DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[RTID 0648–XB652]

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to U.S. Navy Construction of the Multifunctional Expansion of Dry Dock 1 at Portsmouth Naval Shipyard, Kittery, Maine

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

ACTION: Notice; proposed incidental harassment authorization request for comments.

SUMMARY: NMFS has received a request from the U.S. Navy (Navy) for authorization to take marine mammals incidental to construction activities associated with the multifunctional expansion of Dry Dock 1 at Portsmouth Naval Shipyard in Kittery, Maine. 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 will consider public comments prior to making any final decision on the issuance of the requested MMPA authorization and agency responses will be summarized in the final notice of our decision.

DATES: Comments and information must be received no later than March 31, 2022.

ADDRESSES: Comments should be addressed to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service. Written comments should be submitted via email to *ITP.Egger@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, including all attachments, must not exceed a 25-megabyte file size. All comments received are a part of the public record and will generally be posted online at *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: Stephanie Egger, Office of Protected Resources, NMFS, (301) 427–8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: *https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act.* In case of problems accessing these documents, please call the contact listed above.

SUPPLEMENTARY INFORMATION:

Background

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

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 IHA) with respect to potential impacts on the human environment.

This action is consistent with categories of activities identified in Categorical Exclusion B4 (IHA 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 NMFS has 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.

NMFS 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 September 2, 2021, NMFS received a request from the Navy for an IHA to take marine mammals incidental to construction activities associated with the multifunctional expansion of Dry Dock 1 project (also referred to as P–831) at Portsmouth Naval Shipyard in Kittery, Maine. The Navy submitted a revised version of the application on December 21, 2021. The application was deemed adequate and complete on February 10, 2022. The Navy's request is for take of harbor porpoises, harbor seals, gray seals, harp seals, and hooded seals by Level A harassment and Level B harassment. Neither the Navy nor NMFS expects serious injury or mortality to result from this activity; therefore, an IHA is appropriate.

NMFS previously issued IHAs and renewals to the Navy for waterfront improvement work in Portsmouth, in 2017 (81 FR 85525; November 28, 2016), 2018 (83 FR 3318; January 24, 2018), 2019 (84 FR 24476, May 28, 2019), a renewal of the 2019 IHA (86 FR 14598; March 17, 2021), and a 2021 IHA (86 FR 30418; June 8, 2021) As required, the applicant provided monitoring reports (available at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities*) which confirm that the applicant has implemented the required mitigation and monitoring, and which also shows that no impacts of a scale or nature not previously analyzed or authorized have occurred as a result of the activities conducted.

This proposed IHA would cover 1 year of a larger project for which the Navy intends to request a take authorization for subsequent facets of the project. The larger overall expansion and modification of Dry Dock 1 project involves modification of the super flood basin to create two additional dry docking positions (Dry Dock 1 North and Dry Dock 1 West) in front of the existing Dry Dock 1 East. Year 1 construction activities will focus on the preparation of the walls and floors of the super flood basin to support the placement of the monoliths and the construction of the two dry dock positions. The Navy complied with all the requirements (*e.g.,* mitigation, monitoring, and reporting) of the previous IHAs they provided for other preparatory work related to the Dry Dock 1 project and information regarding their monitoring results may be found in the Estimated Take section.

Description of Proposed Activity

Overview

Multifunctional Expansion of Dry Dock 1 (P–381) is one of three projects that support the overall expansion and modification of Dry Dock 1, located in the western extent of the shipyard. The previous two projects, construction of a super flood basin (P–310) and extension of portal crane rail and utilities (P–1074) are currently under construction. Work associated with P–310 and P–1074 has been and/or is being completed under the separate IHAs issued by NMFS. The projects have been phased to support Navy mission schedules. P–381 will be constructed within the same footprint of the super flood basin over an approximated 7-year period. In-water activities are expected to occur within the first 5 years, between April 2022 and April 2027. This IHA request is for the first year of in-water construction for P–381 occurring from April 2022 through April 2023. All work beyond year 1 is anticipated to be requested in a rulemaking/Letter of Authorization (LOA) application submission to NMFS.

The purpose of the proposed project, Multifunctional Expansion of Dry Dock 1 (P–381), is to modify the super flood basin to create two additional dry docking positions (Dry Dock 1 North and Dry Dock 1 West) in front of the existing Dry Dock 1 East. The super flood basin provides the starting point for the P–381 work (see Figure 1–2 of the application).

Year 1 construction activities will focus on the preparation of the walls and floors of the super flood basin to support the placement of the monoliths and the construction of the two dry dock positions. The primary work needed to prepare the super flood basin involves structural reinforcement of the existing berths and floor within the super flood basin, bedrock removal, and demolition of portions of the super flood basin walls. Most of the preparatory work will occur behind the existing super flood basin walls that would act as a barrier to sound and would contain underwater noise to within a small portion of the Piscataqua River (see Figure 1–3 of the application). Construction activities that could affect marine mammals are limited to in-water pile driving and removal activities, rock hammering, rotary drilling, and down-the-hole (DTH) hammering.

Dates and Duration

The construction activities are anticipated to begin in March 2022 and proceed to March 2023. In-water construction activities would occur for 365 days over a period of approximately 12 consecutive months. All in-water work capable of producing noise harmful to marine mammals will be limited to daylight hours. Pile driving days are not necessarily consecutive and certain activities may occur at the same time, decreasing the total number of in-water construction days. The contractor could be working in more than one area of the berths at a time. It is not possible to predict if and/or how often work will occur simultaneously, but it is estimated that overlapping activities would permit the work described in Table 1 to be completed within one calendar year. Table 1 provides the estimated construction schedule and production rates for P–381 Year 1 construction activities. Table 1 reflects the current pile driving, hammering, and drilling durations for activities occurring in Year 1 included in this request for incidental take authorization. Vibratory pile driving and extraction is assumed to occur during 84 days of Year 1. Impact pile driving will occur during 24 days in Year 1. DTH activities would occur for 919 days and rotary drilling would occur for 282 days. Rock hammering would occur for 252 days. Overlapping activities are estimated to reduce the number of construction days by 1,172 days for a total of 365 construction days.

TABLE 1—PILE DRIVING AND DRILLING DURATIONS

[March 2022–March 2023]

Activity	Total amount and estimated dates	Activity component	Method	Daily production rate	Total production days
Center Wall—Install Foundation Support Piles.	38 drilled shafts, Mar-22 to Mar-23	Install 102-inch diameter outer casing.	Rotary Drill	1 shaft/day, 1 hour/day.	38
		Pre-drill 102-inch diameter socket	Rotary Drill	1 shaft/day, 9 hours/day.	38
		Remove 102-inch outer casing	Rotary Drill	1 casing/day, 15 minutes/casing.	38
		Drill 78-inch diameter shaft	Cluster drill DTH	6.5 days/shaft, 10 hours/day.	247
Center Wall—Install Diving Board Shafts.	18 drilled shafts, Mar-22 to Mar-23	Install 102-inch diameter outer casing.	Rotary Drill	1 shaft/day, 1 hour/day.	18
		Pre-drill 102-inch diameter socket	Rotary Drill	1 shaft/day, 9 hours/day.	18
		Remove 102-inch outer casing	Rotary Drill	1 casing/day, 15 minutes/casing.	18
		Drill 78-inch diameter shaft	Cluster drill DTH	6.5 days/shaft, 10 hours/day.	117
Center Wall—Access Platform Support.	38 drilled shafts, Mar-22 to Mar-23	Install 102-inch diameter outer casing.	Rotary Drill	1 shaft/day, 1 hour/day.	38
		Pre-drill 102-inch diameter socket	Rotary Drill	1 shaft/day, 9 hours/day.	38
		Remove 102-inch outer casing	Rotary Drill	1 casing/day, 15 minutes/casing.	38
		Drill 78-inch diameter shaft	Cluster drill DTH	3.5 days/shaft, 10 hours/day.	133
Center Wall—Temporary Launching Piles.	6 drilled shafts, Mar-22 to Apr-22	42-inch diameter shaft	Mono-hammer DTH.	1 shaft/day, 10 hours/day.	6

TABLE 1—PILE DRIVING AND DRILLING DURATIONS—Continued
[March 2022–March 2023]

Activity	Total amount and estimated dates	Activity component	Method	Daily production rate	Total production days
Center Wall Tie Downs	Install 36 rock anchors, Mar-22 to Mar-23.	9-inch diameter holes	Mono-hammer DTH.	2 holes/day, 5 hours/hole.	18
Center Wall—Access Platform Tie Downs.	Install 18 rock anchors, Mar-22 to Mar-23.	9-inch diameter holes	Mono-hammer DTH.	2 holes/day, 5 hours/hole.	9
Center Wall—Install Tie-In to Existing West Closure Wall.	16 sheet piles, Mar-22 to Mar-23+	28-inch wide Z-shaped sheets	Impact with initial vibratory set.	4 piles/day, 5 minutes and 300 blows/pile.	*4
Berth 11 End Wall—Install Secant Pile Guide Wall.	60 sheet piles, Feb-22 to Mar-23	28-inch wide Z-shaped sheets	Impact with initial vibratory set.	8 piles/day, 5 minutes and 300 blows/pile.	8
Berth 1—Remove Granite Block Quay Wall.	610 cy, May-22 to Mar-23+	Granite block demolition	Hydraulic rock hammering.	2.5 hours/day	*10
P–310 West Closure Wall—Remove Closure Wall.	238 sheet piles, Aug-22 to Oct-22	18-inch wide flat- sheets	Vibratory extraction.	4 piles/day, 5 minutes/pile.	60
P–310 West Closure Wall—Mechanical Rock Excavation.	985 cy, Nov-22 to Feb-23	Excavate bedrock	Hydraulic rock hammering.	9 hours/day	77
P–310 West Closure Wall—Mechanical Rock Excavation.	Drill 500 relief holes, Nov-22 to Feb-23.	4–6 inch holes	Mono-hammer DTH.	25 holes/day, 24 minutes/hole.	20
	Drill 46 rock borings (50 cy), May-22 to Jun-22.	42-inch diameter casing	Mono-hammer DTH.	2 borings/day, 5 hours/boring.	[1] 24
West closure wall—Berth 11 Abutment—Install Piles.	Drill 28 shafts, Aug-22 to Mar-23	42-inch diameter casing	Mono-hammer DTH.	1 shaft/day, 10 hours/day.	28
Berth 11—Remove Shutter Panels	112 panels, Oct-22 to Mar-23+	Demolish shutter panels	Hydraulic rock hammering.	5 hours/day	*56
Berth 11 Face—Mechanical Rock Removal at Basin Floor.	3,500 cy, Oct-22 to Mar-23+	Excavate Bedrock	Hydraulic rock hammering.	12 hours/day	*100
	Drill 2,201 relief holes, Oct-22 to Mar-23+.	4–6 inch holes	Mono-hammer DTH.	27 holes/day, 22.2 minutes/hole.	*82
Berth 11 Face—Mechanical Rock at Abutment.	Drill 365 rock borings (1,220 cy), Jul-22 to Jan-23.	42-inch diameter casing	Mono-hammer DTH.	2 borings/day, 5 hours/boring.	183
Dry Dock 1 North Entrance—Drill Tremie Tie Downs.	Drill 100 rock anchors, Jan-23 to Mar-23.	9-inch holes	Mono-hammer DTH.	2 holes/day, 2 hours/hole.	[1] 52
Dry Dock 1 North Entrance—Install Temporary Cofferdam.	Install 96 sheet piles, Dec-22 to Mar-23.	28-inch wide Z-shaped sheets	Impact with initial vibratory set.	8 sheets/day, 5 minutes and 300 blows/pile.	12
Berth 1—Remove Sheet Piles	Remove 12 sheet piles, Mar-23+	25-inch wide Z-shaped sheets	Hydraulic rock hammering.	6 hours/day	*3
Berth 1 Top of Wall—Demolition For Waler Installation.	30 lf+, Mar-23+	Mechanical concrete demolition	Hydraulic rock hammering.	10 hours/day	*6
Totals	539 shafts/borings, 2,855 holes/anchors,422 sheet piles.				1,537

+ These activities may continue into subsequent construction years pursuant to a proposed authorization.
* These activities will begin in year 1 of this IHA request and may continue into following construction years pursuant to a proposed authorization. Only the number of production days occurring in year 1 are presented.

