PILES – 477 SQ. FT. (0.011 ACRES)
- FISHING PIER SUPERSTRUCTURE AND SUBSTRUCTURE MAINTENANCE REPAIR AND/OR REPLACEMENT OF UP TO THIRTY, 54" CONCRETE CYLINDER PILES – 477 SQ. FT. (0.011 ACRES)

NOTES:

- ON WATER WORK AREA FOR BRIDGE TRESTLE "A" REPAIR AND/OR REPLACEMENT – 139,154 SQ. FT. (3.19 ACRES) NO SUBAQUEOUS BOTTOM IMPACTS
- ON WATER WORK AREA FOR FISHING PIER REPAIR AND/OR REPLACEMENT – 59,121 SQ. FT. (1.36 ACRES) NO SUBAQUEOUS BOTTOM IMPACTS
- TOTAL BERM FOUNDATION DREDGING 151,456 SQ. FT.(3.48 ACRES) 48,352 CY.
- ENGINEERED BERM ON EXISTING UPLAND ABOVE MHW 6,970 SQ. FT. (0.16 ACRES); NO SUBAQUEOUS BOTTOM IMPACT

MHW = 2.92' CBBT DATUM
MLW = 0.37' CBBT DATUM
NOTES: MHW/MLW SHOWN AS APPROXIMATE LOCATIONS, ADDITIONAL SURVEY DATA REQUIRED.

120 60 0 120 240
SCALE IN FEET

SUBMISSION TYPE:

NO.	DATE	BY	APP.	REVISION

FILE NAME
JOB NO.

CHESAPEAKE TUNNEL JV
2377 FERRY ROAD
VIRGINIA BEACH, VA 23455

COMMONWEALTH OF VIRGINIA
CHESAPEAKE BAY BRIDGE AND TUNNEL DISTRICT

PARALLEL THIMBLE SHOAL TUNNEL
TO
LUCIUS J. KELLAM, JR. BRIDGE-TUNNEL

CTJV PERMIT UPDATE
PORTAL ISLAND #1

DRAWN BY: MH	DATE: 3/06/19	DWG. NO.	
CHECKED BY:	SCALE: AS NOTED	SHEET 1	OF 2

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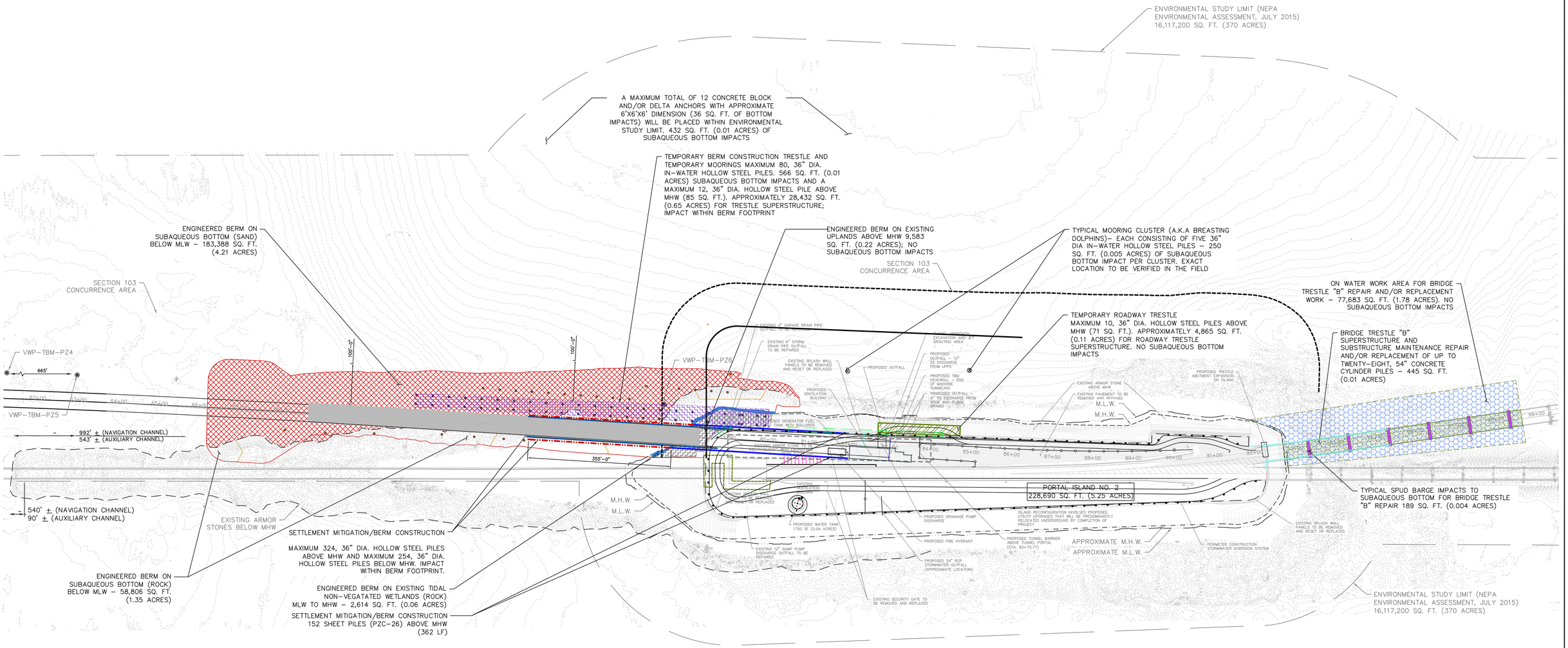
Figure 3. Permit Level Design Impact Area Plan- Portal Island No. 2



LEGEND – TEMPORARY IMPACTS

- LOCATION TO BE DETERMINED — A MAXIMUM TOTAL OF 12 CONCRETE BLOCK AND/OR DELTA ANCHORS WITH APPROXIMATE 6'X6'X6' DIMENSION (36 SQ. FT. OF BOTTOM IMPACTS) WILL BE PLACED WITHIN ENVIRONMENTAL STUDY LIMIT. 432 SQ. FT. (0.01 ACRES) OF SUBAQUEOUS BOTTOM IMPACTS.
- TYPICAL SPUD BARGE IMPACTS TO SUBAQUEOUS BOTTOM FOR BRIDGE TRESTLE "B" REPAIR 189 SQ. FT. (0.004 ACRES)
- TEMPORARY BERM CONSTRUCTION TRESTLE AND TEMPORARY MOORINGS MAXIMUM 80, 36" DIA. IN-WATER HOLLOW STEEL PILES. 566 SQ. FT. (0.01 ACRES) SUBAQUEOUS BOTTOM IMPACTS AND A MAXIMUM 12, 36" DIA. HOLLOW STEEL PILE ABOVE MHW (85 SQ. FT.). APPROXIMATELY 28,432 SQ. FT. (0.65 ACRES) FOR TRESTLE SUPERSTRUCTURE; IMPACT WITHIN BERM FOOTPRINT
- SETTLEMENT MITIGATION/BERM CONSTRUCTION MAXIMUM 324, 36" DIA. HOLLOW STEEL PILES ABOVE MHW AND MAXIMUM 254, 36" DIA. HOLLOW STEEL PILES BELOW MHW. IMPACT WITHIN BERM FOOTPRINT.
- SETTLEMENT MITIGATION/BERM CONSTRUCTION 152 SHEET PILES (PZC-26) ABOVE MHW (362 LF)
- PIEZOMETER (VWP-TBM-PZ#) 3 PIEZOMETERS TOTAL OF 3 SQ. FT. OF SUBAQUEOUS BOTTOM IMPACTS
- TYPICAL MOORING CLUSTERS (A.K.A BREASTING DOLPHINS)– EACH CONSISTING OF FIVE 36" DIA HOLLOW STEEL PILES 250 SQ. FT. OF SUBAQUEOUS BOTTOM IMPACT PER CLUSTER (2 CLUSTERS = TOTAL 500 SQ. FT. (0.01 ACRES) SUBAQUEOUS BOTTOM IMPACTS) EXACT LOCATION TO BE VERIFIED IN THE FIELD

