BILLING CODE 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XR035

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Parallel Thimble Shoal Tunnel Project in Virginia Beach, Virginia

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

ACTION: Notice; proposed incidental harassment authorization; request for comments on proposed authorization and possible renewal.

SUMMARY: NMFS has received a request from the Chesapeake Tunnel Joint Venture (CTJV) for authorization to take marine mammals incidental to Parallel Thimble Shoal Tunnel Project (PTST) in Virginia Beach, Virginia. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an incidental harassment authorization (IHA) to incidentally take marine mammals during the specified activities. NMFS is also requesting comments on a possible one-year renewal that could be issued under certain circumstances and if all requirements are met, as described in *Request for Public Comments* at the end of this notice. NMFS will consider public comments prior to making any final decision on the issuance of the requested MMPA authorizations and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*].

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Physical comments should be sent to 1315 East-West Highway, Silver Spring, MD 20910 and electronic comments should be sent to *ITP.Pauline@noaa.gov*.

Instructions: NMFS is not responsible for comments sent by any other method, to any other address or individual, or received after the end of the comment period. Comments received electronically, including all attachments, must not exceed a 25-megabyte file size. Attachments to electronic comments will be accepted in Microsoft Word or Excel or Adobe PDF file formats only. All comments received are a part of the public record and will generally be posted online at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection*-act without change. All personal identifying information (*e.g.*, name, address) voluntarily submitted by the commenter may be publicly accessible. Do not submit confidential business information or otherwise sensitive or protected information.

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

SUPPLEMENTARY INFORMATION:

Background

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

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

The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

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 proposed action (*i.e.*, the issuance of an incidental harassment authorization) 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 preliminarily determined that the issuance of the proposed IHA qualifies to be categorically excluded from further NEPA review.

We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the IHA request.

Summary of Request

On May 24, 2019, NMFS received a request from the CTJV for an IHA to take marine mammals incidental to pile driving and removal at the Chesapeake Bay Bridge and Tunnel (CBBT) near Virginia Beach, Virginia. The application was deemed adequate and complete on October 11, 2019. The CTJV's request is for take of small numbers of harbor seal (*Phoca vitulina*), gray seal (*Halichoerus grypus*), bottlenose dolphin (*Tursiops truncatus*), harbor porpoise (*Phocoena phocoena*) and humpback whale (*Megaptera novaeangliae*) by Level A and Level B harassment. Neither CTJV nor NMFS expects serious injury or mortality to result from this activity and, therefore, an IHA is appropriate.

NMFS previously issued an IHA to the CTJV for similar work (83 FR 36522; July 30, 2018). However, due to design and schedule changes only a small portion of that work was conducted under the issued IHA. This proposed IHA covers one year of a five-year project.

Description of Proposed Activity

Overview

The CTJV has requested authorization for take of marine mammals incidental to in-water construction activities associated with the PTST project. The 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 of the CBBT facility which extends across the mouth of the Chesapeake Bay near Virginia Beach, Virginia. 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 PTST project will address existing constraints to regional mobility based on current traffic volume along the facility. Construction will include the installation of 878 piles over 188 days as shown below:

- 180 12-inch timber piles
- 140 36-inch steel pipe piles
- 500 36-inch interlocked pipes
- 58 42-inch steel casings

These will be installed using impact driving, vibratory driving and drilling with down-the-hole (DTH) hammers. Some piles will be removed via vibratory hammer. These activities will introduce sound into the water at levels which are likely to result in behavioral harassment or auditory injury based on expected marine mammal presence in the area. In-water construction associated with the project is anticipated to begin in fall of 2019.

Dates and Duration

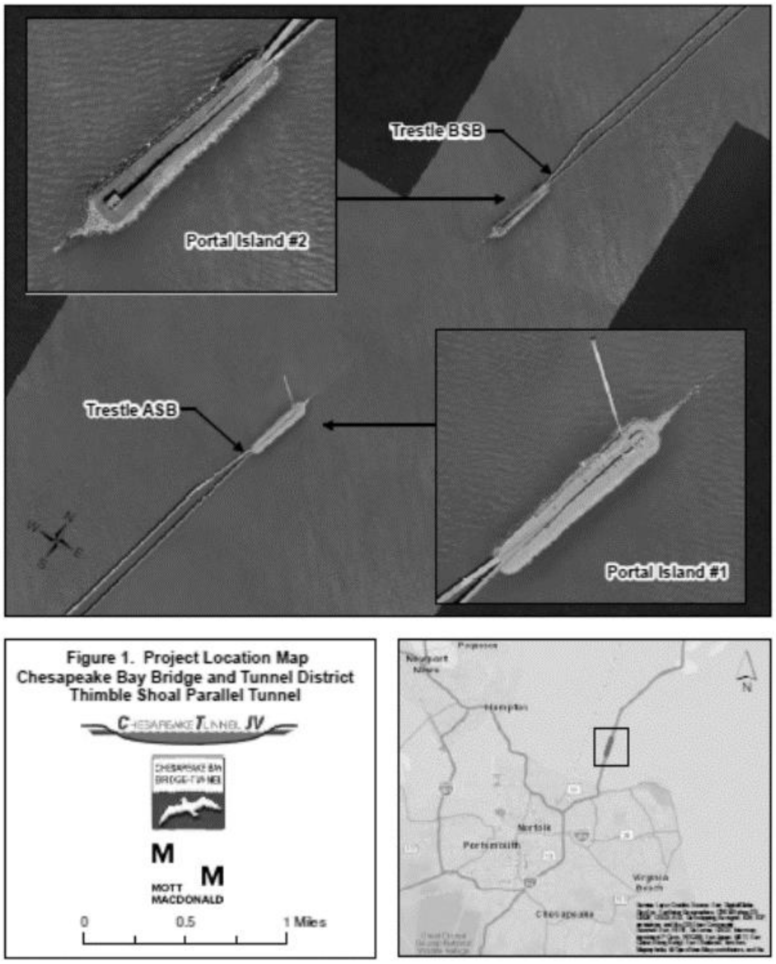
Work authorized under the proposed IHA is anticipated to take 188 days and would occur during standard daylight working hours of approximately 8-12 hours per day depending on the season. In-water work would occur every month with the exception of September and October.

The PTST project has been divided into four phases over 5 years. Phase I commenced in June 2017 and consisted of upland pre-tunnel excavation activities, while Phase IV is scheduled to be completed in May of 2022. In-water activities are limited to Phase II and, potentially, Phase IV (if substructure repair work is required at the fishing pier and/or bridge trestles and abutments).

Specific Geographic Region

The PTST project is located between Portal Island Nos. 1 and 2 of the CBBT as shown in Figure 1. A tunnel will be bored underneath the Thimble Shoal Channel connecting the Portal Islands located near the mouth of the Chesapeake Bay. The CBBT is a 23-mile (37 km) long facility that connects the Hampton Roads area of Virginia to the Eastern Shore of Virginia. Water depths within the PTST construction area range from 0 to 60 ft (18.2 m) below Mean Lower Low Water (MLLW). The Thimble Shoal Channel is 1,000 ft (305 m) wide, is authorized to a depth of -55 ft (16.8 m) below MLLW, and is maintained at a depth of 50 ft (15.2 m) MLLW.

Figure 1: Parallel Thimble Shoal Tunnel Project Location



Detailed Description of Specific Activity

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. Construction of the tunnel structure will begin on Portal Island No. 1 and move from south to north to Portal Island No. 2.

The tunnel boring machine (TBM) components will be barged and trucked to Portal Island No. 1. The TBM will be assembled within an entry/launch portal that will be constructed on Portal Island No. 1. The machine will then both excavate material and construct the tunnel as it progresses from Portal Island No. 1 to Portal Island No. 2.

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

The new parallel two-lane tunnel is 6,350 ft (1935.5 m) in overall total length with 5,356 linear ft (1632.5 m) located below Mean High Water (MHW). Descriptions of upland activities may be found in the application but such actions will not affect marine mammals and are not described here.

Proposed in-water activities include the following and are shown in Table 1:

- Temporary dock construction: Construction of a 32,832 ft^2 (3.050 m^2) working platform on the west side of Portal Island No. 1. This construction includes temporary in-water installation of 58 36-inch piles. A 42-inch steel casing will initially be drilled with a DTH hammer for each of the 36-inch piles which will then be installed with an impact hammer. A bubble curtain will be used during the impact driving of 47 of the 36-inch piles while 11 piles are expected to be installed using the impact hammer without a bubble curtain due to water depth of less than 10 ft.

- Mooring dolphins: An estimated 180 12-inch timber piles will be used for construction of the temporary mooring dolphins (120 piles at Portal Island No. 1 and 60 piles at Portal Island No. 2) and will be installed and removed using a vibratory hammer. However, should refusal be encountered prior to design tip elevation when driving with the vibratory hammer an impact hammer will be used to drive the remainder of the pile length. No bubble curtains will be utilized for the installation of the timber piles.

- Construction of two temporary Omega trestles: 36 in-water 36-inch diameter steel pipe piles will be installed at Portal Island 1 along with 28 in-water 36-inch diameter steel pipe piles at Island 2. These trestles will be offset to the west side of each engineered berm, extending approximately 659 ft (231.7 m) channelward from Portal Island Nos. 1 and 2, respectively.

- Construction of two engineered berms, approximately 1,395 ft (425 m) in length for Portal Island No. 1 (435 ft (132 m) above MHW and 960 ft (292 m) below MHW) requiring 256 36-inch steel interlocked pipe piles (135 on west side; 121 on east side) and approximately 1,354 ft (451 m) in length for Portal Island No. 2 (446 ft (136 m) above MHW and 908 ft below (277 m) MHW) requiring 244 piles of the same size and type (129 piles on west side; 115 on east side). Both berms will extend channelward from each portal island. Construction methods will include impact pile driving as well as casing advancement by DTH hammer. Interlocked pipe piles will be installed through the use of DTH drilling equipment. This equipment uses reverse circulation drilling techniques in order to advance hollow steel pipes through the existing rock found within the project site. Reverse circulation drilling is a process that involves the use of compressed air to power a down-the-hole hammer drill. In addition to providing the reciprocating action of the drill, the compressed air also serves to lift the drill cuttings away from the face of the drill and direct them back into the drill string where they are collected from the drill system for disposal. Once the pipes are advanced through the rock layer using the DTH technology, they are driven to final grade via traditional impact driving methods.

- Vibratory installation and removal of 12 36-inch steel pipe piles at Portal Island 1 and 16 piles at Portal Island 2 on both sides of the new tunnel alignment for settlement mitigation, support of excavation (SOE), and to facilitate flowable fill placement.
- Some in-water construction activities would occur simultaneously. Table 2 depicts concurrent driving scenarios (i.e., Impact + DTH; DTH +DTH) and the number of days they are anticipated to occur at specific locations (i.e. Portal Island 1; Portal Island 2; Portal Island 1 and Portal Island 2).