Specific Geographic Region

The shipyard is located in the Piscataqua River in Kittery, Maine. The Piscataqua River originates at the boundary of Dover, New Hampshire, and Eliot, Maine (see Figure 1 below). The river flows in a southeasterly direction for 2,093 meters (m) (13 miles (mi)) before entering Portsmouth Harbor and emptying into the Atlantic Ocean. The lower Piscataqua River is part of the Great Bay Estuary system and varies in width and depth. Many large and small islands break up the straight-line flow of the river as it continues toward the Atlantic Ocean. Seavey Island, the location of the proposed activities, is located in the lower Piscataqua River approximately 500 m from its southwest bank, 200 m from its north bank, and approximately 4,000 m (2.5 mi) from the mouth of the river.

Water depths in the proposed project area range from 6.4 m (21 feet (ft) to 11.9 m (39 ft) at Berths 11, 12, and 13. Water depths in the lower Piscataqua River near the proposed project area range from 15 ft in the shallowest areas to 69 ft in the deepest areas. The river is approximately 914 m (3,300 ft) wide near the proposed project area, measured from the Kittery shoreline north of Wattlebury Island to the Portsmouth shoreline west of Peirce Island. The furthest direct line of sight from the proposed project area would be 1,287 m (0.8 mi) to the southeast and 418 m (0.26 mi) to the northwest.

Much of the shoreline in the proposed project area is composed of hard shores (rocky intertidal). In general, rocky intertidal areas consist of bedrock that alternates between marine and terrestrial habitats, depending on the tide (Department of the Navy 2013). Rocky intertidal areas consist of ''bedrock, stones, or boulders that singly or in combination cover 75 percent or more of an area that is covered less than 30 percent by vegetation'' (Navy 2013).

The lower Piscataqua River is home to Portsmouth Harbor and is used by commercial, recreational, and military vessels. Between 150 and 250 commercial shipping vessels transit the lower Piscataqua River each year (Magnusson *et al.* June 2012). Commercial fishing vessels are also very common in the river year-round, as are recreational vessels, which are more common in the warmer summer months. The shipyard is a dynamic industrial facility situated on an island with a narrow separation of waterways between the installation and the communities of Kittery and Portsmouth (see Figure 2). The predominant noise sources from Shipyard industrial operations consist of dry dock cranes; passing vessels; and industrial equipment (*e.g.,* forklifts, loaders, rigs, vacuums, fans, dust collectors, blower belts, heating, air conditioning, and ventilation (HVAC) units, water pumps, and exhaust tubes and lids). Other components such as construction, vessel ground support equipment for maintenance purposes, vessel traffic across the Piscataqua River, and vehicle traffic on the shipyard's bridges and on local roads in Kittery and Portsmouth produce noise, but such noise generally represents a transitory contribution to the average noise level environment (Blue Ridge Research and Consulting (BRRC) 2015; ESS Group 2015). Ambient sound levels recorded at the shipyard are considered typical of a large outdoor industrial facility and vary widely in space and time (ESS Group 2015).

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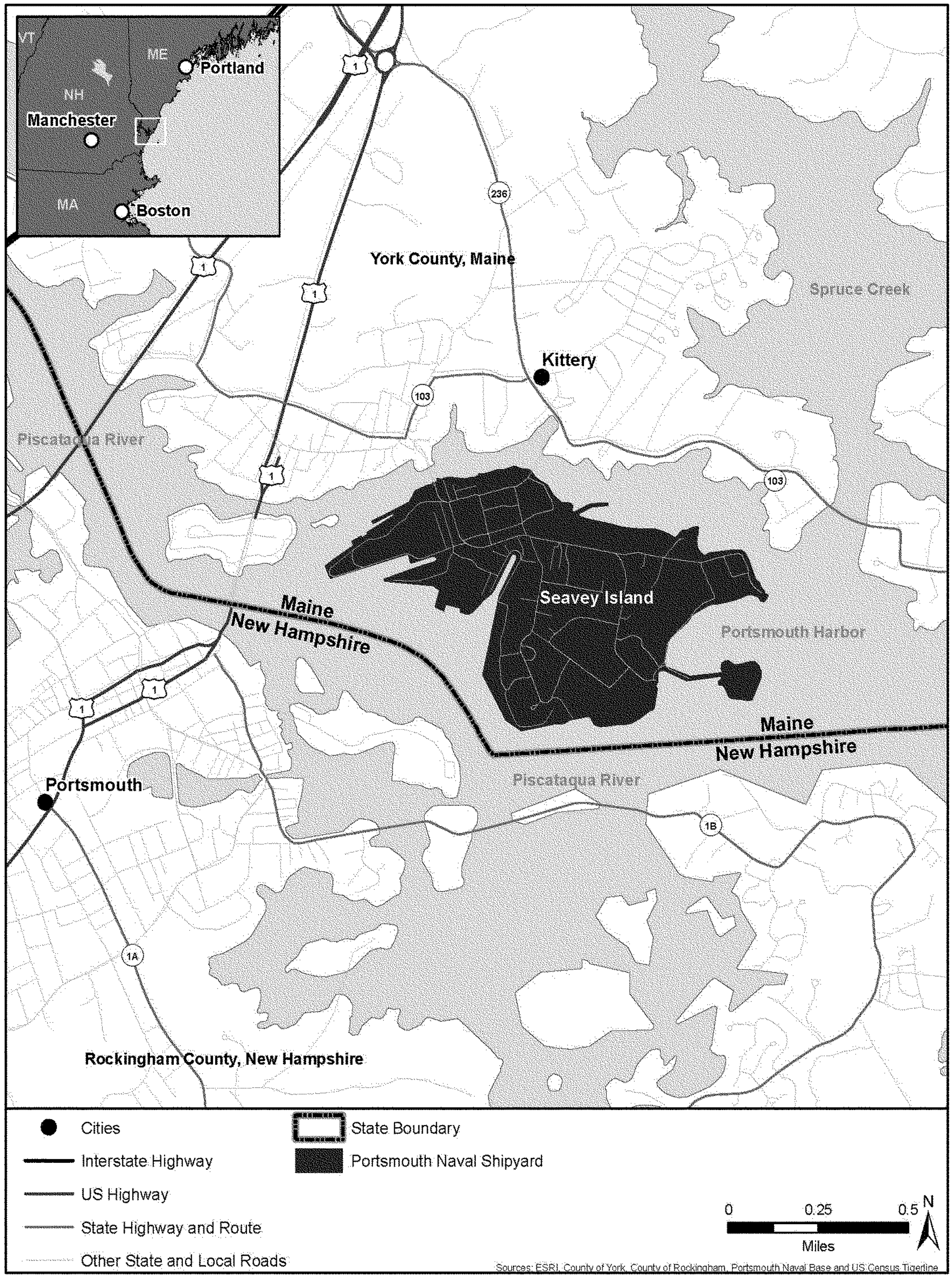

Figure 1--Site Location Map of the Project Area

Figure 2--Region of Influence for Underwater Noise for P-381 Year 1 In-water Construction Activities

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Detailed Description of Specific Activity

Preparatory work for P–381 in Year 1 as proposed for this IHA can be generally grouped into four categories: center wall support and tie-in, structural reinforcement of super flood basin sidewalls and entrance, mechanical bedrock removal, and demolition of super flood basin wall components. Each category involves one or more activities expected to result in harassment of marine mammals.

Center wall support and tie-in—The location of the future center wall requires reinforcement to allow placement of the large pre-cast monolith structures forming the separation between the two new dry docking positions. Specifically, the floor of the existing basin must be able to provide an adequate foundation for the pre-cast monoliths that will make up the dry dock interiors and center wall. The basin floor will be reinforced by 38, 84-inch (in) diameter shafts throughout the footprint of the center wall that will be filled with concrete to create the structural support piles for the center wall. The shafts will be installed using a cluster drill consisting of multiple down-the-hole (DTH) hammers.

Preparations for the center wall also require the installation of a relatively short length of sheet pile wall to create a connection between the existing west closure wall and the center wall. In construction year 1, 16, 28-in wide, Z-shaped sheet piles would be installed for the tie-in on the westerly end of the center wall footprint where it will connect to the west closure wall structure. The sheet piles will be installed using an initial vibratory set followed by driving with impact hammers. The remaining sheet piles will be proposed for installation in the following construction years and described in the subsequent rulemaking/LOA application.

Structural reinforcement of super flood basin sidewalls and entrance—The existing super flood basin walls must be reinforced to allow adjacent bedrock removal and to provide support for the future dry dock walls. Bedrock removal is required to establish the deeper floor elevations needed for the project. The existing walls must be reinforced to prevent undermining during rock removal which could cause the walls to collapse.

Wall reinforcement activities will include the installation of a sheet pile guide wall along the Berth 11 end wall. The guide wall will support the installation of an adjacent secant pile structural support wall that will be installed landside. In construction year 1, 24, 28-in, Z-shaped sheet piles will be installed for the guide wall. The guide wall sheet piles will be placed using an initial vibratory set followed by driving with impact hammers. The remaining guide wall sheet piles will be proposed for installation in the following construction years and described in the subsequent rulemaking/LOA application.