LEGEND – PERMANENT IMPACTS

- ENGINEERED BERM ON SUBAQUEOUS BOTTOM (SAND) BELOW MLW – 183,388 SQ. FT. (4.21 ACRES)
- ENGINEERED BERM ON SUBAQUEOUS BOTTOM (ROCK) BELOW MLW – 58,806 SQ. FT. (1.35 ACRES)
- ENGINEERED BERM ON EXISTING TIDAL NON-VEGATATED WETLANDS (ROCK) MLW TO MHW – 2,614 SQ. FT. (0.06 ACRES)
- BRIDGE TRESTLE "B" SUPERSTRUCTURE AND SUBSTRUCTURE MAINTENANCE REPAIR AND/OR REPLACEMENT OF UP TO TWENTY-EIGHT, 54" CONCRETE CYLINDER PILES – 445 SQ. FT. (0.01 ACRES)

NOTES:

- TEMPORARY ROADWAY TRESTLE MAXIMUM 10, 36" DIA. HOLLOW STEEL PILES ABOVE MHW (71 SQ. FT.). APPROXIMATELY 4,865 SQ. FT. (0.11 ACRES) FOR ROADWAY TRESTLE SUPERSTRUCTURE. NO SUBAQUEOUS BOTTOM IMPACTS
- ON WATER WORK AREA FOR BRIDGE TRESTLE "B" SUPERSTRUCTURE REPAIR AND/OR REPLACEMENT – 77,683 SQ. FT. (1.78 ACRES) NO SUBAQUEOUS BOTTOM IMPACTS
- ENGINEERED BERM ON EXISTING UPLANDS ABOVE MHW 9,583 SQ. FT. (0.22 ACRES); NO SUBAQUEOUS BOTTOM IMPACTS

120 60 0 120 240
SCALE IN FEET

SUBMISSION TYPE:

NO.	DATE	BY	APP.	REVISION

CHESAPEAKE TUNNEL JV
2377 FERRY ROAD
VIRGINIA BEACH, VA 23455

COMMONWEALTH OF VIRGINIA
CHESAPEAKE BAY BRIDGE AND TUNNEL DISTRICT

PARALLEL THIMBLE SHOAL TUNNEL
TO
LUCIUS J. KELLAM, JR. BRIDGE-TUNNEL

CTJV PERMIT UPDATE PORTAL ISLAND #2

DRAWN BY: MH	DATE: 03/06/19	DWG. NO.	
CHECKED BY:	SCALE:	SHEET 2	OF 2

FILE NAME
JOB NO.

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Figure 4. Optional User Spreadsheet Calculations: Impact 2 Piles/Day

IMPACT PILE DRIVING REPORT

VERSION 1.2-Multi-Species: 2022

Example title

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	205	178	188
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	2		
Number of strikes per pile	1000		
Number of strikes per day	2000		
Cumulative SEL at measured distance	211		

OTHER INFO: 0

NOTES: 0

Attenuation: 5

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF	PHYSICAL INJURY		BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth
		Fish ≥ 2 g	Fish < 2 g	
ISOPLETHS (meters)	8.6	398.7	735.6	3,414.5
Isopleth (feet)	28.1	1,308.2	2,413.5	11,202.6

NO FISHES

SEA TURTLES

	PTS ONSET		BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	0.2	29.4	73.6
Isopleth (feet)	0.5	96.3	241.4

NO SEA TURTLES

MARINE MAMMALS

	LF Cetacean	MF Cetaceans	HF Cetaceans	PW Pinniped	OW Pinnipeds
PTS ONSET (Peak isopleth, meters)	1.2	0.2	15.8	1.4	0.2
PTS ONSET (Peak isopleth, feet)	3.8	0.7	52.0	4.5	0.5
PTS ONSET (SEL_{cum} isopleth, meters)	735.8	26.2	876.4	393.8	28.7
PTS ONSET (SEL_{cum} isopleth, feet)	2,414.0	85.9	2,875.5	1,291.9	94.1
	ALL MM	NO MF CET.	NO HF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	735.6	NO LF CET.			
Behavior (RMS isopleth, feet)	2,413.5				

Figure 5. Optional User Spreadsheet Calculations: Vibratory 2 Piles/Day

VIBRATORY PILE DRIVING REPORT

PRINT IN **LANDSCAPE** TO CAPTURE ENTIRE SCREEN

VERSION 1.2-Multi-Species: 2022

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

CTJV PTST Sarah Falin 757-334-9318

PROJECT INFORMATION	RMS
Sound pressure level (dB)	165
Distance associated with sound pressure level (meters)	10
Transmission loss constant	15
Number of piles per day	2
Duration to drive pile (minutes)	15
Duration of sound production in day	1800
Cumulative SEL at measured distance	198

2023 NOAA guidance of 185 dB peak & 171dB RMS for vibratory levels on 36 inch steel pipe piles, with bubble curtain, assuming 6dB reduction. Assuming 2 piles a day.

OTHER INFO 2023 NOAA guidance of 185 dB peak & 171

NOTES extra information

Attenuation 6

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	BEHAVIOR
NO FISHES	RMS Isopleth
ISOPLETHS (meters)	100.0
ISOPLETHS (feet)	328.1

SEA TURTLES

	PTS ONSET	BEHAVIOR
NO SEA TURTLES	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	0.3	2.2
ISOPLETHS (feet)	1.0	7.1

MARINE MAMMALS

	LF Cetacean	MF Cetaceans	HF Cetaceans	PW Pinniped	OW Pinnipeds
PTS ONSET (SELcum isopleth, meters)	8.0	0.7	11.8	4.8	0.3
PTS ONSET (SELcum isopleth, feet)	26.1	2.3	38.6	15.9	1.1
	ALL MM	NO MF CET.	NO HF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	10,000.0	NO LF CET.			
Behavior (RMS isopleth, feet)	32,808.4				

dB RMS for vibratory levels on 36 inch steel pipe piles, with bubble curtain, assuming 6dB reduction. Assuming 2 piles a day at 1000 strikes per pile.