Table 1—Pile Driving Activities Associated with the PTST Project

Pile Location	Pile Function	Pile Type	Installation/Removal Method	Bubble Curtain	Number of Piles below MHW	Days per Activity (Total)	Days per activity (by Hammer Type)
1	Mooring dolphins	12-inch Timber piles	Vibratory (Install)	No	120	21 Days	12 Days (10 Piles/Day)
			Impact (if needed)	No			3 Days (12 Piles/Day)
			Vibratory (Removal)	No			6 Days (20 Piles/Day)
1	Temporary Dock	42-inch Diameter Steel Pipe Casing	DTH (install)	No	58	48 Days	29 Days (2 Piles/day)
			Vibratory (removal)	No			19 Days (3 Piles/day)
		36-inch Diameter Steel Pipe Pile	Impact	Yes	58*	29 Days	29 Days (2 Piles/day)
1	Omega Trestle	36-inch Diameter Steel Pipe Piles	DTH (Install)	No	36**	78 Days	13 Days (2 Piles/Day)
			Impact	Yes			65 Days (0.4 Piles/Day)
1	Berm Support of Excavation Wall - West Side	36-inch Diameter Steel Interlocked Pipe Piles	DTH (install)	No	135	58 Days	45 Days (3 Piles/Day
			Impact	Yes			13 Days (10 Piles/Day)
1	Berm	36-inch	DTH (Install)	No	121	121 Days	80 Days (1.5 Piles/Day)

	Support of Excavation Wall - East Side	Diameter Steel Interlocked Pipe Piles	Impact	Yes			41 Days (3 Piles/Day)
1	Mooring Piles and Templates	36-inch Diameter Steel Pipe Piles	Vibratory (Install & Removal)	No	12	2 Days	2 Days (12 Piles/Day)
2	Mooring Dolphins	12-inch Timber Piles	Vibratory (Install)	No	60	12 Days	6 Days (10 Piles/Day)
			Impact (if needed)	No			2 Days (15 Piles/Day)***
			Vibratory (Removal)	No			4 Days (20 Piles/Day)
2	Omega Trestle	36-inch Diameter Steel Pipe Piles	DTH (Install)	No	28	28 Days	16 Days (2 Piles/Day)
			Impact	Yes			12 Days (2.33 Piles/Day)
2	Berm Support of Excavation Wall - West Side	36-inch Diameter Steel Interlocked Pipe Piles	DTH (Install)	No	129	55 Days	42 Days (3 Piles/Day)
			Impact	Yes			13 Days (9.5 Piles/Day)
2	Berm Support of Excavation Wall - East Side	36-inch Diameter Steel Interlocked Pipe Piles	DTH (Install)	No	115	106 Days	71 Days (1.5 Piles/Day)
			Impact	Yes			35 Days (3 Piles/Day)
2	Mooring Piles and Templates	36-inch Diameter Steel Pipe Piles	Vibratory (Install & Removal)	No	16	4 Days	4 Days (4 Piles/Day)

Total	878	

*11 piles will be installed in <10 ft water so bubble curtain will not be used.
**10 piles will be installed in <10 ft water so bubble curtain will not be used.

Table 2—Concurrent Driving Scenarios for PTST Project

Concurrent Driving Scenarios	Number of Days		
	Island 1	Island 2	Driving at Portal Island 1 and Portal Island 2*
Impact + DTH	13	14	13
DTH + DTH	22	11	17

*Single hammer at each portal island

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

Description of Marine Mammals in the Area of Specified Activities

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

Table 3 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.

Marine mammal abundance estimates presented in this document represent the total number of individuals that make up a given stock or the total number estimated within a particular study or survey area. NMFS's stock abundance estimates for most species represent the total estimate of individuals within the geographic area, if known, that comprises that stock. For some species, this geographic area may extend beyond U.S. waters. All managed stocks in this region are assessed in NMFS's United States Atlantic and Gulf of Mexico Marine Mammal Stock Assessments (Hayes *et al.* 2019). All values presented in Table 3 are the most recent available at the time of publication and are available in the 2018 SARs (Hayes *et al.* 2019).

Table 3—Marine Mammal Species Likely To Occur Near the Project Area

Common name	Scientific name	Stock	ESA/MMPA status; Strategic (Y/N)[1]	Stock abundance (CV, N_{min}, most recent abundance survey)[2]	PBR	Annual M/SI[3]
Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)						
Family Balaenidae						
North Atlantic right whale[7]	*Eubalaena glacialis*	Western North Atlantic (WNA)	E, D; Y	451 (0, 411[4]; 2017)	0.9	5.56
Family Balaenopteridae (rorquals)						
Humpback whale[5]	*Megaptera novaeangliae*	Gulf of Maine	-,-; N	896 (.42; 896; 2012)	14.6	9.7
Fin whale[7]	*Balaenoptera physalus*	WNA	E,D; Y	1,618 (0.33; 1,234; 2011	2.5	2.5
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)						
Family Delphinidae						
Bottlenose dolphin	*Tursiops truncatus*	WNA Coastal, Northern Migratory	-,-; Y	6,639 (0.41; 4,759; 2011)	48	6.1-13.2
		WNA Coastal, Southern Migratory	-,-; Y	7,751 (0.06; 2,353; 2011)	23	0-14.3

		Northern North Carolina Estuarine System	-,-; Y	823 (0.06; 782; 2013)	7.8	0.8-18.2
Family Phocoenidae (porpoises)						
Harbor porpoise	*Phocoena phocoena*	Gulf of Maine/Bay of Fundy	-, -; N	79,833 (0.32; 61,415; 2011)	706	256
Order Carnivora – Superfamily Pinnipedia						
Family Phocidae (earless seals)						
Harbor seal	*Phoca vitulina*	WNA	-; N	75,834 (0.1; 66,884, 2012)	2,006	345
Gray seal[6]	*Halichoerus grypus*	WNA	-; N	27,131 (0.19, 23,158, 2016)	1,359	5,688

1 - Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.
2- NMFS marine mammal stock assessment reports online at*: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-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 2018 North Atlantic Right Whale Consortium 2018 Annual Report Card (Pettis *et al.* 2018).
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 proposed for authorization.

All species that could potentially occur in the proposed survey areas are included in Table 3. However, the temporal and/or spatial occurrence of North Atlantic right whale and fin whale is such that take is 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, NMFS is not proposing to authorize take 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. Due to the low occurrence of North Atlantic right whales and fin whales, NMFS is not proposing to authorize take of these species.

Cetaceans

Humpback Whale

The humpback whale is found worldwide in all oceans. Humpbacks occur off southern New England in all four seasons, with peak abundance in spring and summer. In winter, humpback whales from waters off New England, Canada, Greenland, Iceland, and Norway migrate to mate and calve primarily in the West Indies (including the Antilles, the Dominican Republic, the Virgin Islands and Puerto Rico), where spatial and genetic mixing among these groups occurs.

For the humpback whale, NMFS defines a stock on the basis of feeding location, *i.e.*, Gulf of Maine. However, our reference to humpback whales in this document refers to any individuals of the species that are found in the specific geographic region. These individuals may be from the same breeding population (*e.g.*, West Indies breeding population of humpback whales) but visit different feeding areas.

Based on photo-identification only 39 percent of individual humpback whales observed along the mid- and south Atlantic U.S. coast are from the Gulf of Maine stock (Barco *et al.*, 2002). Therefore, the SAR abundance estimate underrepresents the relevant population, *i.e.*, the West Indies breeding population.

Prior to 2016, humpback whales were listed under the ESA as an endangered species worldwide. Following a 2015 global status review (Bettridge *et al*., 2015), NMFS established 14 DPSs with different listing statuses (81 FR 62259; September 8, 2016) pursuant to the ESA. The West Indies DPS, which consists of the whales whose breeding range includes the Atlantic margin of the Antilles from Cuba to northern Venezuela, and whose feeding range primarily includes the Gulf of Maine, eastern Canada, and western Greenland, was delisted. As described in Bettridge *et al.* (2015), the West Indies DPS has a substantial population size (*i.e.*, approximately 10,000; Stevick *et al.*, 2003; Smith *et al.*, 1999; Bettridge *et al.*, 2015), and appears to be experiencing consistent growth. Humpback whales are the only large cetaceans that are likely to occur in the project area and could be found there at any time of the year. There have been 33 humpback whale strandings recorded in Virginia between 1988 and 2013. 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.

Since January 2016, elevated humpback whale mortalities have occurred along the Atlantic coast from Maine through Florida. The event has been declared a UME with 105 strandings recorded, 7 of which occurred in or near the mouth of the Chesapeake Bay. Partial or full necropsy examinations have been conducted on approximately half of the known cases. A portion of the whales have shown evidence of pre-mortem vessel strike; however, this finding is not consistent across all of the whales examined so more research is needed. NOAA is consulting with researchers that are conducting studies on the humpback whale populations, and these efforts may provide information on changes in whale distribution and habitat use that could provide additional insight into how these vessel interactions occurred. More detailed information is available at: *https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2019-humpback-whale-unusual-mortality-event-along-atlantic-coast.* Three previous UMEs involving humpback whales have occurred since 2000, in 2003, 2005, and 2006.

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). 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.

Bottlenose Dolphin

The bottlenose dolphin occurs 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 as well as an inshore type. The inshore morphotype can be found along the entire United States coast from New York to the Gulf of Mexico, and typically occurs in waters less than 20 meters deep (NOAA Fisheries 2016a). Bottlenose dolphins found in Virginia are representative primarily of either the northern migratory coastal stock, southern migratory coastal stock, or the Northern North Carolina Estuarine System Stock (NNCES).

The northern migratory coastal stock is best defined by its distribution during warm water months when the stock occupies coastal waters from the shoreline to approximately the 20-m isobath between Assateague, Virginia, and Long Island, New York (Garrison *et al*. 2017b). The stock migrates in late summer and fall and, during cold water months (best described by January and February), occupies coastal waters from approximately Cape Lookout, North Carolina, to the North Carolina/Virginia border (Garrison *et al*. 2017b). Historically, common bottlenose dolphins have been rarely observed during cold water months in coastal waters north of the North Carolina/Virginia border, and their northern distribution in winter appears to be limited by water temperatures. Overlap with the southern migratory coastal stock in coastal waters of northern North Carolina and Virginia is possible during spring and fall migratory periods, but the degree of overlap is unknown and it may vary depending on annual water temperature (Garrison *et al*. 2016). When the stock has migrated in cold water months to coastal waters from just north of Cape Hatteras, North Carolina, to just south of Cape Lookout, North Carolina, it overlaps spatially with the Northern North Carolina Estuarine System (NNCES) Stock (Garrison *et al.* 2017b).

The southern migratory coastal stock migrates seasonally along the coast between North Carolina and northern Florida (Garrison *et al*. 2017b). During January–March, the southern migratory coastal stock appears to move as far south as northern Florida. During April–June, the stock moves back north past Cape Hatteras, North Carolina (Garrison *et al.* 2017b), where it overlaps, in coastal waters, with the NNCES stock (in waters ≤1 km from shore). During the warm water months of July–August, the stock is presumed to occupy coastal waters north of Cape Lookout, North Carolina, to Assateague, Virginia, including the Chesapeake Bay.