The conversion of the existing west closure wall to the Dry Dock 1 North entrance requires reinforcement of the section of the west closure wall that will become the new dry dock entrance. The existing structure will be reinforced by drilling shafts through its interior into the underlying bedrock. The shafts will be filled with concrete to create structural piles. This activity will not occur in the water and will not create underwater noise impacts. The structure will then be surrounded by a temporary cofferdam. In construction Year 1, the cofferdam base will be constructed with 24, 28-in wide, Z-shaped sheet piles. The sheet piles will be installed using an initial vibratory set followed by driving with impact hammers. The remainder of cofferdam construction will be proposed in the following construction years and described in the subsequent rulemaking/LOA application.

Additional preparatory work in the west closure wall area involves the installation of support tie downs for future tremie concrete work. The tie downs require the placement of an estimated 51 rock anchors requiring 9-in diameter holes. The rock anchors will be installed using a rotary drill.

Along the northern section of the west closure wall, at its junction with Berth 11, reinforcement piles will be installed to strengthen the abutment area. The reinforcement piles will be constructed by drilling 28, 42-in diameter shafts that will be filled with concrete to create a pile wall. The shafts will be constructed using a DTH cluster drill.

Mechanical bedrock removal—Bedrock will be mechanically excavated using various methods appropriate for the removal location and as needed to avoid damage to adjacent structures. Bedrock removal is required in several locations throughout the basin area. Three methods of rock removal will be employed that may result in injury or harassment of marine mammals:

- Bedrock excavation with a hydraulic rock hammer (*i.e.,* hoe ram or breaker)
- Installation of relief holes (4- to 6-in diameter) using a DTH drill
- Removal of rock using DTH drilling with 36-in cluster drill

Two primary areas of mechanical rock removal are scheduled for Year 1 of the project: The west closure wall footprint and the Berth 11 face. Both sites require the use of the three methods presented in the bulleted list above.

Preparation of the west closure wall area requires the removal of bedrock with a hydraulic hammer along with the DTH drilling 500, 4–6 in diameter relief holes and the drilling of 19 rock borings with a 36-in diameter DTH cluster drill. Approximately 905 cubic yards (cy) of bedrock are anticipated to be removed from the west closure wall area.

Bedrock removal is also required along the Berth 11 face. Again, the rock will be removed with a hydraulic hammer: By drilling 351, 4–6-in diameter relief holes plus drilling 8 rock borings with 36-in diameter DTH cluster drill. Approximately 415 cy of bedrock are anticipated to be removed during construction Year 1. The remaining bedrock will be proposed for removal in the following construction years and described in the rulemaking/subsequent LOA application.

Demolition of super flood basin wall components—Demolition of existing wall structures includes the removal of shutter panels, granite quay walls, sheet piles, and concrete making up the super flood basin. Demolition of existing wall structures would largely be conducted using a rock hammer but some features would be removed by torch cutting. Torch cutting would not generate noise that would be harmful to marine mammals and therefore not discussed further.

Portions of the basin west closure wall will be demolished by extracting the sheet piles with a vibratory hammer. 238, 18-in wide, flat sheet piles will be removed.

Sections of the existing concrete shutter panels making up the face of Berth 11 will be removed with a hydraulic rock hammer. Approximately112 panels would be removed in construction Year 1. The remaining shutter panels will be proposed for removal in the following construction years and described in the rulemaking/subsequent LOA that application.

Berth 1 demolition includes removal of the existing sheet pile wall and portions of the underlying granite block quay wall. In construction year 1, 12, 25-in wide, Z-shaped sheet piles and approximately 610 cy of granite would be removed. The sheet piles and the granite block quay wall will be removed with a hydraulic rock hammer with the remaining sheet piles and granite blocks proposed for removal in the following construction years and described in the subsequent rulemaking/LOA application.

A section of Berth 1 requires the installation of a waler (steel beam) for structural support. To accommodate the waler, about 9.144 m (30 linear ft) of concrete wall will be removed using a hydraulic rock hammer in construction Year 1 with the remaining concrete wall proposed for removal in the following construction years and described in the subsequent rulemaking/LOA application.

Overall Noise Producing Activities

Two types of piles will be installed or removed with pile driving equipment during construction Year 1: 28-in wide, Z-shaped sheet piles and 18-in wide, flat sheet piles. The installation of 28-in wide, Z-shaped steel sheets would use a combination of vibratory and impact hammers, whereas the removal of 18-in wide, flat sheet piles would use only vibratory hammers.

Pile installation/removal would occur using barge mounted cranes equipped with both vibratory and impact hammers. Piles would be installed initially using vibratory means and then finished with impact hammers, if necessary. Impact hammers would also be used to push obstructions out of the way and where sediment conditions do not permit the efficient use of vibratory hammers. To the extent practicable, it is assumed that the piles installed for this project would be set with a vibratory hammer and then finished with an impact hammer in order to reach bearing depth or to have the required load-bearing capacity if installed using vibratory methods only. Pile removal activities would use vibratory hammers exclusively.

The removal of bedrock and the demolition of concrete shutter panels and granite blocks during construction Year 1 would be by mechanical means. These features would be demolished using a hydraulic rock hammer or hoe ram (a portion of bedrock removal would also use DTH mono hammers and cluster drilling).

Two methods of rock excavation would be used during construction Year 1: rotary drill and DTH excavation. DTH excavation using mono-hammers would be used for bedrock removal, to create shafts for support piles and tie downs, and for the excavation of relief holes during mechanical bedrock removal. For the largest shafts (greater than 42-in in diameter) DTH excavation would use a cluster drill. A cluster drill uses multiple mono-hammers within a single bit to efficiently break up bedrock and create large diameter holes. Rotary drilling is considered an intermittent, non-impulsive noise source, similar to vibratory pile-driving.

Concurrent Activities

In order to maintain project schedules, it is likely that multiple pieces of equipment would operate at the same time within the basin. Given the spatial constraints of the project area, a maximum of five pieces of equipment could potentially operate in the project area at a single time. Table 2 provides a summary of possible equipment combinations that could be used simultaneously over the course of the construction year. An analysis of concurrent activities with respect to noise generation from multiple sources is provided in the Estimated Take section.

TABLE 2—SUMMARY OF MULTIPLE EQUIPMENT SCENARIOS

Quantity	Equipment
2	Rotary Drill (2).
2	Cluster Drill (1), Rotary Drill (1).
2	Cluster Drill (2).
3	Cluster Drill (2), Vibratory Hammer (1).
5	Cluster Drill (2), Vibratory Hammer (1), Mono-hammer DTH(1), Rotary Drill (1).
4	Cluster Drill (1), Rock Hammering (1), Mono-hammer DTH (1), Rotary Drill (1).
2	Mono-hammer DTH (1), Rock Hammer (1).
3	Mono-hammer DTH (1), Rock Hammer (2).

Source: 381 Constructors 2021.

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' 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' website (*https://www.fisheries.noaa.gov/find-species*).

Table 3 lists all species with expected potential for occurrence in the Piscataqua River in Kittery, Maine, 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, NMFS follows Committee on Taxonomy (2021). 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' 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' 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' U.S. Atlantic Marine Mammal SARs. All values presented in Table 3 are the most recent available at the time of publication and are available in the final 2020 SARs (Hayes *et al.,* 2021) and draft 2021 SARs, available online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports.*

TABLE 3—MARINE MAMMALS WITH POTENTIAL PRESENCE WITHIN THE PROPOSED 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 Odontoceti (toothed whales)						
Family Phocoenidae (porpoises):						

TABLE 3—MARINE MAMMALS WITH POTENTIAL PRESENCE WITHIN THE PROPOSED PROJECT AREA—Continued

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]
Harbor porpoise	*Phocoena phocoena*	Gulf of Maine/Bay of Fundy.	-;N	95,543 (0.31; 74,034; 2016)	851	164
Order Carnivora—Superfamily Pinnipedia						
Family Phocidae (earless seals):						
Harbor seal	*Phoca vitulina*	Western North Atlantic	-;N	61,336 (0.08, 57,637; 2018)	1,729	339
Gray seal	*Halichoerus grypus*	Western North Atlantic	-;N	27,300 [4] (0.22; 22,785; 2016)	1,389	4,453
Harp seal	*Pagophilus groenlandicus*	Western North Atlantic	-;N	7,600,000 (unk,7,100.000, 2019)	426,000	178,573
Hooded seal	*Cystophora cristata*	Western North Atlantic	-;N	593,500	Unknown	1,680

[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#reports.* CV is coefficient of variation; N_{min} is the minimum estimate of stock abundance.

[3] These values, found in NMFS' 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] This abundance value and the associated PBR value reflect the US population only. Estimated abundance for the entire Western North Atlantic stock, including animals in Canada, is 451,600. The annual M/SI estimate is for the entire stock.

All species that could potentially occur in the proposed action area are included in Table 2. More detailed descriptions of marine mammals in the PNSY project area are provided below.

Harbor Porpoise

Harbor porpoises occur from the coastline to deep waters (≤1800 m); Westgate *et al.* 1998), although the majority of the population is found over the continental shelf (Hayes *et al.,* 2020). In the project area, only the Gulf of Maine/Bay of Fundy stock of harbor porpoise may be present. This stock is found in U.S. and Canadian Atlantic waters and is concentrated in the northern Gulf of Maine and southern Bay of Fundy region, generally in waters less than 150 m deep (Waring *et al.,* 2016).

The Navy has been collecting data on marine mammals in the Piscataqua River since 2017 through construction monitoring and non-construction related monthly surveys (2017–2018). Three harbor porpoises were observed travelling quickly through the river channel during marine mammal monitoring conducted between April and December 2017 in support of the Berth 11 Waterfront Improvements Project (Cianbro 2018a). Two harbor porpoises were observed during construction monitoring that occurred between January 2018 and January 2019 (Cianbro 2018b; Navy 2019). One harbor porpoise was observed in March 2017 during non-construction related surveys conducted on 12 days (one per month) in 2017, and two harbor porpoises (one in August and one in November) were observed in monthly surveys conducted in 2018 (Naval Facilities Engineering Systems Command (NAVFAC) Mid-Atlantic 2018, 2019b). There was one sighting of harbor porpoise during P–310 year 1 monitoring events (May through December 2020) (NAVFAC 2021). To date, no harbor porpoise have been sighted in calendar year 2021 (Stantec 2021).

Harbor Seal

The harbor seal is found in all nearshore waters of the North Atlantic and North Pacific Oceans and adjoining seas above about 30°N (Burns, 2009). In the western North Atlantic, harbor seals are distributed from the eastern Canadian Arctic and Greenland south to southern New England and New York, and occasionally to the Carolinas (Hayes *et al.,* 2020). Haulout and pupping sites are located off Manomet, MA and the Isles of Shoals, ME (Waring *et al.,* 2016).