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Figure 6: Portal Island No. 1 - Level A Harassment Zones for Impacting

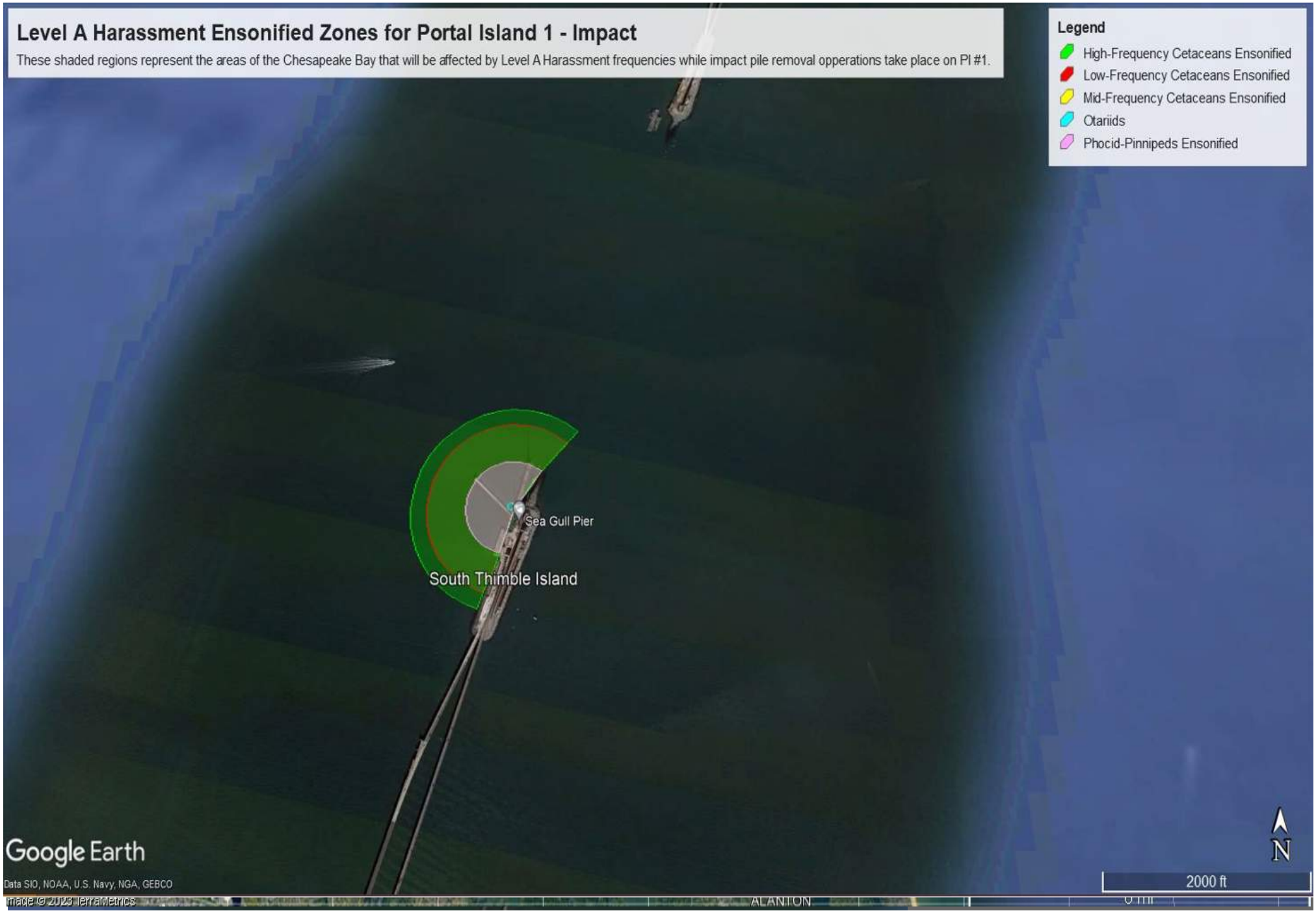

Figure 7: Portal Island No. 1 - Level A Harassment Zones for Vibratory

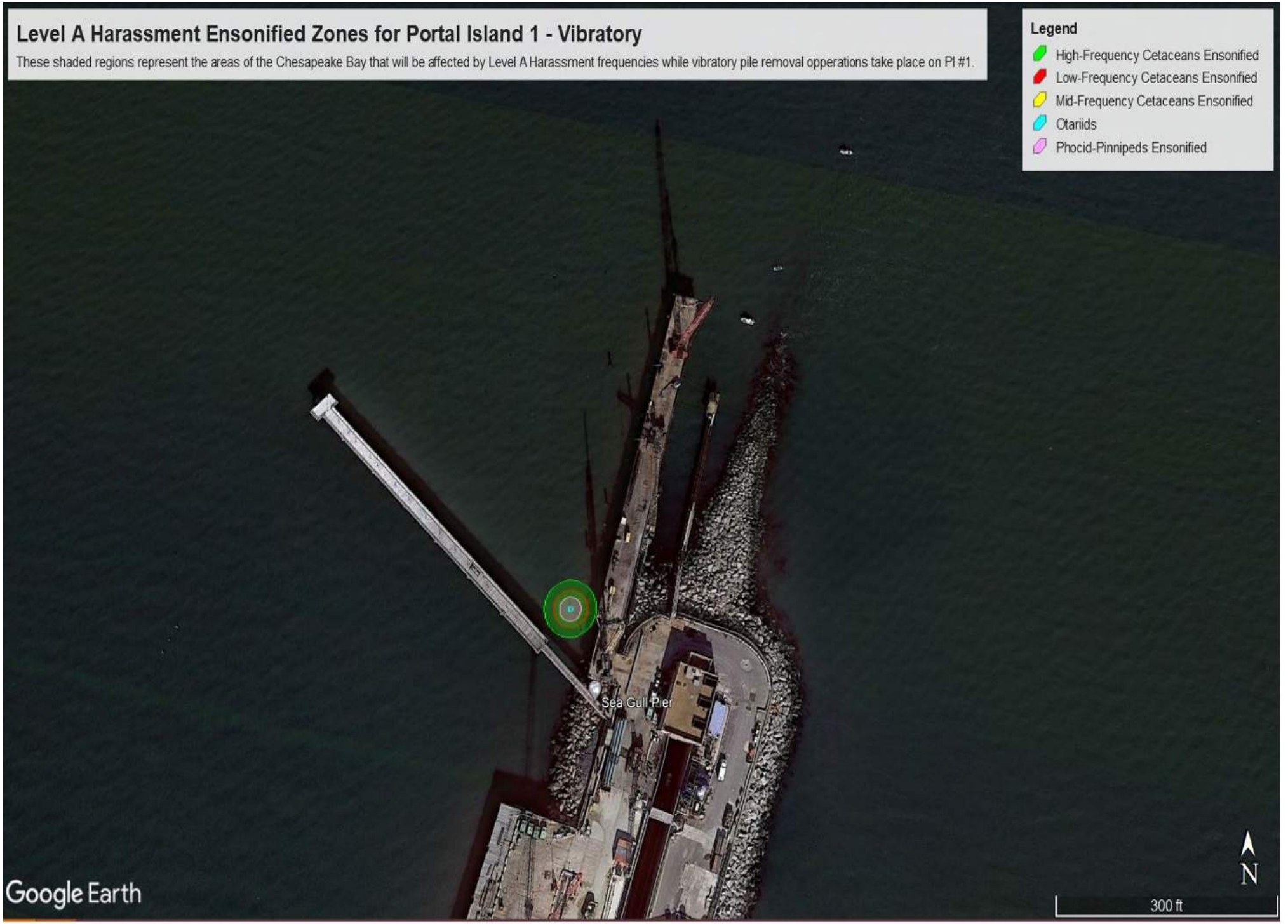