The NNCES stock is best defined as animals that occupy primarily waters of the Pamlico Sound estuarine system (which also includes Core, Roanoke, and Albemarle sounds, and the Neuse River) during warm water months (July–August). Members of this stock also use coastal waters (≤1 km from shore) of North Carolina from Beaufort north to Virginia Beach, Virginia, including the lower Chesapeake Bay. A community of NNCES dolphins are likely year-round Bay residents (Patterson, Pers. Comm*).*

Harbor Porpoise

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 United States 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 porpoise 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). Since 1999, stranding incidents have ranged widely from a high of 40 in 1999 to 2 in 2011, 2012, and 2016 (Barco *et al*. 2017).

Pinnipeds

Harbor Seal

The harbor seal occurs in arctic and temperate coastal waters throughout the northern hemisphere, including on both the east and west coasts of the United States. 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 (Rees *et al.* 2016, Jones *et al*. 2018).

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 seals during the 2014/2015 season, 184 seals during the 2015/2016 season, 308 seals in the 2016/2017 season and 340 seals during the 2017/2018 season. They are primarily concentrated north of the project area at Portal Island No. 3 (Rees *et al* 2016; Jones *et al.* 2018).

Gray Seal

The gray seal occurs 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 United States, occasionally as far south as North Carolina. Gray seals inhabit rocky coasts and islands, sandbars, ice shelves and icebergs (NOAA Fisheries 2016b). In the United States, 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).

Gray seals are uncommon in Virginia and the Chesapeake Bay. Only 15 gray seal strandings were documented in Virginia from 1988 through 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 while no gray seals were reported during the 2016/2017 and 2017/2018 seasons (Rees *et al.* 2016, Jones *et al*. 2018).

Habitat

No ESA-designated critical habitat overlaps with the project area. A migratory Biologically Important Area (BIA) for North Atlantic right whales is found offshore of the mouth of the Chesapeake Bay but does not overlap with the project area. As previously described, right whales are rarely observed in the Bay and sound from the proposed in-water activities are not anticipated to propagate outside of the Bay to the boundary of the designated BIA.

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Current data indicate that not all marine mammal species have equal hearing capabilities (*e.g.*, Richardson *et al.* 1995; Wartzok and Ketten, 1999; Au and Hastings, 2008). To reflect this, Southall *et al.* (2007) recommended that marine mammals be divided into functional hearing groups based on directly measured or estimated hearing ranges on the basis of available behavioral response data, audiograms derived using auditory evoked potential techniques, anatomical modeling, and other data. Note that no direct measurements of hearing ability have been successfully completed for mysticetes (*i.e*., low-frequency cetaceans). Subsequently, NMFS (2018) described generalized hearing ranges for these marine mammal hearing groups. Generalized hearing ranges were chosen based on the approximately 65 decibel (dB) threshold from the normalized composite audiograms, with the exception for lower limits for low-frequency cetaceans where the lower bound was deemed to be biologically implausible and the lower bound from Southall *et al.* (2007) retained. Marine mammal hearing groups and their associated hearing ranges are provided in Table 4.

Table 4—Marine Mammal Hearing Groups (NMFS, 2018)

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

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

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

For more detail concerning these groups and associated frequency ranges, please see NMFS (2018) for a review of available information. Five marine mammal species (3 cetacean and 2 phocid pinniped) have the reasonable potential to co-occur with the proposed survey activities. Please refer to Table 3. Of the cetacean species that may be present, one is classified as low-frequency (humpback whale), one is classified as mid-frequency (bottlenose dolphin) and one is classified as high-frequency (harbor porpoise).

Potential Effects of Specified Activities on Marine Mammals and their Habitat

This section includes a summary and discussion of the ways that components of the specified activity may impact marine mammals and their habitat. The *Estimated Take by Incidental Harassment* section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The *Negligible Impact Analysis and Determination* section considers the content of this section, the *Estimated Take by Incidental Harassment* section, and the *Proposed Mitigation* section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and how those impacts on individuals are likely to impact marine mammal species or stocks.

Description of Sound Sources

The marine soundscape is comprised of both ambient and anthropogenic sounds. Ambient sound is defined as the all-encompassing sound in a given place and is usually a composite of sound from many sources both near and far. The sound level of an area is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.*, waves, wind, precipitation, earthquakes, ice, atmospheric sound), biological (*e.g.,* sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.*, vessels, dredging, aircraft, construction).

The sum of the various natural and anthropogenic sound sources at any given location and time—which comprise "ambient" or "background" sound—depends not only on the source levels (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor, and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10-20 dB from day to day (Richardson *et al.* 1995). The result is that, depending on the source type and its intensity, sound from the specified activity may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

In-water construction activities associated with the project would include impact pile driving, vibratory pile driving, vibratory pile removal, and drilling with a DTH hammer. The sounds produced by these activities fall into one of two general sound types: impulsive and non-impulsive. Impulsive sounds (*e.g.*, explosions, gunshots, sonic booms, impact pile driving) are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI 1986; NIOSH 1998; NMFS 2018). Non-impulsive sounds (*e.g.* aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems) can be broadband, narrowband or tonal, brief or prolonged (continuous or intermittent), and typically do not have the high peak sound pressure with raid rise/decay time that impulsive sounds do (ANSI 1995; NIOSH 1998; NMFS 2018). The distinction between these two sound types is important because they have differing potential to cause physical effects, particularly with regard to hearing (*e.g.*, Ward 1997 in Southall *et al.* 2007).

Impact hammers operate by repeatedly dropping a heavy piston onto a pile to drive the pile into the substrate. Sound generated by impact hammers is characterized by rapid rise times and high peak levels, a potentially injurious combination (Hastings and Popper 2005). Vibratory hammers install piles by vibrating them and allowing the weight of the hammer to push them into the sediment. Vibratory hammers produce significantly less sound than impact hammers. Peak sound pressure levels (SPLs) may be 180 dB or greater, but are generally 10 to 20 dB lower than SPLs generated during impact pile driving of the same-sized pile (Oestman *et al.* 2009). Rise time is slower, reducing the probability and severity of injury, and sound energy is distributed over a greater amount of time (Nedwell and Edwards 2002; Carlson *et al.* 2005). A DTH hammer is used to place hollow steel piles or casings by drilling. A DTH hammer is a drill bit that drills through the bedrock using a pulse mechanism that functions at the bottom of the hole. This pulsing bit breaks up rock to allow removal of debris and insertion of the pile. The head extends so that the drilling takes place below the pile. Sound associated with DTH has both continuous and impulsive characteristics and may be appropriately characterized one way or the other depending on the operating parameters and settings that are utilized on a specific device. CTJV conducted sound source verification (SSV) monitoring prior to the expiration of the previous IHA and determined that impulsive characteristics were predominant as the equipment was employed at the PTST project location (Denes *et al.* 2019).

The likely or possible impacts of CTJV's proposed activity on marine mammals could involve both non-acoustic and acoustic stressors. Potential non-acoustic stressors could result from the physical presence of the equipment and personnel; however, any impacts to marine mammals are expected to primarily be acoustic in nature. Acoustic stressors include effects of heavy equipment operation during pile installation.

Acoustic Impacts

The introduction of anthropogenic noise into the aquatic environment from pile driving is the primary means by which marine mammals may be harassed from CTJV's specified activity. In general, animals exposed to natural or anthropogenic sound may experience physical and psychological effects, ranging in magnitude from none to severe (Southall *et al.* 2007). Exposure to in-water construction noise has the potential to result in auditory threshold shifts and behavioral reactions (*e.g.*, avoidance, temporary cessation of foraging and vocalizing, changes in dive behavior) and/or lead to non-observable physiological responses such an increase in stress hormones ((Richardson *et al.* 1995; Gordon *et al.* 2004; Nowacek *et al.*2007; Southall *et al.* 2007; Gotz *et al.* 2009). Additional noise in a marine mammal's habitat can mask acoustic cues used by marine mammals to carry out daily functions such as communication and predator and prey detection. The effects of pile driving noise on marine mammals are dependent on several factors, including, but not limited to, sound type (*e.g.*, impulsive vs. non-impulsive), the species, age and sex class (*e.g.*, adult male vs. mom with calf), duration of exposure, the distance between the pile and the animal, received levels, behavior at time of exposure, and previous history with exposure (Wartzok *et al.* 2004; Southall *et al.* 2007). Here we discuss physical auditory effects (threshold shifts), followed by behavioral effects and potential impacts on habitat.

Richardson *et al.* (1995) described zones of increasing intensity of effect that might be expected to occur, in relation to distance from a source and assuming that the signal is within an animal's hearing range. First is the area within which the acoustic signal would be audible (potentially perceived) to the animal, but not strong enough to elicit any overt behavioral or physiological response. The next zone corresponds with the area where the signal is audible to the animal and of sufficient intensity to elicit behavioral or physiological responsiveness. Third is a zone within which, for signals of high intensity, the received level is sufficient to potentially cause discomfort or tissue damage to auditory or other systems. Overlaying these zones to a certain extent is the area within which masking (*i.e.*, when a sound interferes with or masks the ability of an animal to detect a signal of interest that is above the absolute hearing threshold) may occur; the masking zone may be highly variable in size.

We describe the more severe effects (*i.e.*, permanent hearing impairment, certain non-auditory physical or physiological effects) only briefly as we do not expect that there is a reasonable likelihood that CTJV's activities would result in such effects (see below for further discussion). NMFS defines a noise-induced threshold shift (TS) as a change, usually an increase, in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). The amount of threshold shift is customarily expressed in dB. A TS can be permanent or temporary. As described in NMFS (2018), there are numerous factors to consider when examining the consequence of TS, including, but not limited to, the signal temporal pattern (*e.g.*, impulsive or non-impulsive), likelihood an individual would be exposed for a long enough duration or to a high enough level to induce a TS, the magnitude of the TS, time to recovery (seconds to minutes or hours to days), the frequency range of the exposure (*i.e.*, spectral content), the hearing and vocalization frequency range of the exposed species relative to the signal's frequency spectrum (*i.e.*, how animal uses sound within the frequency band of the signal; *e.g.*, Kastelein *et al.* 2014b), and the overlap between the animal and the source (*e.g.*, spatial, temporal, and spectral).

Permanent Threshold Shift (PTS)—NMFS defines PTS as a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). Available data from humans and other terrestrial mammals indicate that a 40 dB threshold shift approximates PTS onset (see Ward *et al.* 1958, 1959; Ward 1960; Kryter *et al.* 1966; Miller 1974; Ahroon *et al.* 1996; Henderson *et al.* 2008). PTS levels for marine mammals are estimates, as with the exception of a single study unintentionally inducing PTS in a harbor seal (Kastak *et al.* 2008), there are no empirical data measuring PTS in marine mammals largely due to the fact that, for various ethical reasons, experiments involving anthropogenic noise exposure at levels inducing PTS are not typically pursued or authorized (NMFS 2018).