Harbor seals are the most abundant pinniped in the Piscataqua River. The majority of harbor seals occur along the Maine coast with a large portion of them hauling out at the Isles of Shoals (see Figure 4–1 of the application). Pupping season for harbor seals is May to June. No harbor seal pups were observed during the surveys (Cianbro 2018a, b) as pupping sites are north of the Maine-New Hampshire border (Waring *et al.* 2016). During construction monitoring between the months of April and December 2017, 199 harbor seals were observed (Cianbro 2018a) in the project area. A total of 249 harbor seals were observed during construction monitoring between the months of January 2018 and January 2019 (Navy 2019). The primary behaviors observed during monitoring were milling that occurred almost 60 percent of the time followed by swimming and traveling by the proposed project area at 29 percent and 12 percent, respectively (Cianbro 2018a). A total of 17 and 83 harbor seals were observed during the one-day monthly surveys conducted in 2017 and 2018, respectively (NAVFAC Mid-Atlantic 2018, 2019b). Between May and December of 2020 (NAVFAC 2021), 721 harbor seals were sighted during construction monitoring (NAVFAC 2021). A total of 302 harbor seals have been observed during construction monitoring of the project area between January 2021 and November 2021 (Stantec 2021).

Gray Seal

There are three major populations of gray seals found in the world; eastern Canada (western North Atlantic stock), northwestern Europe and the Baltic Sea. Gray seals in the project area belong to the western North Atlantic stock. The range for this stock is from New Jersey to Labrador. Current population trends show that gray seal abundance is likely increasing in the U.S. Atlantic Exclusive Economic Zone (EEZ) (Hayes *et al.,* 2020). Although the rate of increase is unknown, surveys conducted since their arrival in the 1980s indicate a steady increase in abundance in both Maine and Massachusetts (Hayes *et al.,* 2018). It is believed that recolonization by Canadian gray seals is the source of the U.S. population (Hayes *et al.,* 2018).

There were 24 gray seals observed within the proposed project area between the months of April and December 2017 (Cianbro 2018a) and a total of 12 observed during the January 2018 to January 2019 construction monitoring period (Navy 2019). Ten of the 12 observation occurred during the winter months. (Navy 2019). The primary behavior observed during surveys was milling at just over 60 percent of the time followed by swimming within and traveling through the proposed project area. Gray seals were observed foraging approximately 5 percent of the time (Cianbro 2018a). The one-day monthly marine mammal surveys during 2017 and 2018 recorded six and three sightings, respectively, of gray seal (NAVFAC Mid-Atlantic 2018, 2019b). A total of 47 gray seals were observed during P–310 Year 1 monitoring events from May through December 2020 (NAVFAC 2021). Pupping season for gray seals is December through February. No gray seal pups were observed during the surveys (Cianbro 2018a, b) as pupping sites for gray seals (like harbor seals) are north of Maine-New Hampshire border (Waring et al. 2016). In 2021, monitoring activities have sighted 9 gray seals thus far (Stantec 2021).

Hooded Seal

Hooded seals are also members of the true seal family (*Phocidae*) and are generally found in deeper waters or on drifting pack ice. The world population of hooded seals has been divided into three stocks, which coincide with specific breeding areas, as follows: 1) Northwest Atlantic, 2) Greenland Sea, and 3) White Sea (Waring *et al.,* 2020). The hooded seal is a highly migratory species, and its range can extend from the Canadian arctic to Puerto Rico. In U.S. waters, the species has an increasing presence in the coastal waters between Maine and Florida (Waring *et al.,* 2019). In the U.S., they are considered members of the western North Atlantic stock and generally occur in New England waters from January through May and further south in the summer and fall seasons (Waring *et al.,* 2019).

Hooded seals are known to occur in the Piscataqua River; however, they are not as abundant as the more commonly observed harbor seal. Anecdotal sighting information indicates that two hooded seals were observed from the Shipyard in August 2009, but no other observations have been recorded (Trefry November 20, 2015). Hooded seals were not observed during marine mammal monitoring or survey events that took place in 2017, 2018, and 2020 (Cianbro 2018a, b; NAVFAC Mid-Atlantic 2018, 2019b; Navy 2019; NAVFAC 2021). To date no hooded seals have been sighted in 2021 (Stantec 2021).

Harp Seal

The harp seal is a highly migratory species, its range extending throughout the Arctic and North Atlantic Oceans. The world's harp seal population is separated into three stocks, based on associations with specific locations of pagophilic breeding activities: (1) Off eastern Canada, (2) on the West Ice off eastern Greenland, and (3) in the White Sea off the coast of Russia. The largest stock, which includes two herds that breed either off the coast of Newfoundland/Labrador or near the Magdelan Islands in the Gulf of St. Lawrence, is equivalent to the western North Atlantic stock. Harp seals that occur in the United States are considered members of the western North Atlantic stock and generally occur in New England waters from January through May (Waring *et al.,* 2020).

Harp seals are known to occur in the Piscataqua River; however, they are not as abundant as the more commonly observed harbor seal and were last documented in the river in May of 2020 (Stantec 2020). Two harp seals were sighted on two separate occasions (on May 12 and May 14, 2020) during construction monitoring for P–310 (NAVFAC 2021). No pile driving was occurring at the time of the sighting. Previous to that, the last harp seal sighting was in 2016 (NAVFAC Mid-Atlantic 2016; NMFS 2016b). Harp seals were not observed during marine mammal monitoring or survey events that took place in 2017 and 2018 (Cianbro 2018a, b; NAVFAC Mid-Atlantic 2018, 2019b; Navy 2019). To date no harp seals have been sighted in 2021 (Stantec 2021).

Unusual Mortality Events (UMEs)

Since July 2018, elevated numbers of harbor seal and gray seal mortalities have occurred across Maine, New Hampshire and Massachusetts. This event was declared a UME, but it is now considered non-active and pending closing. Information on this UME is available online at: *https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-life-distress/2018-2020-pinniped-unusual-mortality-event-along.*

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.

TABLE 4—MARINE MAMMAL HEARING GROUPS—Continued
[NMFS, 2018]

Hearing group	Generalized hearing range *
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 (one cetacean and four pinniped (all phocid) species) have the reasonable potential to co-occur with the proposed survey activities. Please refer to Table 3. The only cetacean species that may be present, the harbor porpoise, is classified as a high-frequency cetacean.

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 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 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

Sound travels in waves, the basic components of which are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in hertz (Hz) or cycles per second. Wavelength is the distance between two peaks of a sound wave; lower frequency sounds have longer wavelengths than higher frequency sounds. Amplitude is the height of the sound pressure wave or the 'loudness' of a sound and is typically measured using the dB scale. A dB is the ratio between a measured pressure (with sound) and a reference pressure (sound at a constant pressure, established by scientific standards). It is a logarithmic unit that accounts for large variations in amplitude; therefore, relatively small changes in dB ratings correspond to large changes in sound pressure. When referring to sound pressure levels (SPLs) (the sound force per unit area), sound is referenced in the context of underwater sound pressure to one microPascal (μPa). One pascal is the pressure resulting from a force of one newton exerted over an area of one square meter. The source level (SL) represents the sound level at a distance of 1 m from the source (referenced to 1 μPa). The received level is the sound level at the listener's position. Note that all underwater sound levels in this document are referenced to a pressure of 1 μPa and all airborne sound levels in this document are referenced to a pressure of 20 μPa.

Root mean square (RMS) is the quadratic mean sound pressure over the duration of an impulse. RMS is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick 1983). RMS accounts for both positive and negative values; squaring the pressures makes all values positive so that they may be accounted for in the summation of pressure levels (Hastings and Popper 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak pressures.

When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in all directions away from the source (similar to ripples on the surface of a pond), except in cases where the source is directional. The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones.

Even in the absence of sound from the specified activity, the underwater environment is typically loud due to ambient sound. Ambient sound is defined as environmental background sound levels lacking a single source or point (Richardson *et al.,* 1995), and the sound level of a region is defined by the total acoustical energy being generated by known and unknown sources. These sources may include physical (*e.g.,* waves, earthquakes, ice, atmospheric sound), biological (*e.g.,* sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.,* vessels, dredging, aircraft, construction). A number of sources contribute to ambient sound, including the following (Richardson *et al.,* 1995):

- Wind and waves: The complex interactions between wind and water surface, including processes such as breaking waves and wave-induced bubble oscillations and cavitation, are a main source of naturally occurring ambient noise for frequencies between 200 Hz and 50 kilohertz (kHz) (Mitson 1995). In general, ambient sound levels tend to increase with increasing wind speed and wave height. Surf noise becomes important near shore, with measurements collected at a distance of 8.5 km from shore showing an increase of 10 dB in the 100 to 700 Hz band during heavy surf conditions;
- Precipitation: Sound from rain and hail impacting the water surface can become an important component of total noise at frequencies above 500 Hz, and possibly down to 100 Hz during quiet times;
- Biological: Marine mammals can contribute significantly to ambient noise levels, as can some fish and shrimp. The frequency band for biological contributions is from approximately 12 Hz to over 100 kHz; and
- Anthropogenic: Sources of ambient noise related to human activity include transportation (surface vessels and aircraft), dredging and construction, oil and gas drilling and production, seismic surveys, sonar, explosions, and ocean acoustic studies. Shipping noise typically dominates the total ambient

noise for frequencies between 20 and 300 Hz. In general, the frequencies of anthropogenic sounds are below 1 kHz and, if higher frequency sound levels are created, they attenuate rapidly (Richardson *et al.,* 1995). Sound from identifiable anthropogenic sources other than the activity of interest (*e.g.,* a passing vessel) is sometimes termed background sound, as opposed to ambient sound.

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.

Description of Sounds Sources

In-water construction activities associated with the project would include impact and vibratory pile installation and removal, rotary drilling, DTH, and rock hammering. The sounds produced by these activities fall into one of two general sound types: Impulsive and non-impulsive (defined below). 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). Please see Southall *et al.* (2007) for an in-depth discussion of these concepts.

Impulsive sound sources (*e.g.,* explosions, gunshots, sonic booms, impact pile driving) produce signals that are brief (typically considered to be less than one second), broadband, atonal transients (American National Standards Institute standards (ANSI) 1986; Harris 1998; National Institute for Occupational Safety and Health (NIOSH) 1998; International Organization for Standardization (ISO) 2003; ANSI 2005) and occur either as isolated events or repeated in some succession. Impulsive sounds are all characterized by a relatively rapid rise from ambient pressure to a maximal pressure value followed by a rapid decay period that may include a period of diminishing, oscillating maximal and minimal pressures, and generally have an increased capacity to induce physical injury as compared with sounds that lack these features.

Non-impulsive sounds can be tonal, narrowband, or broadband, brief or prolonged, and may be either continuous or non-continuous (ANSI 1995; NIOSH 1998). Some of these non-impulsive sounds can be transient signals of short duration but without the essential properties of impulses (*e.g.,* rapid rise time). Examples of non-impulsive sounds include those produced by vessels, aircraft, machinery operations such as drilling or dredging, vibratory pile driving, and active sonar systems. The duration of such sounds, as received at a distance, can be greatly extended in a highly reverberant environment.