Figure 8: Portal Island No. 2 - Level A Harassment Zones for Impacting

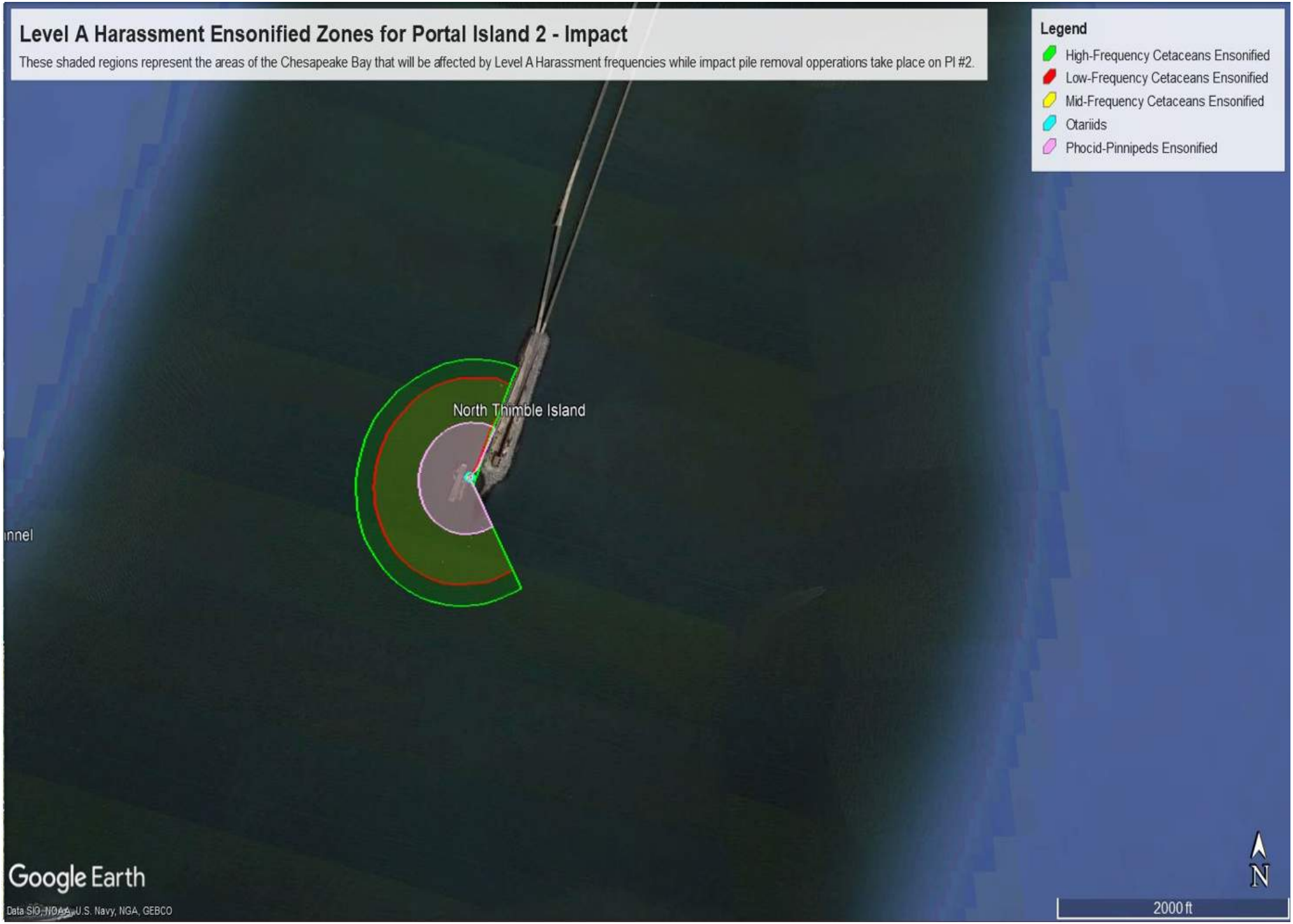

Figure 9: Portal Island No. 2 - Level A Harassment Zones for Vibratory

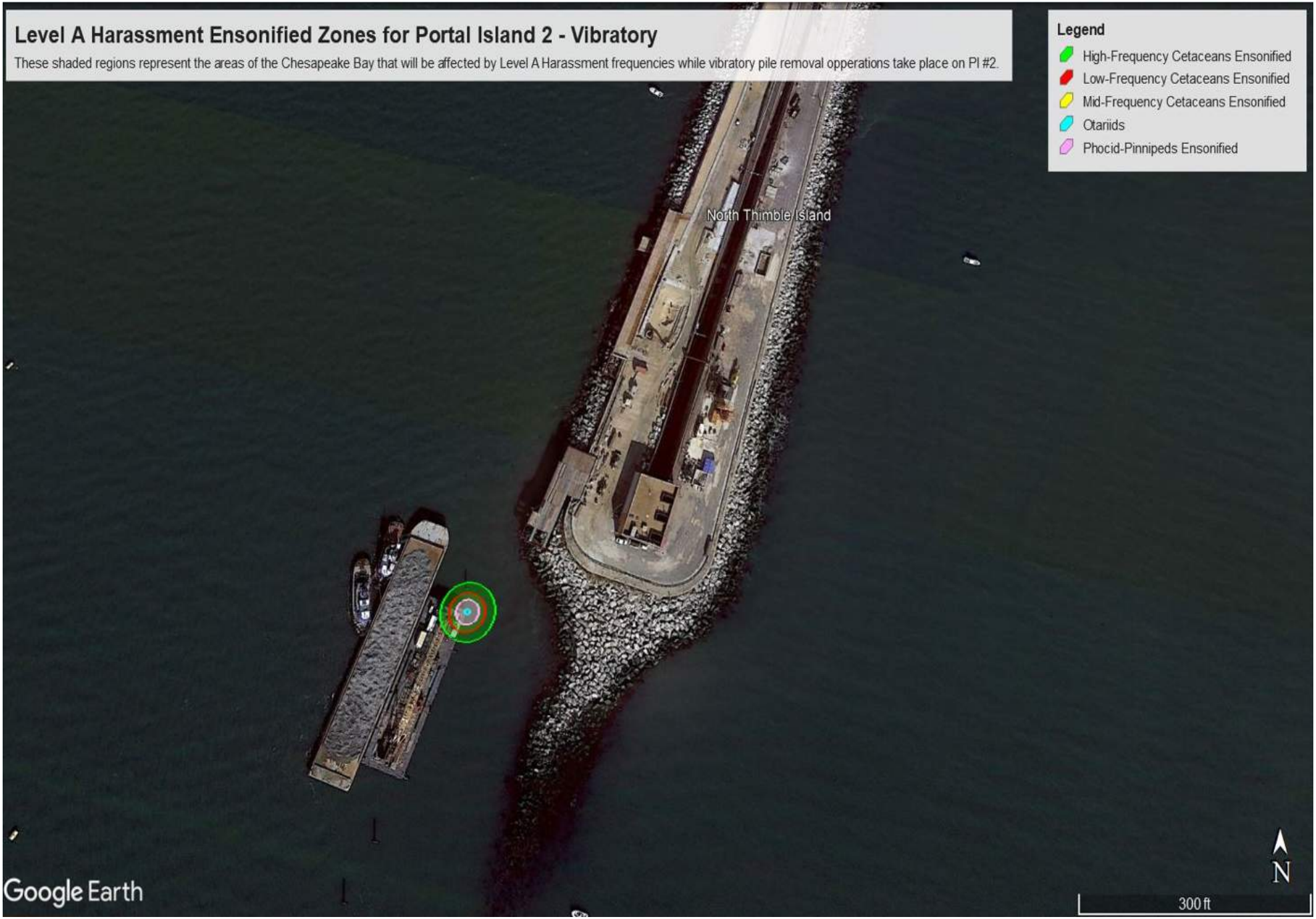

Figure 10:
Level B Harassment for Impacting and Vibratory for Portal Islands 1 & 2