Temporary Threshold Shift (TTS)—A temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (NMFS 2018). Based on data from cetacean TTS measurements (see Southall *et al.* 2007), a TTS of 6 dB is considered the minimum threshold shift clearly larger than any day-to-day or session-to-session variation in a subject's normal hearing ability (Schlundt *et al.* 2000; Finneran *et al.* 2000, 2002). As described in Finneran (2016), marine mammal studies have shown the amount of TTS increases with cumulative sound exposure level (SELcum) in an accelerating fashion: At low exposures with lower SELcum, the amount of TTS is typically small and the growth curves have shallow slopes. At exposures with higher SELcum, the growth curves become steeper and approach linear relationships with the noise SEL.

Depending on the degree (elevation of threshold in dB), duration (*i.e.*, recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious (similar to those discussed in auditory masking, below). For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that takes place during a time when the animal is traveling through the open ocean, where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during time when communication is critical for successful mother/calf interactions could have more serious impacts. We note that reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.* 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without cost.

Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin, beluga whale (*Delphinapterus leucas*), harbor porpoise, and Yangtze finless porpoise (*Neophocoena asiaeorientalis*)) and five species of pinnipeds exposed to a limited number of sound sources (*i.e.*, mostly tones and octave-band noise) in laboratory settings (Finneran 2015). TTS was not observed in trained spotted (*Phoca largha*) and ringed (*Pusa hispida*) seals exposed to impulsive noise at levels matching previous predictions of TTS onset (Reichmuth *et al.* 2016). In general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran 2015). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. No data are available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall *et al.* (2007), Finneran and Jenkins (2012), Finneran (2015), and Table 5 in NMFS (2018).

Behavioral Harassment—Behavioral disturbance may include a variety of effects, including subtle changes in behavior (*e.g.*, minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high-quality habitat. Disturbance may result in changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located. Pinnipeds may increase their haul out time, possibly to avoid in-water disturbance (Thorson and Reyff 2006). Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (*e.g.,* species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (*e.g.,* Richardson *et al.* 1995; Wartzok *et al.* 2003; Southall *et al.* 2007; Weilgart 2007; Archer *et al.* 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison *et al.* 2012), and can vary depending on characteristics associated with the sound source (*e.g.,* whether it is moving or stationary, number of sources, distance from the source). In general, pinnipeds seem more tolerant of, or at least habituate more quickly to, potentially disturbing underwater sound than do cetaceans, and generally seem to be less responsive to exposure to industrial sound than most cetaceans. Please see Appendices B-C of Southall *et al.* (2007) for a review of studies involving marine mammal behavioral responses to sound.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.* 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a "progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial," rather than as, more generally, moderation in response to human disturbance (Bejder *et al.* 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure.

As noted above, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson *et al.* 1995; NRC, 2003; Wartzok *et al.* 2003). Controlled experiments with captive marine mammals have showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al.* 1997; Finneran *et al.* 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002; see also Richardson *et al.* 1995; Nowacek *et al.* 2007).

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (*e.g.,* Lusseau and Bejder 2007; Weilgart 2007; NRC 2005). However, there are broad categories of potential response, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

Changes in dive behavior can vary widely, and may consist of increased or decreased dive times and surface intervals as well as changes in the rates of ascent and descent during a dive (*e.g.,* Frankel and Clark 2000; Costa *et al.* 2003; Ng and Leung 2003; Nowacek *et al.* 2004; Goldbogen *et al.* 2013a,b). Variations in dive behavior may reflect interruptions in biologically significant activities (*e.g.,* foraging) or they may be of little biological significance. The impact of an alteration to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (*e.g.,* bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (*e.g.,* Croll *et al.* 2001; Nowacek *et al.* 2004; Madsen *et al.* 2006; Yazvenko *et al.* 2007). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

Variations in respiration naturally vary with different behaviors and alterations to breathing rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response.

Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure (*e.g.*, Kastelein *et al.* 2001, 2005b, 2006; Gailey *et al.* 2007).

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect increased vigilance or a startle response. For example, in the presence of potentially masking signals, humpback whales and killer whales have been observed to increase the length of their songs (Miller *et al*, 2000; Fristrup *et al.* 2003; Foote *et al*, 2004), while right whales have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al*, 2007b). In some cases, animals may cease sound production during production of aversive signals (Bowles *et al*, 1994).

Avoidance is the displacement of an individual from an area or migration path as a result of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson *et al.* 1995). For example, gray whales *(Eschrictius robustus*) are known to change direction—deflecting from customary migratory paths—in order to avoid noise from seismic surveys (Malme *et al.* 1984). Avoidance may be short-term, with animals returning to the area once the noise has ceased (*e.g.*, Bowles *et al.* 1994; Goold 1996; Stone *et al.* 2000; Morton and Symonds, 2002; Gailey *et al.* 2007). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (*e.g.,* Blackwell *et al.* 2004; Bejder *et al.* 2006; Teilmann *et al.* 2006).

A flight response is a dramatic change in normal movement to a directed and rapid movement away from the perceived location of a sound source. The flight response differs from other avoidance responses in the intensity of the response (*e.g.,* directed movement, rate of travel). Relatively little information on flight responses of marine mammals to anthropogenic signals exist, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus 1996). The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, marine mammal strandings (Evans and England 2001). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and Reeves 2008), and whether individuals are solitary or in groups may influence the response.

Behavioral disturbance can also impact marine mammals in more subtle ways. Increased vigilance may result in costs related to diversion of focus and attention (*i.e.,* when a response consists of increased vigilance, it may come at the cost of decreased attention to other critical behaviors such as foraging or resting). These effects have generally not been demonstrated for marine mammals, but studies involving fish and terrestrial animals have shown that increased vigilance may substantially reduce feeding rates (*e.g.,* Beauchamp and Livoreil 1997; Fritz *et al,*, 2002; Purser and Radford 2011). In addition, chronic disturbance can cause population declines through reduction of fitness (*e.g.,* decline in body condition) and subsequent reduction in reproductive success, survival, or both (*e.g.,* Harrington and Veitch, 1992; Daan *et al.* 1996; Bradshaw *et al.* 1998). However, Ridgway *et al.* (2006) reported that increased vigilance in bottlenose dolphins exposed to sound over a five-day period did not cause any sleep deprivation or stress effects.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (24-hour cycle). Disruption of such functions resulting from reactions to stressors such as sound exposure are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.* 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall *et al.* 2007). Note that there is a difference between multi-day substantive behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts for multiple days does not necessarily mean that individual animals are either exposed to activity-related stressors for multiple days or, further, exposed in a manner resulting in sustained multi-day substantive behavioral responses.

Stress responses—An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (*e.g.*, Seyle 1950; Moberg 2000). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress—including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones.

Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (*e.g.,* Moberg 1987; Blecha 2000). Increases in the circulation of glucocorticoids are also equated with stress (Romano *et al.* 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and distress is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments and for both laboratory and free-ranging animals (*e.g.,* Holberton *et al.* 1996; Hood *et al.* 1998; Jessop *et al.* 2003; Krausman *et al.* 2004; Lankford *et al.* 2005). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Fair and Becker 2000; Romano *et al.* 2002b) and, more rarely, studied in wild populations (*e.g.,* Romano *et al.* 2002a). For example, Rolland *et al.* (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as "distress." In addition, any animal experiencing TTS would likely also experience stress responses (NRC, 2003).

Masking—Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (*e.g.,* those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson *et al.* 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (*e.g.*, snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.,* pile driving, shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.*, signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.*, sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age or TTS hearing loss), and existing ambient noise and propagation conditions.

Masking of natural sounds can result when human activities produce high levels of background sound at frequencies important to marine mammals. Conversely, if the background level of underwater sound is high (*e.g.* on a day with strong wind and high waves), an anthropogenic sound source would not be detectable as far away as would be possible under quieter conditions and would itself be masked. Busy ship channels traverse Thimble Shoal. Commercial vessels including container ships and cruise ships as well as numerous recreational frequent the area, so background sound levels near the PTST project area are likely to be elevated, although to what degree is unknown.

The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect detection of mysticete communication calls and other potentially important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.,* Clark *et al.* 2009) and may result in energetic or other costs as animals change their vocalization behavior (*e.g.,* Miller *et al.* 2000; Foote *et al.* 2004; Parks *et al.* 2007b; Di Iorio and Clark 2009; Holt *et al.* 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson *et al.* 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Houser and Moore 2014). Masking can be tested directly in captive species (*e.g.,* Erbe 2008), but in wild populations it must be either modeled or inferred from evidence of masking compensation. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g.,* Branstetter *et al.* 2013).

Masking affects both senders and receivers of acoustic signals and can potentially have long-term chronic effects on marine mammals at the population level as well as at the individual level. Low-frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, with most of the increase from distant commercial shipping (Hildebrand 2009). All anthropogenic sound sources, but especially chronic and lower-frequency signals (*e.g.,* from vessel traffic), contribute to elevated ambient sound levels, thus intensifying masking.

Underwater Acoustic Effects

Potential Effects of Pile Driving Sound

The effects of sounds from pile driving might include one or more of the following: Temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, and masking (Richardson *et al.* 1995; Gordon *et al.* 2003; Nowacek *et al.* 2007; Southall *et al.* 2007). The effects of pile driving on marine mammals are dependent on several factors, including the type and depth of the animal; the pile size and type, and the intensity and duration of the pile driving sound; the substrate; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. Impacts to marine mammals from pile driving activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the frequency, received level, and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The further away from the source, the less intense the exposure should be. The substrate and depth of the habitat affect the sound propagation properties of the environment. In addition, substrates that are soft (*e.g.,* sand) would absorb or attenuate the sound more readily than hard substrates (*e.g.,* rock), which may reflect the acoustic wave. Soft porous substrates would also likely require less time to drive the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source.

In the absence of mitigation, impacts to marine species could be expected to include physiological and behavioral responses to the acoustic signature (Viada *et al.* 2008). Potential effects from impulsive sound sources like impact pile driving can range in severity from effects such as behavioral disturbance to temporary or permanent hearing impairment (Yelverton *et al.* 1973). Due to the nature of the pile driving sounds in the project, behavioral disturbance is the most likely effect from the proposed activity. Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shifts. Note that PTS constitutes injury, but TTS does not (Southall *et al.* 2007).

Non-auditory Physiological Effects

Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al.* 2006; Southall *et al.* 2007). Studies examining such effects are limited. In general, little is known about the potential for pile driving to cause non-auditory physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would presumably be limited to short distances from the sound source and to activities that extend over a prolonged period. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall *et al.* 2007) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. We do not expect any non-auditory physiological effects because of mitigation that prevents animals from approach the source too closely. Marine mammals that show behavioral avoidance of pile driving, including some odontocetes and some pinnipeds, are especially unlikely to incur non-auditory physical effects.