Acoustic Impacts

The introduction of anthropogenic noise into the aquatic environment from pile driving or drilling is the primary means by which marine mammals may be harassed from the Navy'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). In general, exposure to pile driving or drilling 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). Exposure to anthropogenic noise can also lead to non-observable physiological responses such an increase in stress hormones. 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 or drilling 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.

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 decibels (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 an animal uses sound within the frequency band of the signal; *e.g.,* Kastelein *et al.,* 2014), 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)—TTS is 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 (2015), 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 a 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 (*Tursiops truncatus*), 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 (*e.g.,* 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 (Kastak *et al.,* 2005; Kastelein *et al.,* 2012a) and harbor porpoises (Lucke *et al.,* 2009; Kastelein *et al.,* 2012b) 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. There are no data 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) and Finneran (2015).

Behavioral Harassment—Exposure to noise from pile driving and removal also has the potential to behaviorally disturb marine mammals. 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).

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.

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.

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), however distress is an unlikely result of this project based on observations of marine mammals during previous, similar projects in the area.

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.

Airborne Acoustic Effects—Although pinnipeds are known to haul-out regularly on man-made objects, we believe that incidents of take resulting solely from airborne sound are unlikely due to the sheltered proximity between the proposed project area and the haulout sites (on the opposite side of the island where activities are occuring). There is a possibility that an animal could surface in-water, but with head out, within the area in which airborne sound exceeds relevant thresholds and thereby be exposed to levels of airborne sound that we associate with harassment, but any such occurrence would likely be accounted for in our estimation of incidental take from underwater sound. Therefore, authorization of incidental take resulting from airborne sound for pinnipeds is not warranted, and airborne sound is not discussed further here. Cetaceans are not expected to be exposed to airborne sounds that would result in harassment as defined under the MMPA.

Potential Effects on Marine Mammal Habitat

Water quality—Temporary and localized reduction in water quality will occur as a result of in-water construction activities. Most of this effect will occur during the installation of piles and bedrock removal when bottom sediments are disturbed. The installation of piles and bedrock removal an will disturb bottom sediments and may cause a temporary increase in suspended sediment in the project area. Using available information collected from a project in the Hudson River, pile driving activities are anticipated to produce total suspended sediment (TSS) concentrations of approximately 5.0 to 10.0 mg/L above background levels within approximately 300 feet (91 meters) of the pile being driven (Federal Highway Administration (FHWA) 2012). During pile extraction, sediment attached to the pile moves vertically through the water column until gravitational forces cause it to slough off under its own weight. The small resulting sediment plume is expected to settle out of the water column within a few hours. Studies of the effects of turbid water on fish (marine mammal prey) suggest that concentrations of suspended sediment can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton 1993). The TSS levels expected for pile driving or removal (5.0 to 10.0 mg/L) are below those shown to have adverse effects on fish (580.0 mg/L for the most sensitive species, with 1,000.0 mg/L more typical) and benthic communities (390.0 mg/L (Environmental Protection Agency 1986)).

Impacts to water quality from DTH mono-hammers are expected to be similar to those described for pile driving. Impacts to water quality would be localized and temporary and would have negligible impacts on marine mammal habitat. The cluster drill system and rotary drilling of shafts would have negligible impacts on water quality from sediment resuspension because the system would operate within a casing set into the bedrock. The cluster drill would collect excavated material inside of the apparatus where it would be lifted to the surface and placed onto a barge for subsequent disposal.

Turbidity within the water column has the potential to reduce the level of oxygen in the water and irritate the gills of prey fish species in the proposed project area. However, turbidity plumes associated with the project would be temporary and localized, and fish in the proposed project area would be able to move away from and avoid the areas where plumes may occur. Therefore, it is expected that the impacts on prey fish species from turbidity, and therefore on marine mammals, would be minimal and temporary.

Overall effects of turbidity and sedimentation are expected to be short-term, minor, and localized. Currents are strong in the area and, therefore, suspended sediments in the water column should dissipate and quickly return to background levels. Following the completion of sediment-disturbing activities, the turbidity levels are expected to return to normal ambient levels following the end of construction. In general, the area likely impacted by the project is relatively small compared to the available habitat in Great Bay Estuary.

Effects on Potential Prey—Sound may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species (*e.g.,* crustaceans, cephalopods, fish, zooplankton). Marine mammal prey varies by species, season, and location and, for some, is not well documented. Studies regarding the effects of noise on known marine mammal prey are described here.

Fish utilize the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.,* Zelick *et al.,* 1999; Fay, 2009). Depending on their hearing anatomy and peripheral sensory structures, which vary among species, fishes hear sounds using pressure and particle motion sensitivity capabilities and detect the motion of surrounding water (Fay *et al.,* 2008). The potential effects of noise on fishes depends on the overlapping frequency range, distance from the sound source, water depth of exposure, and species-specific hearing sensitivity, anatomy, and physiology. Key impacts to fishes may include behavioral responses, hearing damage, barotrauma (pressure-related injuries), and mortality.

Fish react to sounds which are especially strong and/or intermittent low-frequency sounds, and behavioral responses such as flight or avoidance are the most likely effects. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. The reaction of fish to noise depends on the physiological state of the fish, past exposures, motivation (*e.g.,* feeding, spawning, migration), and other environmental factors. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented 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). Several studies have demonstrated that impulse sounds might affect the distribution and behavior of some fishes, potentially impacting foraging opportunities or increasing energetic costs (*e.g.,* Fewtrell and McCauley, 2012; Pearson *et al.,* 1992; Skalski *et al.,* 1992; Santulli *et al.,* 1999; Paxton *et al.,* 2017). However, some studies have shown no or slight reaction to impulse sounds (*e.g.,* Pena *et al.,* 2013; Wardle *et al.,* 2001; Jorgenson and Gyselman, 2009; Cott *et al.,* 2012). More commonly, though, the impacts of noise on fish are temporary.

SPLs of sufficient strength have been known to cause injury to fish and fish mortality. However, in most fish species, hair cells in the ear continuously regenerate and loss of auditory function likely is restored when damaged cells are replaced with new cells. Halvorsen *et al.* (2012a) showed that a TTS of 4–6 dB was recoverable within 24 hours for one species. Impacts would be most severe when the individual fish is close to the source and when the duration of exposure is long. Injury caused by barotrauma can range from slight to severe and can cause death, and is most likely for fish with swim bladders. Barotrauma injuries have been documented during controlled exposure to impact pile driving (Halvorsen *et al.,* 2012b; Casper *et al.,* 2013).

The greatest potential impact to fish during construction would occur during impact pile driving, rock hammering, and DTH excavation (DTH mono-hammer and cluster drill). However, the duration of impact pile driving would be limited to the final stage of installation (''proofing'') after the pile has been driven as close as practicable to the design depth with a vibratory driver. Vibratory pile driving and rock hammering would possibly elicit behavioral reactions from fish such as temporary avoidance of the area but is unlikely to cause injuries to fish or have persistent effects on local fish populations. In addition, it should be noted that the area in question is low-quality habitat since it is already highly developed and experiences a high level of anthropogenic noise from normal shipyard operations and other vessel traffic. In general, impacts on marine mammal prey species are expected to be minor and temporary.

In-Water Construction Effects on Potential Foraging Habitat

The proposed activities would not result in permanent impacts to habitats used directly by marine mammals. The total seafloor area affected by pile installation and removal is a very small area compared to the vast foraging area available to marine mammals outside this project area. Construction may have temporary impacts on benthic invertebrate species, another marine mammal prey source. Direct benthic habitat loss would result with the permanent loss of approximately 3.5 acres (14,164 square m) of benthic habitat from construction of the super flood basin. The water surface of Great Bay Estuary extends approximately 4.45 square miles (124,000,000 sf) at low tide (Mills No date). Therefore, the loss of 152,000 sf would represent approximately one-tenth of one percent of the benthic habitat in the estuary at low tide. However, the areas to be permanently removed are beneath and adjacent to the existing berths along the Shipyard's industrial waterfront and are regularly disturbed as part of the construction dredging to maintain safe navigational depths at the berths. Further, vessel activity at the berths creates minor disturbances of benthic habitats (*e.g.,* vessel propeller wakes) during waterfront operations. Therefore, impacts of the project are not likely to have adverse effects on marine mammal foraging habitat in the proposed project area. The impacts will be temporary and highly localized, and no habitat will be permanently impacted by construction. Therefore, it is expected that impacts on foraging opportunities for marine mammals due to the project would be minimal.

The area impacted by the project is relatively small compared to the available habitat just outside the project area, and there are no areas of particular importance that would be impacted by this project. 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. As described in the preceding, the potential for the Navy's construction to affect the availability of prey to marine mammals or to meaningfully impact the quality of physical or acoustic habitat is considered to be insignificant.

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, in the form of behavioral disturbance, masking, and potential TTS, with a smaller amount of Level A harassment in the form of PTS. 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) the number of days of activities. We note that while these 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 take estimate.

Acoustic Thresholds

NMFS recommends the use of 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—Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.,* frequency, predictability, duty cycle), the environment (*e.g.,* bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.,* 2007, Ellison *et al.,* 2012). Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μPa (RMS) for continuous (*e.g.,* vibratory pile-driving, drilling) and above 160 dB re 1 μPa (RMS) for impulsive and/or intermittent (*e.g.,* impact pile driving, DTH) sources. The Navy's construction includes the use of continuous and impulsive sources, and therefore the level of 120 and 160 dB re 1 μPa (RMS) is applicable.

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

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

These thresholds were developed by compiling and synthesizing the best available science and are provided in Table 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.*

As mentioned previously, the Navy's modification and expansion of Dry Dock 1 includes the use of impulsive (*i.e.,* impact pile driving, DTH) and non-impulsive (*i.e.,* drilling, vibratory pile driving) sources.

TABLE 5—THRESHOLDS IDENTIFYING THE ONSET OF PERMANENT THRESHOLD SHIFT FOR HIGH FREQUENCY CETEACEANS AND PINNIPEDS

Hearing group	PTS onset acoustic thresholds* (received level)	
	Impulsive	Non-impulsive
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.

* 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 (HF cetaceans and PW 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 transmission loss coefficient.

Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is:

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

where

B = transmission loss coefficient (assumed to be 15)

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

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

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

The intensity of pile driving sounds is greatly influenced by factors such as the type of piles, hammers, and the physical environment in which the activity takes place. There are sound source level (SSL) measurements available for certain pile types and sizes from the similar environments from other Navy pile driving projects that were evaluated and used as proxy sound source levels to determine reasonable sound source levels likely to result from the pile driving and removal activities (Table 6). Some of the proxy source levels are expected to be more conservative, as the values are from larger pile sizes. Acoustic monitoring results and associated monitoring reports from past projects conducted at the shipyard and elsewhere were reviewed. Projects reviewed were those most similar to the specified activity in terms of drilling and rock hammering activities, type and size of piles installed, method of pile installation, and substrate conditions.