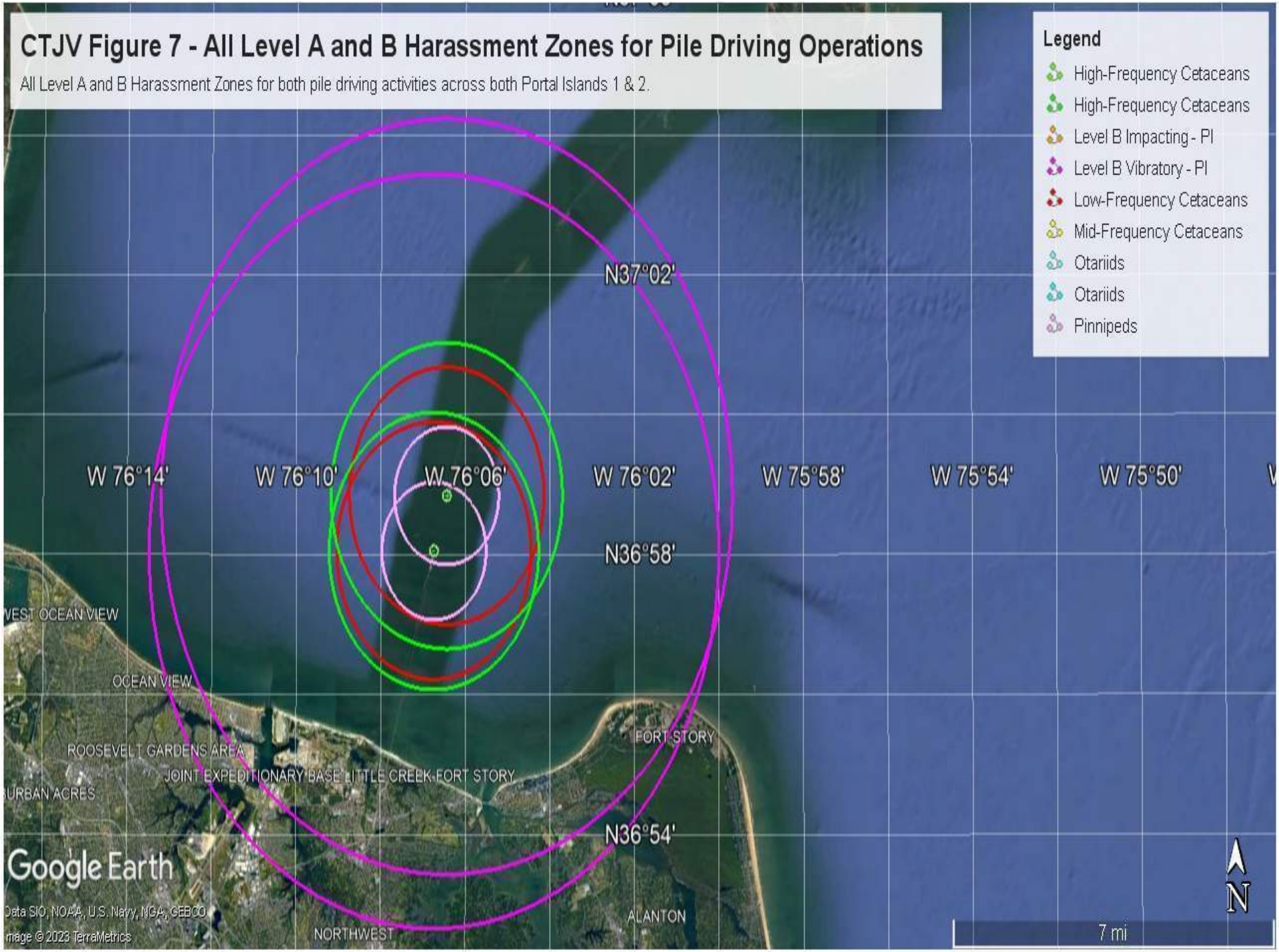

Figure 10: Refined Level B Zones for Portal Island 1

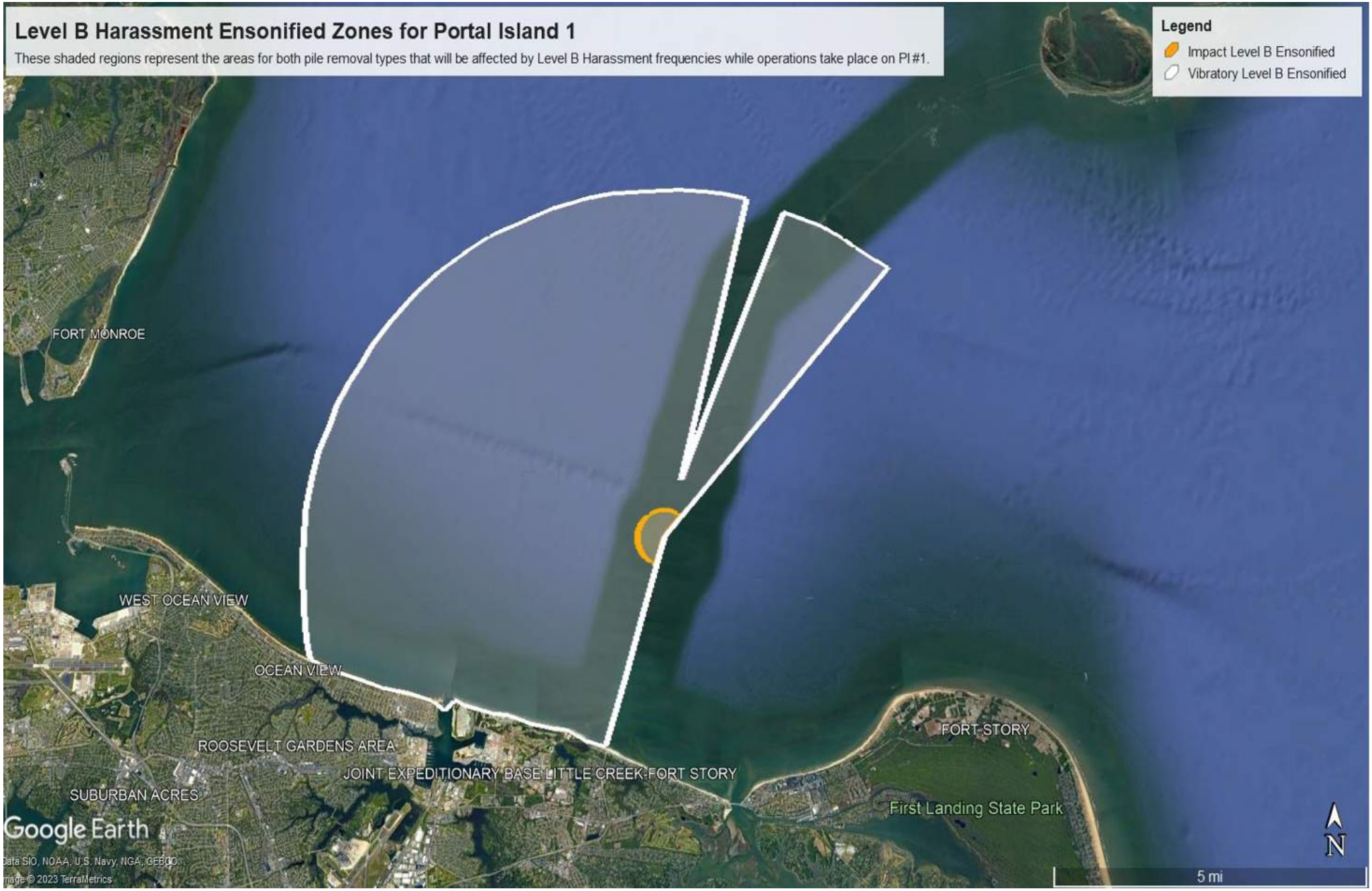

Figure 11: Refined Level B Zones for Portal Island 2

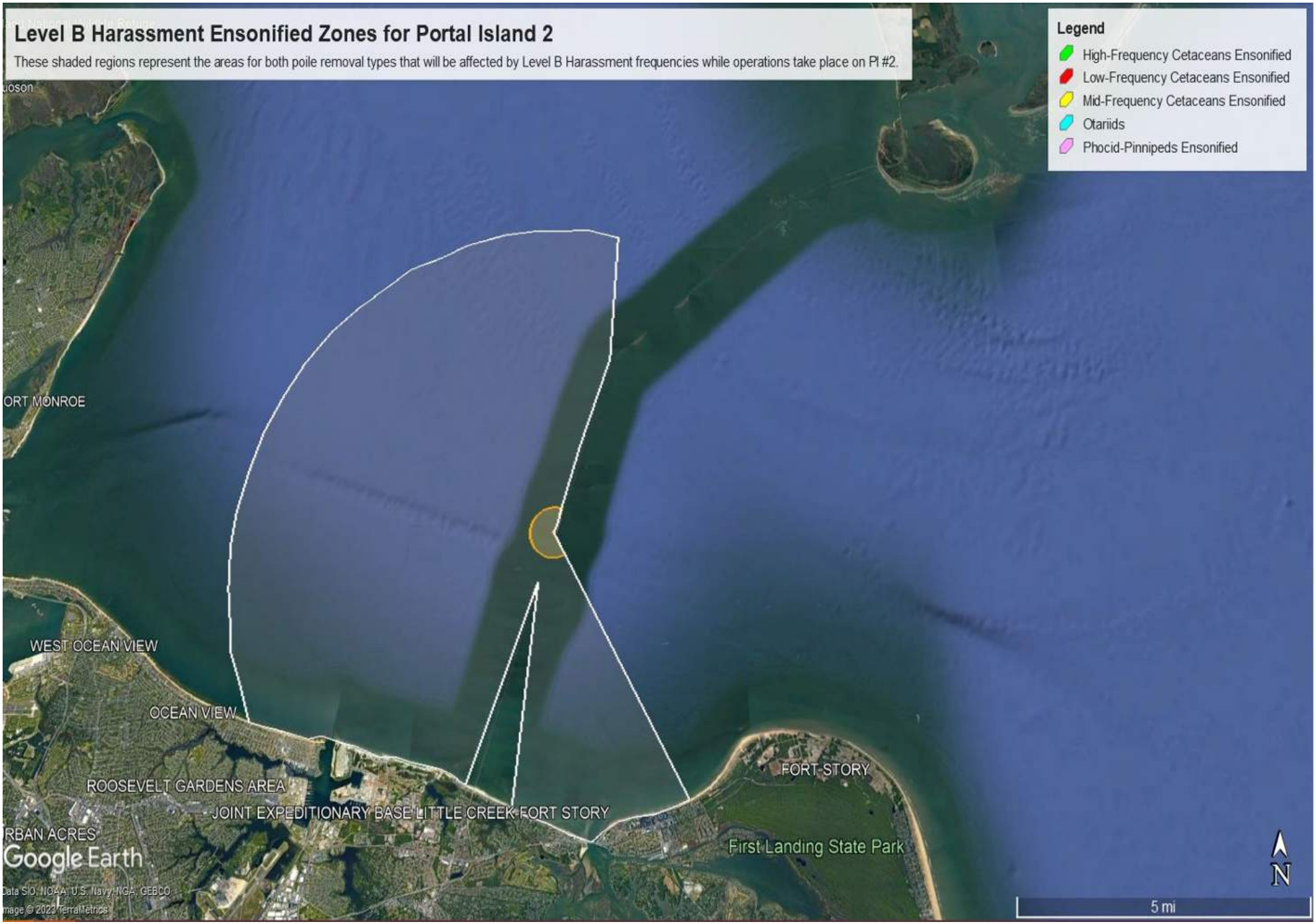

Figure 12: Protected Species Observer Locations on the Project

Portal Island 1:

Portal Island 2:

Appendix B: Marine Mammal Monitoring Plan

Marine Mammal Monitoring Plan
for the
Parallel Thimble Shoal Tunnel Project

Prepared by:

Chesapeake Tunnel Joint Venture
2377 Ferry Road
Virginia Beach, Virginia 23455

Submitted to:

National Marine Fisheries Service
Office of Protected Resources
1315 East-West Highway
Silver Spring, Maryland 20910-3226

July 2023

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

CBBT	Chesapeake Bay Bridge-Tunnel
CTJV	Chesapeake Tunnel Joint Venture
dB	decibel
dB re 1µPa^{2}sec	decibels reference level 1 micropascal squared per second
District	Chesapeake Bay Bridge and Tunnel District
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FE	Federally Endangered
FR	Federal Register
Hz	Hertz
IHA	Incidental Harassment Authorization
IWC	International Whaling Commission
kHz	Kilohertz
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water
MMMP	Marine Mammal Monitoring Plan
MMPA	Marine Mammal Protection Act
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	NOAA National Marine Fisheries Service
PSO	Protected Species Observer
PTS	Permanent Threshold Shift
PTST	Parallel Thimble Shoal Tunnel
RMS SPL	Root mean squared sound pressure level
SE	State Endangered
SEL_{CUM}	Cumulative sound exposure level
SPL_{PEAK}	Peak sound pressure level
TBM	Tunnel boring machine
USACE	United States Army Corps of Engineers