Disturbance Reactions

Responses to continuous sound, such as vibratory pile installation, have not been documented as well as responses to pulsed sounds. With both types of pile driving, it is likely that the onset of pile driving could result in temporary, short term changes in an animal's typical behavior and/or avoidance of the affected area. These behavioral changes may include (Richardson *et al.* 1995): Changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located; and/or flight responses (*e.g.*, pinnipeds flushing into water from haul-outs or rookeries). Pinnipeds may increase their haul out time, possibly to avoid in-water disturbance (Thorson and Reyff 2006). If a marine mammal responds to a stimulus by changing its behavior (*e.g.,* through relatively minor changes in locomotion direction/speed or vocalization behavior), the response may or may not constitute taking at the individual level, and is unlikely to affect the stock or the species as a whole. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on animals, and if so potentially on the stock or species, could potentially be significant (*e.g.,* Lusseau and Bejder 2007; Weilgart 2007).

The biological significance of many of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However, the consequences of behavioral modification could be expected to be biologically significant if the change affects growth, survival, or reproduction. Significant behavioral modifications that could potentially lead to effects on growth, survival, or reproduction include:

- Drastic changes in diving/surfacing patterns (such as those thought to cause beaked whale stranding due to exposure to military mid-frequency tactical sonar);
- Longer-term habitat abandonment due to loss of desirable acoustic environment; and
- Longer-term cessation of feeding or social interaction.

The onset of behavioral disturbance from anthropogenic sound depends on both external factors (characteristics of sound sources and their paths) and the specific characteristics of the receiving animals (hearing, motivation, experience, demography) and is difficult to predict (Southall *et al.* 2007).

Auditory Masking

Natural and artificial sounds can disrupt behavior by masking. The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Because sound generated from in-water pile driving is mostly concentrated at low frequency ranges, it may have less effect on high frequency echolocation sounds made by porpoises. The most intense underwater sounds in the proposed action are those produced by impact pile driving. Given that the energy distribution of pile driving covers a broad frequency spectrum, sound from these sources would likely be within the audible range of marine mammals present in the project area. Impact pile driving and DTH drilling activities are relatively short-term, with rapid pulses occurring for less than fifteen minutes per pile. The probability for impact pile driving and DTH drilling resulting from this proposed action masking acoustic signals important to the behavior and survival of marine mammal species is low. Vibratory pile driving is also relatively short-term, with rapid oscillations occurring for approximately 30 minutes per pile. It is possible that vibratory pile driving resulting from this proposed action may mask acoustic signals important to the behavior and survival of marine mammal species, but the short-term duration and limited affected area would result in insignificant impacts from masking. Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for vibratory and impact pile driving, and which have already been taken into account in the exposure analysis. Active pile driving is anticipated to occur for up to 8 hours per day for 188 days, but we do not anticipate masking to significantly affect marine mammals for the reasons listed above.

Airborne Acoustic Effects

Pinnipeds that occur near the project site could be exposed to airborne sounds associated with pile driving that have the potential to cause behavioral harassment, depending on their distance from pile driving activities. Cetaceans are not expected to be exposed to airborne sounds that would result in harassment as defined under the MMPA.

Airborne noise would primarily be an issue for pinnipeds that are swimming or hauled out near the project site within the range of noise levels elevated above the acoustic criteria. Only limited numbers of pinnipeds have used Portal Island 1 and 2 as haulouts (<6 percent of total pinniped sightings). The majority of hauled out pinniped sightings have been found at Portal Island 3 (~90 percent) according to Jones *et al.* (2018), which is 6 km north of Portal Island 2. This is far beyond the distance at which harassment could occur due to airborne noise.

We recognize that pinnipeds in the water could be exposed to airborne sound that may result in behavioral harassment when looking with their heads above water. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater sound. For instance, anthropogenic sound could cause hauled out pinnipeds to exhibit changes in their normal behavior, such as reduction in vocalizations, or cause them to temporarily abandon the area and move further from the source. However, these animals would previously have been `taken' because of exposure to underwater sound above the behavioral harassment thresholds, which are in all cases larger than those associated with airborne sound. Thus, the behavioral harassment of these animals would already accounted for in these estimates of potential take. Therefore, we do not believe that authorization of incidental take resulting from airborne sound for pinnipeds is warranted, and airborne sound is not discussed further here.

Marine Mammal Habitat Effects

The area likely impacted by the project is relatively small compared to the available habitat for all impacted species and stocks, and does not include any ESA-designated critical habitat. As previously mentioned, no BIAs overlap with the project area. CTJV's proposed construction activities would not result in permanent negative impacts to habitats used directly by marine mammals, but could have localized, temporary impacts on marine mammal habitat including their prey by increasing underwater and airborne SPLs and slightly decreasing water quality. Increased noise levels may affect acoustic habitat (see masking discussion above) and adversely affect marine mammal prey in the vicinity of the project area (see discussion below). During pile driving, elevated levels of underwater noise would ensonify areas near the project where both fish and mammals occur and could affect foraging success.

There are no known foraging hotspots or other ocean bottom structure of significant biological importance to marine mammals present in the marine waters of the project area. Therefore, the main impact issue associated with the proposed activity would be temporarily elevated sound levels and the associated direct effects on marine mammals, as discussed previously in this document. The primary potential acoustic impacts to marine mammal habitat are associated with elevated sound levels produced by impact, vibratory, and DTH pile installation as well as vibratory pile removal in the project area. Physical impacts to the environment such as construction debris are unlikely.

In-water pile driving would also cause short-term effects on water quality due to increased turbidity. CTJV would employ standard construction best management practices to reducing any potential impacts. Therefore, the impact from increased turbidity levels is expected to be discountable.

In-Water Construction Effects on Potential Foraging Habitat

Pile installation may temporarily increase turbidity resulting from suspended sediments. Any increases would be temporary, localized, and minimal. In general, turbidity associated with pile installation is localized to about a 25-foot (7.6 m) radius around the pile (Everitt *et al.* 1980). Large cetaceans are not expected to be close enough to the project activity areas to experience effects of turbidity, and any small cetaceans and pinnipeds could avoid localized areas of turbidity. Therefore, the impact from increased turbidity levels is expected to be discountable to marine mammals.

Essential Fish Habitat (EFH) for several species or groups of species overlaps with the project area including: little skate, Atlantic herring, red hake, windowpane flounder, winter skate, clearnose skate, sandbar shark, sand tiger shark, bluefish, Atlantic butterfish, scup, summer flounder, and black sea bass. Use of soft start procedure and bubble curtains will reduce the impacts of underwater acoustic noise to fish from pile driving activities. Avoidance by potential prey (*i.e.*, fish) of the immediate area due to the temporary loss of this foraging habitat is also possible. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity.

In-water Construction Effects on Potential Prey (Fish)—Construction activities would produce continuous (*i.e.*, vibratory pile driving and removal) and pulsed (*i.e.* impact driving, DTH) sounds. Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution (summarized in Popper and Hastings 2009). Hastings and Popper (2005) reviewed several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented physical and behavioral effects of pile driving on fish, although several are based on studies in support of large, multiyear bridge construction projects (*e.g.*, Scholik and Yan 2001, 2002; Popper and Hastings 2009). Sound pulses at received levels of 160 dB may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Pearson *et al.* 1992; Skalski *et al.* 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality (summarized in Popper *et al.* 2014).

The most likely impact to fish from pile driving activities at the project area would be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. In general, impacts to marine mammal prey species are expected to be minor and temporary.

In summary, given the relatively small areas being affected, pile driving activities associated with the proposed action are not likely to have a permanent, adverse effect on any fish habitat, or populations of fish species. Thus, we conclude that impacts of the specified activity are not likely to have more than short-term adverse effects on any prey habitat or populations of prey species. Further, any impacts to marine mammal habitat are not expected to result in significant or long-term consequences for individual marine mammals, or to contribute to adverse impacts on their populations.

Estimated Take

This section provides an estimate of the number of incidental takes proposed for authorization through this IHA, which will inform both NMFS' consideration of small numbers and the negligible impact determination.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as any act of pursuit, torment, or annoyance, which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes would primarily be by Level B harassment, as use of acoustic sources (*i.e.*, impact driving, vibratory driving and removal, DTH drilling) 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, primarily for high frequency cetacean species and phocid pinnipeds because predicted auditory injury zones are larger than for low-frequency and mid-frequency species. The proposed mitigation and monitoring measures are expected to minimize the severity of such taking to the extent practicable.

As described previously, no mortality is anticipated or proposed to be authorized for this activity. Below we describe how the take is estimated.

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

Acoustic Thresholds

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

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 micropascal (μPa) root mean square (rms) for continuous (*e.g.,* vibratory pile-driving) and above 160 dB re 1 μPa (rms) for non-explosive impulsive (*e.g.,* impact pile driving) or intermittent (*e.g.*, scientific sonar) sources.

CTJV's proposed activity includes the use of continuous (vibratory pile driving/removal) and impulsive (impact pile driving; DTH hammer) sources and, therefore, the 120 and 160 dB re 1 μPa (rms) are applicable.

Level A harassment for non-explosive sources - NMFS' Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NMFS 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). CTJV's proposed activity includes the use of impulsive (impact pile driving; DTH drilling) and non-impulsive (vibratory pile driving) sources.

These thresholds are provided in the Table 5 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance*.

Table 5—Thresholds Identifying the Onset of Permanent Threshold Shift

	PTS Onset Acoustic Thresholds* **(Received Level)**	
Hearing Group	**Impulsive**	**Non-impulsive**
Low-Frequency (LF) Cetaceans	*Cell 1* $L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	*Cell 2* $L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	*Cell 3* $L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	*Cell 4* $L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	*Cell 5* $L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	*Cell 6* $L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	*Cell 7* $L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	*Cell 8* $L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	*Cell 9* $L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	*Cell 10* $L_{E,OW,24h}$: 219 dB

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

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

Ensonified Area

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

The sound field in the project area is the existing background noise plus additional construction noise from the proposed project. Pile driving generates underwater noise that can potentially result in disturbance to marine mammals in the project area. The maximum (underwater) area ensonified is determined by the topography of the Bay including shorelines to the west south and north as well as by hard structures such as 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 6 dB reduction in sound level for each doubling of distance from the source (20*log[range]). Cylindrical spreading occurs in an environment in which sound propagation is bounded by the water surface and sea bottom, resulting in a reduction of 3 dB in sound level for each doubling of distance from the source (10*log[range]). A practical spreading value of fifteen is often used under conditions, such as the PTST project site where water generally increases with depth as the receiver moves away from pile driving locations, resulting in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions. Practical spreading loss is assumed here.

The intensity of pile driving sounds is greatly influenced by factors such as the type of piles, hammers, and the physical environment in which the activity takes place. In order to calculate distances to the Level A harassment and Level B harassment thresholds for the 36-inch steel piles proposed in this project, CTJV used acoustic monitoring data from other locations as described in Caltrans 2015 for impact and vibratory driving. CTJV also conducted their own sound source verification testing on 42-inch steel casings as described below to determine source levels associated with DTH drilling. NMFS used vibratory driving of 36-in steel pile source levels for vibratory driving of 42-inch casings source levels. CTJV has proposed to employ bubble curtains during impact driving of 36-inch steel piles and, therefore, reduced the source level by 7 dB (a conservative estimate based on several studies including Austin *et al.* 2016).