TABLE 6—SUMMARY OF IN-WATER PILE DRIVING SOURCE LEVELS (AT 10 M FROM SOURCE)

Pile type	Installation method	Pile diameter	Peak (dB re 1 µPa)	RMS (dB re 1 µPa)	SEL (dB re 1 µPa² sec)
Casing/Socket	Rotary Drill	102-inch [1]	NA	154 m	NA
Shaft	DTH Cluster Drill	78-inch [2]	NA	195.2 (Level A) 167 dB (Level B)	181
Casing	DTH mono-hammer	42-inch [1]	194	167	164
Rock anchor	DTH mono-hammer	9-inch [1]	172	167	146
Relief hole	DTH mono-hammer	4 to 6-inch [1]	170	167	144
Z-shaped Sheet	Impact	28-inch [3]	211	196	181
	Vibratory	28-inch [4]	NA	167	167
Flat sheet	Vibratory	18-inch [5]	NA	163	163
Bedrock and concrete demolition.	Rock Hammer [6 thnsp;7]	NA	197	184	175

[1] Egger 2021a.
[2] Egger 2021b.
[3] A proxy value for impact pile driving 28-inch steel sheet piles could not be found so the proxy for a 30-inch steel pipe pile has been used (NAVFAC SW 2020 [p. A–4]).
[4] A proxy value for vibratory pile driving 28-inch steel sheet piles could not be found so a proxy for a 30-inch steel pipe pile has been used (Navy 2015 [p. 14]).
[5] NMFS 2019 (p. 24484, Table 5).
[6] Reyff 2018a.
[7] Reyff 2018b.

Notes: All SPLs are unattenuated; dB = decibels; NA = Not applicable; single strike SEL are the proxy sources levels presented for impact pile driving and were used to calculate distances to PTS.

dB re 1 µPa = dB referenced to a pressure of 1 microPascal, measures underwater SPL. dB re 1 µPa²-sec = dB referenced to a pressure of 1 microPascal squared per second, measures underwater SEL.

All recordings were made at 10 meters unless noted otherwise.

With regards to the proxy values summarized in Table 6, very little information is available regarding source levels for in-water rotary drilling activities. As a conservative measure and to be consistent with previously issued IHAs for similar projects in the region (Egger 2021a; Dazey 2012), a proxy of 154 dB RMS is proposed for all rotary drilling activities.

Rock hammering is analyzed as an impulsive noise source. For purposes of this analysis, it is assumed that the hammer would have a maximum strike rate of 460 strikes per minute and would operate for a maximum duration of 15 minutes before needing to reposition or stop to check progress. Therefore, noise impacts for rock hammering activities are assessed using the number of blows per 15-minute interval (6,900 blows) and the number of 15-minute intervals anticipated over the course of the day based on the durations provided in Table 2–1 and Table 6–5. As with rotary drilling, very little information is available regarding source levels associated with nearshore rock hammering. Measurements taken for this activity as part of the Tappan Zee Bridge replacement project recorded sound levels as follows:

- 197 dBpk, 184 dB RMS, 175 dB SEL (Reyff 2108a, 2018b)

Since no other comparable proxy values were identified in the literature, the Navy is proposing to use the same proxy values for rock hammering activities associated with P–381.

The Navy consulted with NMFS to obtain the appropriate proxy values for DTH mono-hammers. With regards to DTH mono-hammers, NMFS provided proxy values of 170 dBpk, 167 RMS, and 144 dB single strike SEL for holes 8-inches in diameter or less (Reyff 2020); 172 dBpk, 167 RMS, and 146 dB single strike SEL for holes 8- to 18 inches in diameter (Guan and Miner 2020); and 194 dBpk, 167 RMS, and 164 dB single strike SEL for holes 24- to 42-inches in diameter (Reyff 2020, Denes et al 2019 as cited in NMFS 2021a). For the 78-inch DTH cluster drill, NMFS provided an RMS value of 195.2 based off of regression and extrapolation calculations of existing data. Because of the high number of hammers and strikes for this system, cluster drills were treated as a continuous sound source for the time component of Level A harassment but still used the impulsive thresholds. The Level B harassment sound source level at 10 m remained at 167 dB RMS (Heyvaert and Reyff, 2021 as cited in NMFS 2021b).

In conjunction with the NMFS Technical Guidance (2018), 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, NMFS 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 overestimation of Level A harassment take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available, and NMFS continues to develop ways to quantitatively refine these tools and will qualitatively address the output where appropriate. For stationary sources (such as from impact and vibratory pile driving), the NMFS User Spreadsheet (2020) predicts the closest distance at which, if a marine mammal remained at that distance the whole duration of the activity, it would not incur PTS. Inputs used in the User Spreadsheet can be found in Appendix A of the Navy's application and the resulting isopleths are reported below (Tables 7 and 8).

Calculated distances to Level A harassment (PTS Onset) and Level B harassment thresholds are large, especially for DTH and rock hammering activities. However, the full distance of sound propagation would not be reached due to the presence of land masses and anthropogenic structures that would prevent the noise from reaching nearly the full extent of the larger harassment isopleths. Refer to Figure 2 for the region of influence, which illustrates that the land masses preclude the sound from traveling more than approximately 870 m (3,000 ft) from the source, at most.

Maximum distances are provided for the behavioral thresholds for in-water construction activities. Areas encompassed within the threshold (harassment zones) were calculated by using a Geographical Information System to clip the maximum calculated distances to the extent of the region of influence (ROI) (refer to Figure 2 for the ROI).

Table 7 summarizes the calculated maximum distances corresponding to the underwater marine mammal harassment zones from impulsive (impact pile driving, rock hammering, DTH) and Table 8 for non-impulsive noise (vibratory pile driving, rotary drilling, etc.) and the area of the harassment zone within the ROI. The distances do not take the land masses into consideration, but the ensonified areas do. Neither consider the reduction that will be achieved by the required use of a bubble curtain and therefore all take estimates are considered conservative. Refer to Figures 6–9 through 6–11 of the application for the calculated maximum distances corresponding to the underwater marine mammal harassment zones from impulsive (impact pile driving, rock hammering, DTH) and non-impulsive noise (vibratory pile driving, rotary drilling) and the corresponding area of the harassment zone within the ROI.

TABLE 7—CALCULATED DISTANCE AND AREAS OF LEVEL A AND LEVEL B HARASSMENT FOR IMPULSIVE NOISE
[DTH, impact pile driving, hydraulic rock hammering]

Activity	Purpose	Count and size/duration	Total production days	Level A harassment (PTS onset) *		Level B harassment *
				High frequency cetaceans (harbor porpoise)	Phocid pinnipeds	Harbor porpoise and phocids
DTH Cluster Drill	Foundation Support Piles for Center Wall.	38, 78-inch shafts	247	84,380.4 m/0.417 km².	37,909.7 m/0.417 km².	13,594 m/0.417 km².
DTH Cluster Drill	Foundation Leveling Piles for Center Wall.	18, 78-inch shafts	117	84,380.4 m/0.417 km².	37,909.7 m/0.417 km².	13,594 m/0.417 km².
DTH Cluster Drill	Center Wall—Access Support Platform.	38, 78-inch shafts	133	84,380.4 m/0.417 km².	37,909.7 m/0.417 km².	13,594 m/0.417 km².
DTH Mono-hammer	Center Wall—Temporary Launching Piles.	6, 42-inch shafts	6	3,880.3 m/0.417 km²	1,743.3 m/0417km²	13,594 m/0.417 km².
DTH Mono-hammer	Center Wall Tie-Downs	36, 9-inch holes	18	244.8 m/0.074 km²	110 m/0.0229 km²	13,594 m/0.417 km².
DTH Mono-hammer	Center Wall—Access Platform Tie-Downs.	18, 9-inch holes	9	244.8 m/0.0741 km²	110 m/0.0229 km²	13,594 m/0.417 km².
Impact Pile Driving	West Closure Wall Tie-In to Existing Wall.	16,** 28-inch Z-shaped sheets.	** 4	988.2 m/0.4034 km²	444.0 m/0.2012 km²	2,512 m/0.417 km².
Impact Pile Driving	Berth 11 End Wall Secant Pile Guide Wall.	60, 28-inch Z-shaped sheets.	7	1,568.6 m/0.417 km²	704.7 m/0.365 km²	2,512 m/0.417 km².
DTH Mono-hammer	Relief Holes Under West Closure Cell.	500, 4–6 inch holes	20	180.1 m/0.0481 km²	80.9 m/0.015 km²	13,594 m/0. 417 km².
DTH Mono-hammer	Mechanical Rock Removal Along Face of Existing Abutment.	46, 42-inch casing advancements.	24	3,880.3 m/0.417 km²	1,743.3 m/0.417 km²	13,594 m/0.417 km².
DTH Mono-hammer	Install Piles for Dry Dock 1 North Entrance Abutment.	28, 42-inch shafts	28	3,880.3 m/0.417 km²	1,743.3 m/0.417 km²	13,594 m/0.417 km².
DTH Mono-hammer	Relief Holes Under West Closure Cell.	2,201,** 4–6 inch holes.	** 82	180.1 m/0.0481km²	80.9 m/0.015 km²	13,594 m/0.417 km².
DTH Mono-hammer	Mechanical Rock Removal Along Face of Existing Abutment.	365, 42-inch casing advancements.	183	3,880.3 m/0.417 km²	1,743.3 m/0.417 km²	13,594 m/0.417 km².
DTH Mono-hammer	Dry Dock 1 Entrance Tremie Tie Downs.	100, 9-inch holes	52	132.9 m/0.0303 km²	59.7 m/0.009km²	13,594 m/0.417 km².

TABLE 7—CALCULATED DISTANCE AND AREAS OF LEVEL A AND LEVEL B HARASSMENT FOR IMPULSIVE NOISE—Continued

[DTH, impact pile driving, hydraulic rock hammering]

Activity	Purpose	Count and size/ duration	Total production days	Level A harassment (PTS onset) *		Level B harassment *
				High frequency cetaceans (harbor porpoise)	Phocid pinnipeds	Harbor porpoise and phocids
Impact Pile Driving	Install Sheet Piles for Dry Dock 1 North Entrance and Temporary Cofferdam.	96, 28-inch Z-shaped sheets.	12	1,568.6 m/0.417 km²	704.7 m/0.365km²	2,512 m/0.417 km².
Hydraulic Rock Hammer.	Removal of Sheetpile and Granite Quay Wall (610 cy).	2.5 hours	** 10	5,860.0 m/0.417 km²	2,633 m/0.4174km²	398 m/0.165 km².
Hydraulic Rock Hammer.	Mechanical Rock Removal (985 cy) Under West Closure Cell.	9 hours	77	13,766 m/0.417 km²	6,184.7 m/0.417 km²	398 m/0.165 km².
Hydraulic Rock Hammer.	Shutter Panel Demolition	5 hours	** 56	9,303.1 m/0.417 km²	4,179.6 m/0.417 km²	398 m/0.165 km².
Hydraulic Rock Hammer.	Mechanical Rock Removal (3,500 cy) Along Face of Existing Berth 11 at Basin Floor.	12 hours	** 100	16,676.3 m/0.417 km².	7,492.2 m/0.417 km²	398 m/0.165 km².
Hydraulic Rock Hammer.	P–310 Sheet Pile Removal—Berth 1.	12, 25-inch Z-shaped sheets, 6 hours.	** 3	10,505.4 m/0.417 km².	4,719.8 m/0.417 km²	398 m/0.1652 km².
Hydraulic Rock Hammer.	Berth 1 Top of Wall Demolition for Waler Install.	10 hours	** 6	14,767.7 m/0.417 km².	6,634.7 m/0.417 km²	398 m/0.165km².