VPDES	Virginia Pollution Discharge Elimination System
ZOI	Zone of Impact

1. INTRODUCTION

The Parallel Thimble Shoal Tunnel (PTST) Project consists of the construction of a two-lane parallel tunnel to the west of the existing Thimble Shoal Tunnel, connecting Portal Island Numbers (Nos.) 1 and 2 (Figure 1). 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 6,525 linear feet (ft) of new tunnel will be constructed using a tunnel boring machine (TBM), with 5,356 linear ft located below Mean High Water (MHW).

Pile removal 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 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.

The previous IHA Renewal application was submitted by the CTJV in September 2022 and an IHA Renewal was issued by NOAA with an effective date of 08 November 2022. This new IHA application was prepared to include quantities of piles and size that need to be removed subsequent from to the piles installed under CTJV's previous IHAs. This new IHA application includes construction activities that are expected to be completed during the 12-month period from 01 January 2024 through 31 December 2024. Clarifications of work remaining works are provided below.

The following activites are scheduled to occur during the 12-month construction period extending from January 2024 to December 2024 and is illustrated in Table 1.

- The removal of 36" hollow steel mooring piles on both Island 1 & 2 (9 piles on Portal Island No. 1 and 18 total on Portal Island No. 2).
- The removal of 36" hollow steel piles on the temporary dock and trestle (97 total on Portal Island No.1).
- The removal of 36" hollow steel piles on the trestle (34 total on Portal Island No.2).