Source levels for drilling with a DTH hammer were field verified at the PTST project site by JASCO Applied Sciences in July 2019 (Denes, 2019). Underwater sound levels were measured during drilling with a DTH hammer at five pile locations – 3 without bubble curtain attenuation and 2 with bubble curtain attenuation. The average SPL value at 10 m for the DTH location without a bubble curtain was 180 dB re 1μPa, while the average SEL and PK levels were 164 dB re 1μPa2·s and 190 dB re 1μPa, respectively. These values were greater than DTH testing done at another location in Alaska (Denes *et al.* 2016). The dominant signal characteristic was found to be impulsive rather than continuous. Southall *et al.* (2007) suggested that impulsive sounds can be distinguished from non-impulsive sounds by comparing the SPL of a 0.035 s window that includes the pulse and with a 1 s window that may include multiple pulses. If the SPL of the 0.035 s window is 3 dB or more greater than the 1 s window, then the signal should be considered impulsive. Denes (2019) observed that at the PTST site, the SPL of the 0.035 s pulse is 5 dB higher than the SPL of the 1 s sample, so the DTH source is classified here as impulsive. Source levels associated with DTH drilling of 42-inch steel casings were assumed to be the same as recorded for installation of 36-in steel pipe by DTH.

CTJV utilized in-water measurements generated by the Greenbusch Group (2018) from the WSDOT Seattle Pier 62 project (83 FR 39709) to establish proxy sound source levels for vibratory installation and removal of 14-inch timber piles. NMFS reviewed the report by the Greenbusch Group (2018) and determined that the findings were derived by pooling together all steel pile and timber pile at various distance measurements data together. The data was not normalized to the standard 10 m distance. NMFS analyzed source measurements at different distances for all 63 individual timber piles that were removed and normalized the values to 10 m. The results showed that the median is 152 dB SPLrms. This value was used as the source level for vibratory removal of 14-inch timber piles. Source levels for impact driving of 12-in timber piles were from the Ballena Bay Marina project in Alameda, CA as described in Caltrans 2015. Sound source levels used to calculate take are shown in Table 6.

Table 6—The Sound Source Levels (dB Peak, dB RMS, and dB sSEL) by Hammer Type

Type of Pile	**Hammer Type**	**Estimated Peak Noise Level (dB Peak)**	**Estimated Pressure Level (dB RMS)**	**Estimated Single Strike Sound Exposure Level (dB sSEL)**	**Relevant Piles at the PTST Project**	**Pile Function**
36-inch Steel Pipe	Impact[a]	210	193	183	Plumb	Omega Trestle, Temporary Dock, Berm Wall West, and Berm Wall East
	Impact with Bubble Curtain[b]	203	186	176	Plumb	Berm Wall West, Berm Wall East, and Temporary Dock
	DTH – Impulsive[d]	190	180	164	Plumb	Omega Trestle, Berm Wall West, and Berm Wall East
	Vibratory[a]	NA	170	170	Pipe Piles	Mooring Piles and Templates
12-inch Timber Pile	Vibratory[c]	NA	152	152	Plumb	Mooring Dolphins
	Impact[a]	177	165	157	Plumb	Mooring Dolphins
42-inch Steel Casing	DTH – Impulsive[d]	190	180	164	Steel Casing	Temporary Dock
	Vibratory[a]	NA	170	170	Pipe Piles	Temporary Dock

Note: sSEL = Single Strike Exposure Level; dB = decibel; N/A = not applicable
[a] Caltrans 2015.
[b] 7 dB reduction was assumed for use an encased bubble curtain (Austin *et al.* 2016).
[c] Greenbusch Group 2018.
[d] Denes *et al.* 2019.

CTJV used NMFS' Optional User Spreadsheet, available at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-*

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

Table 7 provides the sound source values and input used in the User Spreadsheet to calculate harassment isopleths for each source type while Table 8 shows distances to Level A harassment isopleths. Note that the isopleths calculated using the proposed number of piles driven per day is highly conservative. PTS is based on accumulated exposure over time. Therefore, an individual animal would have to be within the calculated PTS zones when all of the piles of a single type and driving method are being actively installed throughout an entire day. The marine mammals proposed for authorization are highly mobile. It is unlikely that an animal would remain within the PTS zone during the installation of, for example, 10 piles over an 8-hour period. NMFS opted to reduce the number of piles driven per day by approximately 50 percent in order to derive more realistic PTS isopleths. In cases where the number of proposed piles per day was an odd number, NMFS used the next largest whole number that was greater than 50 percent. These are shown in Table 7 in the row with the heading “Piles/day to calculate PTS.” Table 8 contains calculated distances to PTS isopleths and Table 9 depicts distances to Level B harassment isopleths.

Table 7—User Spreadsheet Input Parameters Used for Calculating Harassment Isopleths

Model Parameter	12-in timber		36-in steel				42-in steel casing		
	Vibratory	Impact	Vibratory	Impact	Impact - with bubble	DTH	Vibratory	DTH	DTH - Simult.
Spreadsheet Tab Used	A.1*	E.1**	A.1	E.1	E.1	E.1	A.1	E.1	E.1
Weighting Factor (kHz)	2.5	2	2.5	2.0	2.0	2.0	2.5	2.0	2.0
RMS (dB)	152	165	170	193	186	180	170	180	180
Peak/SEL (dB)	na	177/157	na	210/183	203/176	190/164	na	190/164	190/164
Proposed Piles/day	10	10	10	7	10	3	10	3	6
Piles/day to calculate PTS	5	5	5	4	5	2	5	2	3
Duration to drive pile (minutes)	30	na	12	na	na	na	12	na	na
Propagation	15	15	15	15	15	15	15	15	15
Distance from source (meters)	10	10	10	10	10	10	10	10	10
Strikes per pile	na	1000	na	1000	1000	25200	na	25200	50400

* A.1) Vibratory Pile driving
** E.1) Impact Pile Driving

Table 8-Radial Distance to PTS Isopleths (meters)

Scenario		Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	Pile Location
Driving Type	**Pile Type**	**Distance from Islands 1 & 2**	**Distance from Islands 1 & 2**	**Distance from Islands 1 & 2**	**Distance from Islands 1 & 2**	
Impact	12-in. Timber	54	1.9	65	2	Mooring Dolphins
	36-in. Steel	2,516	90	2,997	1,347	Omega Trestle, Temporary Dock, Berm Wall West, and Berm Wall East
Impact with Bubble Curtain	36-in. Steel	997	36	1,188	534	Berm Wall West, Berm Wall East, and Temporary Dock
DTH – Impulsive	42-in. Steel	737	26	878	395	Casing for Temporary Dock
	36-in. Steel	737	26	878	395	Omega Trestle, Temporary Dock, Berm Wall West, and Berm Wall East
DTH Simultaneous	42-in. Steel	1,534	55	1,827	821	Omega Trestle, Temporary Dock, Berm Wall West, and Berm Wall East
DTH & Impact Hammer with bubble curtain: Simultaneous at the same island	36-and 42-in. Steel*	1,734	62	2,066	929	

DTH at PI 1 and Impact with Bubble Curtain Hammer at PI 2	36-and 42-in. Steel	737 (Island 1) 997 (Island 2)	26 (Island 1) 36 (Island 2)	878 (Island 1) 1,188 (Island 2)	395 (Island 1) 534 (Island 2)	
Continuous (Vibratory)	12-in. Timber	3	0.3	5	2	Mooring Dolphins
	36-in. Steel	27	2	40	17	Mooring Piles and Templates
	42-in. Steel	27*	2*	40*	17*	Casing for Temporary Dock

*Activity will not occur on Portal Island 2

Table 9—Radial Distance (meters) to Level B Harassment Monitoring Isopleths

Driving Method	Pile Type	Distance from Island 1 & 2	Pile Location
Impact	12-in. Timber	22	Mooring Dolphins
	36-in. Steel	1,555	Omega Trestle, Temporary Dock, Berm Wall West, and Berm Wall East
Impact with Bubble Curtain	36-in. Steel	541	Berm Wall West, Berm Wall East, and Temporary Dock
DTH - Impulsive	42-in. Steel	215*	Casing for Temporary Dock
	36-in. Steel	215	Omega Trestle, Temporary Dock, Berm Wall West, and Berm Wall East
Continuous (Vibratory)	12-in. mooring	1,354	Mooring Dolphins
	36-in. Steel	21,544	Mooring Piles and Templates
	42-in. Steel	21,544*	Casing for Temporary Dock

*Activity will not occur on Portal Island 2

Marine Mammal Occurrence and Take Calculation and Estimation

In this section we provide the information about the presence, density, or group dynamics of marine mammals and describe how it is brought together with the information above to produce a quantitative take estimate. When available, peer-reviewed scientific publications were used to estimate marine mammal abundance in the project area. In some cases population estimates, densities, and other quantitative information are lacking. Local observational data and estimated group size were utilized where applicable.

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 km^2 in March to 0.00010/100 km^2 in August. Furthermore, CTJV conducted marine mammal monitoring during SSV testing for 5 days in July 2019. During that time there were no sightings or takes of humpback whales.

Because humpback whale occurrence is low as demonstrated above, CTJV and NMFS estimated that there will be a single humpback sighting every two months for the duration of in-water pile driving activities. Using an average group size of 2 animals, pile driving activities over a 10-month period would result in 10 takes of humpback whale by Level B harassment. No takes by Level A harassment are expected or proposed.

Bottlenose Dolphin

Expected bottlenose dolphin take 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). Three years of dolphin survey data were collected from either in-shore or open ocean transects. In-shore transects occurred off the coast of Virginia Beach in the Atlantic Ocean as well as inside the Bay to the southwest of the proposed project area. The previously issued IHA (83 FR 36522; July 30, 2018) used the same seasonal dolphin densities provided by Engelhaupt *et al.* (2016) to calculate take.

CTJV used data from Engelhaupt *et al.* (2016) but employed a different methodology to estimate take for this IHA. Dolphin sightings are not uniformly distributed along the survey area. There were more sightings along the Atlantic coastal ocean and fewer along the shoreline within the Bay. It is likely that bottlenose dolphins do not use the habitat uniformly, but rather selectively based on heterogeneity in available habitat, dietary items and protection with some individuals preferring ocean and others estuary (Ballance, 1992; Gannon and Waples 2004). Although 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 in the Bay near the project area. A spatially refined approach was employed by plotting dolphin sightings within 12 km of the project location and then determining densities following methodology outlined in Engelhaupt *et al.* (2016) and Miller *et al.* (2019) using the package DISTANCE in R statistical software. The distance of 12 km was selected for estimating dolphin densities because uncertainty increases in extrapolating those data out further from the geographical location of the survey. Additionally, most of the sound generated by the proposed project will be directed into the Bay where dolphin densities are less compared to coastal ocean regions. Therefore, a 12 km radius should provide more accurate density estimates near the proposed project area by excluding higher density data from the coastal ocean areas.