Source: Kiewit 2021.
Notes:
* To determine underwater harassment zones, ensonified areas from the source were clipped along the shoreline using Geographical Information Systems (GIS).
** These activities will continue into the following construction years and the remaining construction days and activities will be included in a subsequent LOA. The construction days and activities represented in this table account ONLY for year 1 activities.
lf = linear feet; N/A = Not Applicable.
Proxy sources used were unattenuated SPLs.

TABLE 8—CALCULATED DISTANCE AND AREAS OF LEVEL A AND LEVEL B HARASSMENT FOR NON-IMPULSIVE NOISE

[Vibratory pile driving, rotary drilling]

Activity	Purpose	Count and size	Total production days	Level A harassment (PTS onset)		Level B harassment
				High frequency cetaceans harbor porpoise	Phocid pinnipeds	Harbor porpoise and phocids
Rotary Drill	Center Wall Foundation Pile—Install Outer Casing.	38, 102-inch Borings	38	2.1 m/0.000014 km²	1.3 m/0.000005 km²	1,848 m/0.417 km².
Rotary Drill	Center Wall Foundation Pile—Pre-Drill Socket.	38, 102-inch Borings	38	8.9 m/0.000248 km²	5.4 m/0.000091 km²	1,848 m/0.417 km².
Rotary Drill	Center Wall Foundation Pile—Remove Outer Casing.	38, 102-inch Borings	38	0.8 m/0.000002 km²	0.5 m/0.000001 km²	1,848 m/0.417 km².
Rotary Drill	Center Wall Leveling Piles—Install Outer Casing.	18, 102-inch Borings	18	2.1 m/0.000014 km²	1.3 m/0.000005 km²	1,848 m/0.417 km².
Rotary Drill	Center Wall Leveling Piles—Pre-Drill Socket.	18, 102-inch Borings	18	8.9 m/0.000248 km²	5.4 m/0.000091 km²	1,848 m/0.417 km².
Rotary Drill	Center Wall Leveling Piles—Remove Outer Casing.	18, 102-inch Borings	18	0.8 m/0.000002 km²	0.5 m/0.000001 km²	1,848 m/0.417 km².
Rotary Drill	Center Wall Access Platform Support—Install Outer Casing.	38, 102-inch Borings	38	2.1 m/0.000014 km²	1.3 m/0.000005 km²	1,848 m/0.417 km².
Rotary Drill	Center Wall Access Platform Support—Pre-Drill Socket.	38, 102-inch Borings	38	8.9 m/0.000248 km²	5.4 m/0.000091 km²	1,848 m/0.417 km².
Rotary Drill	Center Wall Access Platform Support —Remove Outer Casing.	38, 102-inch Borings	38	0.8 m/0.000002 km²	0.5 m/0.000001 km²	1,848 m/0.417 km².
Vibratory Pile Driving	Tie-In to Existing West Closure Wall.	16, ** 28-inch Z-Shaped Sheets.	** 4	12.2 m/0.000454 km².	5.0 m/0.000078 km²	13,594 m/0.417 km².
Vibratory Pile Driving	Berth 11 End Wall Secant Pile Guide Wall.	60, 28-inch Z-Shaped Sheets.	7	19.4 m/0.001041 km².	8.0 m/0.0002 km²	13,594 m/0.417 km².
Vibratory Extraction	Remove P–310 West Closure Wall.	238, 18-inch Flat Sheets.	60	6.6 m/0.000136 km²	2.7 m/0.000023 km²	7,356 m/0.417 km².
Vibratory Pile Driving	Install Sheet Piles for Dry Dock 1 North Entrance and Temporary Cofferdam.	96, 28-inch Z-Shaped Sheets.	12	19.4 m/0.001041 km².	8.0 m/0.0002 km²	13,594 m/0.417 km².

** These activities will continue into the following construction years and the remaining construction days and activities will be included in a subsequent LOA. The construction days and activities represented in this table account ONLY for year 1 activities.
lf = linear feet; N/A = Not Applicable.
Proxy sources used were unattenuated SPLs.

Concurrent Activities

Simultaneous use of pile drivers, hammers, and drills could result in increased SPLs and harassment zone sizes given the proximity of the component sites and the rules of decibel addition (see Table 9 below). Due to the relatively small size of the ROI, the use of a single DTH cluster drill or rock hammer would ensonify the entire ROI to the Level A harassment thresholds (PTS Onset) (refer to Table 7). Therefore, when this equipment is operated in conjunction with other noise generating equipment, there would be no change in the size of the harassment zone. The entire ROI would remain ensonified to the Level A harassment thresholds for the duration of the activity and there would be no Level B harassment zone. However, when DTH cluster drills or rock hammers are not in use, increased SPLs and harassment zone sizes within the ROI could result. Due to the large amount of bedrock excavation required for the construction of the multifunctional expansion of Dry Dock 1, the only scenario identified in which DTH cluster drills and/or rock hammers would not be in operation would be at the beginning of the project when two rotary drills could be used simultaneously (refer to Table 2).

According to recent, project specific, guidance provided by NMFS to the Navy, when two noise sources have overlapping sound fields, there is potential for higher sound levels than for non-overlapping sources because the isopleth of one sound source encompasses the sound source of another isopleth. In such instances, the sources are considered additive and combined using the rules of decibel addition, presented in Table 9 below.

TABLE 9—ADJUSTMENTS FOR SOUND EXPOSURE LEVEL CRITERION

Source types	Difference in sound level (at specified meters)	Adjustments to specifications for Level A harassment RMS/ SEL_{ss}* calculations
Non-impulsive, continuous/Non-impulsive, continuous OR Impulsive source (multiple strikes per second)/Impulsive source (multiple strikes per second.	0 or 1 dB	Add 3 dB to the highest sound level (at specified meters) AND adjust number of piles per day to account for overlap (space and time).
	2 or 3 dB	Add 2 dB to the highest sound level (at specified meters) AND adjust number of piles per day to account for overlap (space and time).
	4 to 9 dB	Add 1 dB to the highest sound level (at specified meters) AND adjust number of piles per day to account for overlap (space and time).
	10 dB or more	Add 0 dB to the highest sound level (at specified meters) AND adjust number of piles per day to account for overlap (space and time).

* RMS level for vibratory pile driving/rotary hammer and single strike SEL (SEL_{ss}) level for DTH/rock hammer.

For simultaneous usage of three or more continuous sound sources, the three overlapping sources with the highest sound source levels are identified. Of the three highest sound source levels, the lower two are combined using the above rules, then the combination of the lower two is combined with the highest of the three. For example, with overlapping isopleths from 24-, 36-, and 42-inch diameter steel pipe piles with sound source levels of 161, 167, and 168 dB RMS respectively, the 24- and 36-inch would be added together; given that 167 − 161 = 6 dB, then 1 dB is added to the highest of the two sound source levels (167 dB), for a combined noise level of 168 dB. Next, the newly calculated 168 dB is added to the 42-inch steel pile with sound source levels of 168 dB. Since 168 − 168 = 0 dB, 3 dB is added to the highest value, or 171 dB in total for the combination of 24-, 36-, and 42-inch steel pipe piles (NMFS, 2021 unpublished). By using this method, a revised proxy source for Level A and Level B analysis was determined for the use of two, 102-inch diameter rotary drills. The revised proxy value is presented in Table 10 and the resulting harassment zones are summarized in Table 11 (depicted in Figure 6–13 in the Navy's application).

TABLE 10—REVISED PROXY VALUES FOR SIMULTANEOUS USE OF NON-IMPULSIVE SOURCES

Equipment		Rotary drill
	RMS	154
Rotary Drill	154	157

TABLE 11—LEVEL A AND LEVEL B HARASSMENT ZONES RESULTING FROM THE SIMULTANEOUS USE OF TWO, 102-in DIAMETER ROTARY DRILL

Multiple source scenario	Level A harassment (PTS Onset)		Level B harassment
	Harbor porpoise distance to 155 dB SEL_{cum} threshold/area of harassment zone	Phocids distance to 185 dB SEL_{cum} threshold/area of harassment zone	Harbor porpoise and phocids distance to 120 dB (DTH) threshold/ area of harassment zone
2 Rotary Drills	23.6 m/0.002 km²	9.7 m/0.0002 km²	2,929 m/0.417 km².

Marine Mammal Occurrence and Take Calculation and Estimation

In this section we provide the information about the presence, density, or group dynamics of marine mammals that will inform the take calculations. Potential exposures to impact pile and vibratory pile driving, rotary drilling, DTH, and rock hammering noise for each acoustic threshold were estimated using marine mammal density estimates (N) from the Navy Marine Species Density Database (NMSDD) (Navy 2017) or from monitoring reports from the Berth 11 Waterfront Improvements and P–310 construction projects. Specifically, where monitoring data specific to the project area were available, they were used, and the NMSDD data were used when there were no monitoring data available. The take estimate was determined using the following equation take estimate = N * days of activity * area of harassment. The pile type, size, and installation method that produce the largest zone of influence (ZOI) were used to estimate exposure of marine mammals to noise impacts. We describe how the information provided above is brought together to produce a quantitative take estimate in the species sections below.

Harbor Porpoise

Harbor porpoises may be present in the proposed project area during spring, summer, and fall, from April to December. Based on density data from the Navy Marine Species Density Database, their presence is highest in spring, decreases in summer, and slightly increases in fall. During previous monitoring of construction projects in the area, three harbor porpoise were sighted between April and December of 2017; two harbor porpoise were sighted in early August of 2018; and one harbor porpoise was sighted in 2020 (Cianbro 2018a, b; Navy 2019; NAVFAC 2021). Using the 2017 and 2018 data from construction monitoring for the Berth 11 Waterfront Improvements project, the density of harbor porpoise for the largest harassment zone was determined to be 0.04/km^2.

Estimated take was calculated by density * harassment zone * days for each activity (see Table 12). Note that where the Level A harassment zone is as large as the Level B harassment zone and fills the entire ensonified area, the enumerated takes in the Level A harassment column may be in the form of Level A harassment and/or Level B harassment.