Pile removal will be conducted by initially using an impact hammer to break the friction on the previously installed piles, then switch to a vibratory hammer for extraction. In the event that the pile cannot be removed with this method, the pile will then be cut off a minimum of three feet below the stabilized, post construction sediment-water interface per USACE Section 408 requirements.

Table 1. Anticipated Pile Installation Schedule (January 2024- December 2024)

Line	Pile Location	Pile Function	Pile Type	Installation/ Removal Method	Bubble Curtain Yes/No	Number of Piles Below MHW	Number of Piles In Water Depth <10ft	Number of Days per Activity (Total)*	Number of Piles/ Days per Activity (Per Hammer Type)*	Anticipated Installation Date
1	Portal Island No. 1	Mooring dolphins	36-inch Diameter Hollow Steel Pipe Pile	Impact (if needed)	Yes	9	18	5	(2 Piles/Day)	1 January through 28 February 2024
				Vibratory (Removal)	Yes	9			(2 Piles/Day)	
2	Portal Island No. 1	Temporary Dock/ Trestle	36-inch Diameter Hollow Steel Interlocked Pipe Piles	Impact (if needed)	Yes	97	194	*49*	(2 Piles/Day)	1 January through 30 April 2024
				Vibratory (Removal)	Yes	97			(2 Piles/Day)	
3	Portal Island No. 2	Mooring dolphins	36-inch Diameter Hollow Steel Pipe Pile	Impact (if needed)	Yes	18	36	*9*	*(2 Piles/Day)*	December 1-31, 2024
				Vibratory (Removal)	Yes	18			(2 Piles/Day)	
4	Portal Island No. 2	Omega Trestle	36-inch Diameter Hollow Steel Interlocked Pipe Piles	Impact (if needed)	Yes	34	68	*17*	*(2 Piles/Day)*	December 1-31, 2024
				Vibratory (Removal)	Yes	34			*(2 Piles/Day)*	

The Chesapeake Tunnel Joint Venture (CTJV) has submitted an Incidental Harassment Authorization (IHA) application to request takes for five species: harbor seals (*Phoca vitulina*), gray seals (*Halichoerus grypus*), bottlenose dolphin (*Tursiops* spp.), harbor porpoises (Phocoena phocoena) and humpback whales (*Megaptera novaeangliae*) by Level B harassment. Fin whales (*Balaenoptera physalus*) and North Atlantic right whales (*Eubalaena glacialis*) are expected to be rare in the PTST Project Area, and no takes have been requested for these species. Pile removal operations will cease if any marine mammal species enters the Level A Shutdown Zones or if fin whales, humpback whales and North Atlantic right whales are observed in the level B monitoring zones. No takes are requested for airborne noise associated with on-land pile driving. Prior to the issuance of the IHA, pile driving on Portal Islands will cease if gray or harbor seals are observed entering the Level B airborne noise monitoring zone associated with these activities. Takes requested in the IHA for coverage in 2024 are summarized in Table 2.

Table 2. Number of Level A and B Takes Requested Per Species

Species	Stock	Level A Harassment Requests	Level B Harassment Requests
Humpback Whale	Gulf of Maine	0	3
Harbor Porpise	Gulf of Maine/ Bay of Fundy	3	6
Bottlenose Dolphin	WNA Coastal, Northern Migratory	0	7,357
	WNA Coastal, Southern Migratory	0	7,357
	NNCES	0	200
Harbor Seal	Western North Atlantic	1,473	2,210
Gray Seal	Western North Atlantic	12	17

Level A Shutdown Zones and B Zones of Impact (ZOI) are calculated based on the type of activity occurring and the hearing frequency of the marine mammal. Animals that may inhabit or pass through the area of construction are classified within the following hearing frequencies:

<u>High Frequency Cetacean:</u>

- Harbor Porpoise (*Phocoena phocoena*)

<u>Mid-Frequency Cetacean:</u>

- Bottlenose Dolphins (*Tursiops spp.*)

<u>Low Frequency Cetacean:</u>

- Fin Whale (*Balaenoptera physalus*)
- Humpback Whale (*Megaptera novaeangliae*)
- North Atlantic Right Whale (*Eubalaena glacialis*)

<u>Phocid Pinnipeds:</u>

- Harbor Seals (*Phoca vitulina*)
- Gray Seals (*Halichoerus grypus*)

This PTST Marine Mammal Monitoring Plan (MMMP) proposes a protocol for monitoring marine mammals during round pile and sheet pile driving activities in the Project Area. The goal of this MMMP is to prevent unauthorized Level A or Level B takes and to minimize Level B harassment using clearly defined methods for monitoring and shutdown procedures during construction. Incidents of harassment and construction shutdown events will be recorded and reported.

2. METHODS

2.1 MONITORING PROCEDURES

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 on the island that work is be preformed. Having a PSO located at Fort Story in Virginia Beach, is no longer necessary, as all DTH work has been completed. Figure 7 shows locations that the PSO will be located. Since there is only going to be one hammer working at a time at any given island. It is not expected to need more than one PSO at any given time.

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 PSOs must be near each pile driving rig during active operation of driving devices. A minimum of one additional PSOs may be required at each active driving rig if the Level B harassment zone and shutdown harassment 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. Monitoring will occur year-round, during pile removal operations, because some marine mammal species have the potential to be present at any time of the year.

2.2 OBSERVER QUALIFICATIONS

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.

If only one marine mammal observer is needed, this individual will have prior experience with observing marine mammals in the field. If teams of two or more observers are needed, one observer will be designated as the lead observer. The lead observer will have prior experience working as a marine mammal observer, and additional observers may substitute education or training for experience.

2.3 DATA COLLECTION

Marine mammal observers at the PTST Project Area will use Observation Record Forms approved by NOAA. An observation record will be completed by each observer for each location and day of survey.

The following data will be included in the observation records:

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 of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any. PSOs s 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:

- Dates and times (begin and end) of all marine mammal monitoring;

- 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);

- 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.

- PSO locations during marine mammal monitoring;

- 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.

- 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.
- Date and time that in-water or upland round pile or sheet pile driving/installation begins and/or ends;
- Sea state using the Beaufort Wind Force Scale and weather including percent cloud cover, percent glare, visibility;
- Species, numbers of individuals, and when possible the sex and age class of observed marine mammals;
- Pile driving or sheet pile activities occurring during each sighting;
- Behaviors exhibited by observed marine mammals, including bearing and direction of travel, and behavioral responses to soft-start and shutdown procedures;
- Location of marine mammal, distance from observer to marine mammal, and distance from the pile driving activities to the marine mammal.
- Whether the observation required implementation of shutdown procedures and the duration of each shutdown;
- Other human activity in the area such as fishing or transit of navy or cargo ships in the navigation channel. Hull numbers of fishing, cargo, or navy vessels will be recorded if possible.

2.4 EQUIPMENT

Marine mammal observers will have the following equipment available during monitoring:

- Binoculars
- Range finder
- Logbook
- Cell phone or other wireless communication
- GPS Unit (for all vessel based observations, if implemented).

3. MONITORING ZONES

3.1 LEVEL A AND LEVEL B MONITORING ZONES

The 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. Separate ZOIs were calculated for impact and vibratory pile driving/ removal (non-impulsive and continuous) for 36-inch hollow round steel pile removal. Table 3 provides output for all proposed methods of driving hollow steel piles.