Transect distance and areas were determined by using Image J software (NIH Freeware) to trace individual transects within the calculated Level B harassment zones. The entire length of the transects was also calculated using Image J to determine the viability of this approach where the average transect zig-zag from Image J was 3.6 km compared to the methods in the report of a 3.7 km transect. Dolphin sightings were truncated at 0.32 km from the transect line based on the probability of accurate abundance estimations following the approach from Engelhaupt *et al.* (2016). Density estimates were stratified based on seasons (as defined by Engelhaupt *et al.* 2016) where there would be sufficient data to run the model, as monthly density estimates did not have enough data points. Seasonal densities are below in Table 10 and Level B harassment zone areas are shown in Table 11.

Table 10—Bottlenose Dolphin Densities (individual/km^2) from Inshore Areas of Virginia

Season	Density within 12 km of project area
Spring	0.6
Summer	0.62
Fall	1.17
Winter	0.26

Table 11—In-Water Area (km^2) Used for Calculating Dolphin Takes per Construction Components per Hammer Type

Construction Component	Impact Hammer	Impact with Bubble Curtain	Vibratory Hammer	Impact + DTH Hammers	DTH + DTH Hammers
Mooring Cluster	0.003	0.003	4.16	--	--
Temporary Dock	5.55	0.63	830	--	0.25
Omega Trestle and West O-pile wall	8.55	8.55	830	1.72	0.49
East O-Pile Walls	--	--	--	1.43	--

Densities from Table 10 and harassment zone areas from Table 11 were used to calculate the monthly takes based on the number of pile driving days. The number of dolphin takes per construction component per pile driving method was then summed for each month (Table 12). NMFS proposes to authorize 10,109 incidents of take for bottlenose dolphin by Level B harassment as shown in Table 12 and has split out the three dolphin stocks as shown in Table 13. There is insufficient information to apportion the takes precisely to the three stocks present in the area. Given that most of the NNCES stock are found in the Pamlico Sound estuarine system, NMFS will assume that no more than 200 of the proposed takes will be from this stock. A subset of these 200 takes would likely be comprised of Bay resident dolphins, although the number is unknown. Since members of the northern migratory coastal and southern migratory coastal stocks are thought to occur in or near the Bay in greater numbers, we will conservatively assume that no more than half of the remaining animals (9,909) will accrue to either of these stocks.

During 5 days of SSV testing conducted by CTJV in July 2019, dolphins were recorded every day with a minimum daily sighting rate of 8 (July 22, 2019 and maximum daily rate of 40 animals (July 23, 2019). There were 116 total sightings of which 50 were recorded as takes by Level B harassment. For comparative purposes, the average daily dolphin take rate estimated for the proposed IHA is 54 animals while the maximum sightings per day was 40 animals as noted above. Given this information, NMFS is confident that the proposed dolphin take estimate is reasonable, if somewhat conservative.

Table 12—Estimated Bottlenose Dolphin Take by Month and Driving Activity

Month	**November**	**December**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	
Dolphin Density (n/km2)	**1.17**	**0.26**	**0.26**	**0.26**	**0.6**	**0.6**	**0.6**	**0.62**	**0.62**	**0.62**	**1.17**	**1.17**	
Mooring Cluster													
Vibratory - Timber Piles	7	2	0	0	0	0	0	0	0	0	0	0	
Impact - Timber Piles	3	1	0	0	0	0	0	0	0	0	0	0	
Dolphin Takes	34	2	0	0	0	0	0	0	0	0	0	0	36
Temporary Dock													
Impact - Steel Pile	0	1	1	1	1	1	1	0	0	0	0	0	
Impact with Bubble Curtain - Steel Pile	0	2	2	2	2	2	2	0	0	0	0	0	
Vibratory - Steel Pile	0	4	4	4	4	4	4	0	0	0	0	0	
Two DTH - Steel Pile	0	3	3	3	3	3	3	0	0	0	0	0	
Dolphin Takes	0	865	649	649	1499	1499	1499	0	0	0	0	0	6,660
Omega Trestle/ West O-pile Walls/ Mooring Piles & Templates													
Impact - Steel Pile	2	2	2	2	4	3	2	0	0	0	0	0	
Vibratory - Steel Pile	1	1	0	0	0	0	1	1	1	1	0	0	
Two DTH - Steel Pile	2	2	2	2	6	4	4	0	0	0	0	0	
DTH+ Impact - Steel Pile	3	3	3	3	8	6	4	0	0	0	0	0	
Dolphin Takes	998	222	6	6	31	23	514	515	515	515	0	0	3,343
Omega Trestle / East O-Pile Walls													
Impact - Steel Pile	0	2	2	2	2	4	2	2	2	2	0	0	
DTH+ Impact - Steel Pile	0	1	1	1	1	2	1	1	1	1	0	0	
Two DTH - Steel	0	1	1	1	1	2	1	1	1	1	0	0	

Pile													
Dolphin Takes	0	4	4	4	8	16	8	9	9	9	0	0	70
Total No. of Pile Driving Days per Month	18	25	21	21	32	31	25	5	5	5	0	0	
Total Level B harassment Takes													10,109

Harbor Porpoise

Given that harbor porpoises are uncommon in the project area, this exposure analysis assumes that there is a porpoise sighting once during every two months of operations which would equate to five sightings over ten months. Assuming an average group size of two (Hansen *et al*. 2018; Elliser *et al*. 2018) over 10 months of in-water work results in a total of 10 estimated takes of porpoises. Harbor porpoises are members of the high-frequency hearing group which have Level A harassment isopleths as large as 2,997 m during impact installation of four piles per day. Given the relatively large Level A harassment zones during impact driving, NMFS assumed in the previous IHA (83 FR 36522; July 30, 2018) that 40 percent of estimated porpoises takes would be by Level A harassment and authorized 4 takes of porpoises by Level A and 6 takes by Level B harassment. CTJV conducted marine mammal monitoring during SSV testing at the project location for 5 days in July 2019. During that time there were no sightings or takes of porpoises. However, NMFS is conservatively proposing to authorize the same number of porpoise takes for Level A and Level B harassment for this IHA.

Harbor Seal

The number of harbor seals expected to be present in the PTST project area was estimated using survey data for in-water and hauled out seals collected by the United States Navy at the portal islands from November 2014 through April 2018 (Rees *et al.*, 2016; Jones *et al.* 2018). The survey data revealed a daily maximum of 45 animals during this period which occurred in January, 2018. The maximum number of animals observed per day (45) was multiplied by the total number of proposed driving days between November and May (173) since (seals are not present in the area from June through October). Based on this calculation NMFS proposes to authorize 7,785 incidental takes of harbor seal. Note that the CTJV monitoring report did not record any seal observations over 5 days of SSV testing, but this would be expected as seals are not present during July.

The largest Level A harassment isopleth for phocid species is approximately 1,347 meters which would occur during impact driving of 36-inch steel piles. The smallest Level A harassment isopleths are 2 m and would occur during impact and vibratory driving of 12-inch timber piles. NMFS has prescribed a shutdown zone for harbor seals of 15 meters as a mitigation measure 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 harassment zone specified for a given scenario and the remaining affected seals would result in Level B harassment takes. Therefore, NMFS proposes to authorize 3,114 takes by Level A harassment and 4,671 takes by Level B harassment.

Gray Seal

The number of gray seals expected to be present at the PTST project area was estimated using survey data collected by the U.S. Navy at the portal islands from 2014 through 2018 (Rees *et al.* 2016; Jones *et al*. 2018). One seal was observed in February of 2015 and one seal was recorded in February of 2016 while no seals were observed at any time during 2017 or 2018. Since seals are anticipated to occur only during the month of February at a rate of 1 animal per day for the anticipated 21 in-water work days during that month, NMFS proposes to authorized 21 incidental takes of gray seal.. The Level A isopleths for gray seals are identical to those for harbor seals. With a shutdown zone of 15 meters, previously, NMFS previously estimated 40 of the total take (not 40 percent of the affected species or stock) would occur in the Level A harassment zone specified for a given scenario. Therefore, NMFS proposes to authorize 8 takes by Level A harassment and 13 takes by Level B harassment.

Table 13 shows that estimated percentage of stock proposed for take by both Level A and Level B harassment.

Table 13—Estimated Take by Level A and Level B Harassment

Species	Stock	Level A Takes	Level B Takes
Humpback whale	Gulf of Maine	--	10
Harbor porpoise	Gulf of Maine/Bay of Fundy	4	6
Bottlenose dolphin	WNA Coastal, Northern Migratory	--	4,955
	WNA Coastal, Southern Migratory	--	4,954
	NNCES		200
Harbor seal	Western North Atlantic	3,114	4,671
Gray seal	Western North Atlantic	8	13

Proposed Mitigation

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

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

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

(2) the practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

In addition to the measures described later in this section, CTJV will employ the following standard mitigation measures:

- Conduct briefings between construction supervisors and crews and the marine mammal monitoring team prior to the start of all pile driving activity, and when new personnel join the work, to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures;
- For in-water heavy machinery work other than pile driving (*e.g.*, standard barges, etc.), if a marine mammal comes within 10 m, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions. This type

of work could include the following activities: (1) movement of the barge to the pile location; or (2) positioning of the pile on the substrate via a crane (*i.e.*, stabbing the pile);

- Work may only occur during daylight hours, when visual monitoring of marine mammals can be conducted;

- For those marine mammals for which Level B harassment take has not been requested, in-water pile driving will shut down immediately if such species are observed within or entering the monitoring zone (*i.e.*, Level B harassment zone); and

- If take reaches the authorized limit for an authorized species, pile installation will be stopped as these species approach the Level B harassment zone to avoid additional take.

The following measures would apply to CTJV's mitigation requirements:

Establishment of Shutdown Zone—For all pile driving and drilling activities, CTJV would establish a shutdown zone. The purpose of a shutdown zone is generally to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). These shutdown zones would be used to prevent incidental Level A harassment from impact pile driving for bottlenose dolphins and humpback whales. Shutdown zones for species proposed for authorization are as follows:

- 100 meters for harbor porpoise and bottlenose dolphin.

- 15 meters for harbor seal and gray seal.

- For humpback whale, shutdown distances are shown in Table 14 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. CTJV would also establish and monitor Level B harassment zones which are areas where SPLs are equal to or exceed the 160 dB rms threshold for impact driving and DTH drilling and 120 dB rms threshold during vibratory driving. Monitoring zones provide utility for observing by establishing monitoring protocols for areas adjacent to the shutdown zones. The monitoring zones enable observers to be aware of and communicate the presence of marine mammals in the project area outside the shutdown zone and thus prepare for a potential cease of activity should the animal enter the shutdown zone. The proposed Level A and Level B harassment monitoring zones are described in Table 14. Since some of the Level B harassment monitoring zones cannot be effectively observed in their entirety, Level B harassment exposures will be recorded and extrapolated based upon the number of observed take and the percentage of the Level B harassment zone that was not visible.

Table 14—Level A and Level B Harassment Monitoring Zones During Project Activities (meters)

Scenario		Level A Harassment Zones				Level B Monitoring Zones
		Low-Frequency Cetaceans	Mid-Frequency Cetaceans	High-Frequency Cetaceans	Phocid Pinnipeds	
Driving Type	**Pile Type**	**Island 1 & 2**	**Island 1 & 2***	**Island 1 & 2**	**Island 1 & 2**	**Island 1 & 2**
Impact	12-in. Timber	55	--	--	--	25
	36-in. Steel	2,520	--	3,000	1,350	1,585
Impact with Bubble Curtain	36-in. Steel	1,000	--	1,190	540	545
DTH – Impulsive	42-in. Steel	740	--	880	395	220
DTH Simultaneous at same island	42-in. Steel	1,535	--	1,830	825	220
DTH & Impact Hammer with bubble curtain: Simultaneous at the same island	36-and 42-in. Steel	1,735	--	2,070	930	545
DTH at PI 1. And Impact with Bubble Curtain Hammer at PI 2	36-and 42-in. Steel	740	--	880	395	220 from PI 1 545 from PI 2

Continuous (Vibratory)	12-in. Timber	--	--	--	--	1,360
	36-in. Steel	30	--	--	20	21,545
	42-in.** Steel	30	--	--	20	21,545

*indicates that shutdown zone is larger than calculated harassment zone.
**Activity only proposed at Portal Island 1 as part of project pile driving plan.

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 driving, contractors would be required to provide an initial set of strikes from the hammer at reduced energy, with each strike followed by a 30-second waiting period. This procedure would be conducted a total of three times before impact pile driving begins. Soft start would be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of 30 minutes or longer. Soft start is not required during vibratory or DTH pile driving activities.

Use of bubble curtains - Use of air bubble curtain system would be implemented by CTJV during impact driving 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 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.
- 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 **-** Prior to the start of daily in-water construction activity, or whenever a break in pile driving of 30 minutes or longer occurs, protected species observers (PSOs) will observe the shutdown and 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.

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

Proposed Monitoring and Reporting

In order to issue an IHA for an activity, Section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed action area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

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

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

Marine Mammal Visual Monitoring

Monitoring shall be conducted by NMFS-approved observers. 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. 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 would 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, as long as the time elapsed between uses of the pile driving equipment is no more than 30 minutes.

CTJV would be required to station PSOs at locations offering the best available views of the monitoring zones. At least one PSO must be located in close proximity to each pile driving rig during active operation of single or multiple, concurrent driving devices. A minimum of one additional PSO is required at each active driving rig if the Level B harassment zone and shutdown zones cannot reasonably be observed by one PSO.

PSOs would scan the waters using binoculars, and/or spotting scopes, and would use a handheld GPS or range-finder device to verify the distance to each sighting from the project site. All PSOs would 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 would adhere to the following PSO qualifications:

(i) Independent observers (*i.e.*, not construction personnel) are required.

(ii) At least one observer must have prior experience working as an observer.

(iii) Other observers may substitute education (degree in biological science or related field) or training for experience.

(iv) 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.

(v) 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 will record 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. In addition, CTJV will attempt to distinguish between the number of individual animals taken and the number of incidences of take. We require that, at a minimum, the following information be collected on the sighting forms:

- Date and time that monitored activity begins or ends;
- Construction activities occurring during each observation period;
- Weather parameters (*e.g.*, percent cover, visibility);
- Water conditions (*e.g.*, sea state, tide state);
- Species, numbers, and, if possible, sex and age class of marine mammals;
- Description of any observable marine mammal behavior patterns, including bearing and direction of travel and distance from pile driving activity, and if possible, the correlation to SPLs;
- Distance from pile driving activities to marine mammals and distance from the marine mammals to the observation point;
- Description of implementation of mitigation measures (*e.g.*, shutdown or delay);
- Locations of all marine mammal observations; and
- Other human activity in the area.

Reporting

A draft report would 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.

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.

Negligible Impact Analysis and Determination

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

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

No serious injury or mortality is anticipated given the nature of the activities and measures designed to minimize the possibility of injury to marine mammals. The potential for these outcomes is minimized through the construction method and the implementation of the planned mitigation measures. Specifically, vibratory driving, impact driving, and drilling with DTH hammers will be the primary methods of installation and pile removal will occur with a vibratory hammer. Impact pile driving produces short, sharp pulses with higher peak levels and much sharper rise time to reach those peaks. When impact pile driving is used, implementation of bubble curtains, soft start and shutdown zones significantly reduces any possibility of injury. Given sufficient notice through use of soft starts (for impact driving), marine mammals are expected to move away from a sound source that is annoying prior to it becoming potentially injurious.

CTJV will use qualified PSOs stationed strategically to increase detectability of marine mammals, enabling a high rate of success in implementation of shutdowns to avoid injury for most species. PSOs will be stationed on a specific Portal Island whenever pile driving operations are underway at that location. More than one PSO may be stationed on an island in order to provide a relatively clear view of the shutdown zone and monitoring zones. These factors will limit exposure of animals to noise levels that could result in injury.

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

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

In addition to the expected effects resulting from authorized Level B harassment, we anticipate that small numbers of harbor porpoises, 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 driving (*i.e.*, the low-frequency region below 2 kHz), not severe hearing impairment or impairment in the regions of greatest hearing sensitivity. If hearing impairment occurs, it is most likely that the affected animal's threshold would increase by a few dBs, which is not likely to meaningfully affect its ability to forage and communicate with conspecifics. As described above, we expect that marine mammals would be likely to move away from a sound source that represents an aversive stimulus, especially at levels that would be expected to result in PTS, given sufficient notice through use of soft start.

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

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

- No mortality is anticipated or authorized;
- Limited Level A harassment exposures (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 proposed 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 proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from the proposed activity will have a negligible impact on all affected marine mammal species or stocks.

Small Numbers

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

The proposed take of marine mammal stocks comprises less than 10.2 percent of the Western North Atlantic harbor seal stock abundance, and less than one percent of the other stocks, with the exception of bottlenose dolphin stocks. There are three bottlenose dolphin stocks that could occur in the project area. Therefore, the estimated 10,109 dolphin takes by Level B harassment would likely be split among the western North Atlantic northern migratory coastal stock, western North Atlantic southern migratory coastal stock, and NNCES stock. Based on the stocks' respective occurrence in the area, NMFS estimated that there would be 200 takes from the NNCES stock, with the remaining takes split evenly between the northern and southern migratory coastal stocks. Based on consideration of various factors described below, we have determined the numbers of individuals taken would comprise less than one-third of the best available population abundance estimate of either coastal migratory stock. Detailed descriptions of the stocks' ranges have been provided in *Description of Marine Mammals in the Area of Specified Activities.*

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

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

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

Both migratory coastal stocks likely overlap with the NNCES stock at various times during their seasonal migrations. The NNCES stock is defined as animals that primarily occupy waters of the Pamlico Sound estuarine system (which also includes Core, Roanoke, and Albemarle sounds, and the Neuse River) during warm water months (July–August). Members of this stock also use coastal waters (≤1 km from shore) of North Carolina from Beaufort north to Virginia Beach, Virginia, including the lower Chesapeake Bay. Comparison of dolphin photo-identification data confirmed that limited numbers of individual dolphins observed in Roanoke Sound have also been sighted in the Chesapeake Bay (Young 2018). Like the migratory coastal dolphin stocks, the NNCES stock covers a large range. The spatial extent of most small and resident bottlenose dolphin populations is on the order of 500 km^2, while the NNCES stock occupies over 8,000 km^2 (LeBrecque *et al*. 2015). Given this large range, it is again unlikely that a preponderance of animals from the NNCES stock would depart the North Carolina estuarine system and travel to the northern extent of the stock's range. However, recent evidence suggests that there is like a small resident community of NNCES dolphins that inhabits the Chesapeake Bay year-round (Patterson, Pers. Comm).

Many of the dolphin observations in the Bay are likely repeated sightings of the same individuals. The Potomac-Chesapeake Dolphin Project has observed over 1,200 unique animals since observations began in 2015. Re-sightings of the same individual can be highly variable. Some dolphins are observed once per year, while others are highly regular with greater than 10 sightings per year (Mann, *pers. comm.*). Multiple sightings of the same individual would considerably reduce the number of individual animals that are taken by harassment. Furthermore, the existence of a resident dolphin population in the Bay would increase the percentage of dolphin takes that are actually re-sightings of the same individuals.

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

- The take of marine mammal stocks proposed for authorization comprises less than 9 percent of any stock abundance (with the exception of bottlenose dolphin stocks);
- Potential bottlenose dolphin takes in the project area are likely to be allocated among three distinct stocks;
- Bottlenose dolphin stocks in the project area have extensive ranges and it would be unlikely to find a high percentage of any one stock concentrated in a relatively small area such as the project area or the Bay;
- The Bay represents the migratory boundary for each of the specified dolphin stocks and it would be unlikely to find a high percentage of any stock concentrated at such boundaries; and
- Many of the takes would be repeats of the same animal and it is likely that a number of individual animals could be taken 10 or more times.

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

Unmitigable Adverse Impact Analysis and Determination

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

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 proposed for authorization 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.

Proposed Authorization

As a result of these preliminary determinations, NMFS proposes to issue an IHA to the CTJV for conducting pile driving activities as part of the PTST project for a period of one year from the date of issuance, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. A draft of the proposed IHA can be found at *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act*.

Request for Public Comments

We request comment on our analyses, the proposed authorization, and any other aspect of this Notice of Proposed IHA for the proposed PTST project. We also request at this time comment on the potential renewal of this proposed IHA as described in the paragraph below. Please include with your comments any supporting data or literature citations to help inform decisions on the request for this IHA or a subsequent Renewal.

On a case-by-case basis, NMFS may issue a one-year IHA renewal with an additional 15 days for public comments when (1) another year of identical or nearly identical activities as described in the Specified Activities section of this notice is planned or (2) the activities as described in the Specified Activities section of this notice would not be completed by the time the IHA expires and a Renewal would allow for completion of the activities beyond that described in the Dates and Duration section of this notice, provided all of the following conditions are met:

- A request for renewal is received no later than 60 days prior to expiration of the current IHA.

- The request for renewal must include the following:

(1) An explanation that the activities to be conducted under the requested Renewal are identical to the activities analyzed under the initial IHA, are a subset of the activities, or include changes so minor (*e.g.*, reduction in pile size) that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of

reducing the type or amount of take because only a subset of the initially analyzed activities remain to be completed under the Renewal).

(2) A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

- Upon review of the request for Renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures will remain the same and appropriate, and the findings in the initial IHA remain valid.

Dated: November 19, 2019.

Donna S. Wieting,

Director, Office of Protected Resources,

National Marine Fisheries Service.

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