Table 3. Level A and B Harrassment Monitoring Zones During Project Activities (meters)

Driving Scenerio	Radii/ Island	Level A Harassment Zones															Level B Harassment Zones		
		Low-Frequency Cetaceans			Mid-Frequency Cetaceans			High-Frequency Cetaceans			Phocid Pinnipeds			Otariids					
		Radius (m)	Island 1	Island 2	Radius (m)	Island 1	Island 2	Radius (m)	Island 1	Island 2	Radius (m)	Island 1	Island 2	Radius (m)	Island 1	Island 2	Radius (m)	Island 1	Island 2
Vibratory w/ Bubble Curtain (2 piles/day)		8	1	1	1	1	1	12	1	1	5	1	1	1	1	1	10,000	315	315
Impact w/ Bubble Curtain (2 piles/day)		285	37	37	11	1	1	339	52	52	153	11	11	12	1	1	736	1.38	1.32

TABLE 4: The Sound Levels (dB Peak, dB RMS, and dB sSEL) Expected To Be Generated In Water By Each Hammer Type/Mitigation Measure At The PTST Project

Type of Pile	Hammer Type	Estimated Peak Noise Level (dB Peak)	Estimated Pressure Level (dB RMS)	Estimated Single Strike Sound Exposure Level (dB sSEL)	Pile Function
36- Inch Steel Pipe	Impact with Bubble Curtain [a]	205	188	178	Mooring and Temp. Dock Pile Removal
	Vibratory with Bubble Curtain [b]	175	165	198	

NOTE: sSEL = Single Strike Exposure Level; dB = decibel; N/A = not applicable

[a]A 5 dB reduction was assumed for an encased bubble curtain (ICF Jones and Stokes 2009, NAVFAC 2014) using the Greater Atlantic Regional Fisheries Office (GARFO) spreadsheet tool from the highest levels reported in the proxy project that reported unattenuated sound levels.

[b]Caltrans. 2015. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Using vibratory driving of 36" steel pile as surrogate data

3.2 DISTURBANCE ZOIS FOR AIRBORN NOISE

Pinnipeds (harbor seals and gray seals) can be affected by in-air noise when they are hauled out. Loud noises can cause hauled-out pinnipeds to panic back into the water, leading to disturbance and possible injury. For in-air sound exposure of hauled-out pinnipeds, NMFS uses criteria for Level B harassment of 90 dB re 20 µPa rms for harbor seals and 100 dB re 20 µPa rms for all other pinnipeds.
The spherical spreading model was used to estimate noise threshold distances from the maximum anticipated in-air noise source level.

Given the maximum source level of 98 dBA for in-air noise during impact pile removal of 36-inch steel piles, the calculated isopleths for in-air noise can be used for all pile sizes and types associated with the Project. Based on this model, in-air noise from impact removal of 36-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 5).

Table 5. Radial distance (meters) from pile driven above MHW to PTS sound thresholds for Harbor Seals and Gray Seals

Source	Sound Level	Level A Harassment Zone (m)	Level B Harassment Zone (m)
			Harbor Seals/ Gray Seals
Impact Hammer 36-inch Pile	97 dBLMAX at 92m[a]	1,828	736
Vibratory Hammer 36-inch Pile	98 dB $_{LMAX}$ @15.24m[b]	4.8	10,000

[a]Laughlin 2007

[b] Laughlin 2010

4. MITIGATION MEASURES

The CTJV 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:

- 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.
    - Removal of hollow steel pipe piles using a impact hammer with bubble curtain to break the tension of the previously installed pile.
    - Removal of 36” hollow steel pipe pile will be by vibratory 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 are 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 removal, 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 removal 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 removal activities.

- Use of bubble curtains system is implemented during impact and vibratory removal of 36-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:Use of bubble curtains system is implemented during impact and vibratory driving/ removal of 36-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 harassment 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.
    - 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.

5. RESPONSE TO OBSERVED MARINE MAMMALS

5.1 MONITORING AND SHUTDOWN OF DISTURBANCE ZONES

The following measures would apply to CTJV's mitigation requirements: Establishment of Shutdown Zone— For all pile removal 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 6 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 6) will be monitored during all phases of construction.

Table 6 : Required Shutdown Zone Actions During Construction

Common Name	Scientific Name	Status*	Take Requested	Action during Project Activity
Fin whale	*Balaenoptera physalus*	FE/SE	No	Shutdown if observed approaching or within ZOIs A or B
Humpback whale	*Megaptera novaeangliae*		Yes	Record take for Level B; Shutdown if observed approaching or within Level A ZOI
North Atlantic right whale	*Eubalaena glacialis*	FE/SE	No	Shutdown if observed approaching or within ZOIs A or B
Bottlenose dolphin	*Tursiops truncatus.*		Yes	Record take for Level B; Shutdown if observed approaching or within Level A ZOI
Harbor porpoise	*Phocoena phocoena*		Yes	Record take for Level B; Shutdown if observed approaching or within Level A ZOI
Harbor seal	*Phoca vitulina*		Yes	Record take for Level B; Shutdown if observed approaching or within Level A ZOI
Gray seal	*Halichoerus grypus*		Yes	Record take for Level B; Shutdown if observed approaching or within Level A ZOI

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

If a whale or harbor porpoise is observed entering the Level A or Level B monitoring zones, the observer will directly contact the construction supervisor to indicate that pile driving needs to be stopped immediately. The observer will track the individual until it has left the Level A Shutdown Zone. After the whale or porpoise has been out of the Level A Shutdown Zone and B

monitoring zones for 30 minutes, the observer will notify the construction supervisor that pile removal activities may resume.

If a seal or bottlenose dolphin enters the Level A Shutdown Zones, the observer will directly contact the construction supervisor to indicate that pile driving needs to be stopped immediately. The observer(s) tracks the individual until it has left the Level A Shutdown Zone. After the seal or dolphin has been out of the Level A Shutdown Zone for 30 minutes, the observer will notify the construction supervisor that pile driving activities may resume.

If a seal or bottlenose dolphin enters the Level B monitoring zone for in-water activities, the observer will record a take of the species observed. Each individual marine mammal will count once as a take in a 24-hour period. If a seal enters the Level B monitoring zone for in water or in-air pile driving activities the observer will record a take of the species observed. If the seal hauls out it or is recorded hauled out it is not recorded again in the reciprocal environment. The observer(s) will track the individual until it has left the Level B monitoring zone.

All observations and takes of marine mammals will be documented on observation forms and compiled records will be reported to NOAA in accordance with the reporting procedures described in Section 6.

5.2 OBSERVATIONS OF INJURED OR DEAD MARINE MAMMALS

In the event that 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.

5.3 UNAUTHORIZED EXPOSURES

If an unauthorized exposure occurs (e.g., a marine mammal occurring in a Level A Shutdown Zone or Level B ZOI without an authorized take), the observer(s) will:

- Record the species type (if known), date, time, and location of the observation,

- Record any behavioral changes that occur during observation,
- Contact the construction manager to cease pile driving activity immediately, and
- Immediately notify NOAA Fisheries.

6. 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 the course of 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.

7. REFERENCES

Caltrans. 2015. *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish*. Available online: http://www.dot.ca.gov/hq/env/bio/files/bio_tech_guidance_hydroacoustic_effects_110215.pdf

NOAA Fisheries. 2015a. Marine mammal acoustic thresholds for Level B harassment. http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/threshold_guidance.html

NOAA. 2016. Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. Technical Memorandum NMFS-OPR-55.

NOAA Fisheries. 2016h. Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing. NOAA Technical Memorandum NMFS-OPR-55. July 2016. 189 pp.

NMFS. 2020. Current Basic Guidance for Assessment of DTH Pile Installation