TABLE 12—CALCULATED PROPOSED TAKE BY LEVEL A AND LEVEL B HARASSMENT OF HARBOR PORPOISE BY PROJECT ACTIVITY

Project activity	Density	Level A harassment zone (km^2)	Number of days	Take by Level A harassment	Level B harassment zone (km^2)	Take by Level B harassment
Center Wall—Install Foundation: 38 drilled shafts: Cluster drill DTH (Drill) 78-inch diameter casing	0.04	0.417	247	4	0.417	0
Center Wall—Install Diving Board Shafts: 18 drilled shafts: Cluster drill DTH (Drill) 78-inch diameter socket	0.04	0.417	117	2	0.417	0
Center Wall—Access Platform Support: 38 drilled shafts: Cluster Drill DTH (Drill) 78-inch outer casing	0.04	0.417	133	2	0.417	0
Mechanical Rock Excavation, Hydraulic rock hammering (985 cy)	0.04	0.417	77	1	0.165	0
Remove Shutter Panels: 112 panels, Demolish shutter panels, Hydraulic rock hammering	0.04	0.417	56	1	0.165	0
Mechanical Rock Removal at Basin Floor: Excavate Bedrock, Hydraulic rock hammering	0.04	0.417	100	2	0.165	0
Mechanical Rock at Abutment: Drill 365 rock borings (1,220 cy), 42-inch diameter casing, Mono-hammer DTH	0.04	0.417	183	3	0.417	0
Center Wall—Install Foundation: 38 drilled shafts: Rotary Drill (Install) 102-inch diameter outer casing	0.04	0.00001	38	0	0.417	1
Center Wall—Install Foundation: 38 drilled shafts: Rotary Drill (Pre-drill) 102-inch diameter socket,	0.04	0.00001	38	0	0.417	1
Center Wall—Install Foundation: 38 drilled shafts: Rotary Drill (Remove) 102-inch outer casing	0.04	0.00001	38	0	0.417	1
Center Wall—Access Platform Support: 38 drilled shafts: Rotary Drill (Install) 102-inch diameter outer casing	0.04	0.00001	38	0	0.417	1
Center Wall—Access Platform Support: 38 drilled shafts: Rotary Drill (Pre-drill) 102-inch diameter socket	0.04	0.00001	38	0	0.417	1
Center Wall—Access Platform Support: 38 drilled shafts: Rotary Drill (Remove) 102-inch outer casing,	0.04	0.0000002	38	0	0.417	1
Remove Wall: 238 sheet piles, 18-inch wide flatwebbed, Vibratory Extraction	0.04	0.000136	60	0	0.417	1
Mechanical Rock Removal at Basin Floor: Drill 2,201 relief holes, 4–6 holes, Mono-hammer DTH,	0.04	0.048109	82	0	0.417	1
Drill Tremie Ties Downs: Drill 100 rock anchors, 9-inch holes, Mono-hammer DTH	0.04	0.0303	52	0	0.417	1
Total Estimated Take	....	....	....	15	....	9

In summary, we estimate that up to 15 takes in the form of Level A harassment and/or Level B harassment could occur during DTH excavation (DTH mono-hammer and cluster drill), impact pile driving, and rock hammering activities. In addition, DTH mono-hammer excavation could result in 2 takes by Level B harassment and vibratory installing/extracting and rotary drilling activities could result in 7 takes by Level B harassment (Table 12).

Harbor Seal

Harbor seals may be present year-round in the project vicinity, with constant densities throughout the year. Harbor seals are the most common pinniped in the Piscataqua River near the Shipyard. Harbor seal sightings were recorded during monthly surveys conducted in 2017 and 2018 (NAVFAC Mid-Atlantic 2018, 2019b) as well as during Berth 11 and P–310 construction monitoring in 2017, 2018, 2020 and 2021 (Cianbro 2018a, b; Navy 2019; Stantec 2020, Stantec 2021). Estimated take by Level B harassment has been calculated by multiplying the average number of harbor seals sighted per day from May 2020 through October 2021 by the number of actual in-water construction days (375 days (159 during P–310 year 1 and 216 during P–310 year 2). Over the course of this time period, there have been 1,023 harbor seal observations equating to equating to 3 harbor seal sightings per day. Initially, takes were calculated for Level A and Level B harassment for harbor seals where the density of animals (2.48 harbor seals/km^2, rounded to 3) was multiplied by the harassment zone and the number of days per construction activity. However, using that method produced take numbers for Level B harassment that were lower than the number of harbor seals that has been previously observed in the Navy's monitoring reports. Therefore, NMFS is proposing (and the Navy agrees), to increase the take by Level B harassment to more accurately reflect harbor seal observations in the monitoring reports, by using the value of three harbor seals a day multiplied by the total number of construction days resulting in 1,125 takes by Level B harassment proposed for authorization. Take by Level A harassment of 1,269 harbor seals is shown in Table 13 below. Note that where the Level A harassment zone is as large as the Level B harassment zone and fills the entire ensonified area, the enumerated takes in the Level A harassment column may be in the form of Level A harassment and/or Level B harassment. The proposed takes by Level B harassment were not included in Table 13 as they were calculated by a different method.

TABLE 13—CALCULATED PROPOSED TAKE BY LEVEL A HARASSMENT OF HARBOR SEAL BY PROJECT ACTIVITY

Project activity	Harbor seals density	Level A harassment zone (km^2)	Number of days	Take by Level A harassment
Center Wall—Install Foundation: 38 drilled shafts: Cluster drill DTH (Drill) 78-inch diameter casing	3	0.417	247	309
Center Wall—Install Diving Board Shafts: 18 drilled shafts: Cluster drill DTH (Drill) 78-inch diameter socket	3	0.417	117	146
Center Wall—Access Platform Support: 38 drilled shafts: Cluster Drill DTH (Drill) 78-inch outer casing	3	0.417	133	166
Center Wall—Temp Launching Piles: 6 drilled shafts: 42-inch diameter shaft, Mono-hammer DTH	3	0.417	6	8
Center Wall Tie Downs: 36 Rock Anchors (Install): 9-inch diameter holes, Mono-hammer DTH	3	0.023	18	1
Center Wall—Access Platform Tie Downs: 18 Rock Anchors (Install): 9-inch diameter holes, Mono-hammer DTH	3	0.023	9	1
Center Wall-Install Tie-In to Existing West Closure Wall: 16 sheet piles: 28-inch wide Z-shaped sheets—IMPACT Install	3	0.201	4	2
Berth 11 End Wall—Install Secant Pile Guide Wall: 60 sheets piles: 28-inch wide Z-shaped sheets—IMPACT Install	3	0.417	7	8
Berth 1—Remove Granite Block Quay Wall: 610 cy, Granite block demo, Hydraulic Rock hammering	3	0.417	10	13
P310 West Closure Wall—Mechanical Rock Excavation: 985 cy, Excavated bedrock, Hydraulic rock hammering	3	0.417	77	96
P310 West Closure Wall—Mechanical Rock Excavation: Drill 500 relief holes, 4–6 inch holes, Mono-hammer DTH	3	0.015	20	1
P310 West Closure Wall—Mechanical Rock Excavation: Drill 46 rock borings (50 cy), 42-inch diameter casing, Mono-hammer DTH	3	0.417	24	30
West Closure well—Berth 11 Abutment- Install Piles: Drill 28 shafts, 42-inch diameter casing, Mono-hammer DTH	3	0.417	28	35
Berth 11—Remove Shutter Panels: 112 panels, Demolish shutter panels, Hydraulic rock hammering	3	0.417	56	70
Berth 11 Face—Mechanical Rock Removal at Basin Floor: 3,500 cy, Excavate Bedrock, Hydraulic rock hammering	3	0.417	100	125
Berth 11 Face—Mechanical Rock Removal at Basin Floor: Drill 2,201 relief holes, 4–6 holes, Mono-hammer DTH	3	0.015	82	4
Berth 11 Face—Mechanical Rock at Abutment: Drill 365 rock borings (1,220 cy), 42-inch diameter casing, Mono-hammer DTH	3	0.417	183	229
Dry Dock 1 North Entrances—Install Temporary Cofferdam: Install 96 sheet piles, 28-inch wide Z-shaped sheets, IMPACT Install	3	0.365	12	13
Berth 1—Remove sheet piles: Remove 12 sheet piles, 25-inch wide Z-shaped sheets, Hydraulic rock hammering	3	0.417	3	4
Berth 1 Top of Wall—Demolition for Waler Installation: 30 lf, Mechanical concrete demolition, Hydraulic rock hammering	3	0.417	6	8
Total Estimated Take				1,269

Gray Seal

Gray seals may be present year-round in the project vicinity, with constant densities throughout the year. Gray seals are less common in the Piscataqua River than the harbor seal. Sightings of gray seals were recorded during P–310 construction monitoring in 2020 and 2021 (Stantec 2020; Stantec 2021). Estimated take by Level B harassment has been calculated by multiplying the average number of gray seal observations per day from May 2020 through October 2021 (47 during year 1 P–310 monitoring and 9 during year 2 P–310 monitoring (to date)) over the course of 337 monitoring days (Stantec 2020; 2021). Over the course of this time period, there have been 56 gray seal observations equating to equating to 0.2 gray seal sightings per day. Initially, takes were calculated for Level A and Level B harassment for gray seals where the density was multiplied by the harassment zone and the number of days per construction activity. However, using that method produced take numbers for Level B harassment that were fewer than the number of gray seals that has been previously observed in the Navy's monitoring reports. Therefore, NMFS is proposing (and the Navy agrees), to increase the take by Level B harassment to more accurately reflect gray seal observations in the monitoring reports, by using the value of 0.2 gray seals multiplied by the total number of construction days resulting in 75 takes by Level B harassment proposed for authorization. Initially takes were calculated for Level A and Level B harassment for gray seals in a similar manner where takes were determined by individual activity. However, NMFS is proposing (and Navy agrees) to increase the take by Level B harassment by using the value of 0.2 gray seals which were then multiplied by the number of total construction days resulting in 75 takes by Level B harassment proposed for authorization.

Take by Level A harassment of 85 gray seals is shown in Table 14 below. Note that where the Level A harassment zone is as large as the Level B harassment zone and fills the entire ensonified area, the enumerated takes in the Level A harassment column may be in the form of Level A harassment and/or Level B harassment. The proposed takes by Level B harassment were not included in Table 14 as they were calculated by a different method.

TABLE 14—CALCULATED PROPOSED TAKE BY LEVEL A HARASSMENT OF GRAY SEAL BY PROJECT ACTIVITY

Project activity	Gray seal density	Level A harassment zone (km^2)	Number of days	Take by Level A harassment
Center Wall—Install Foundation: 38 drilled shafts: Cluster drill DTH (Drill) 78-inch diameter casing	0.2	0.417	247	21
Center Wall—Install Diving Board Shafts: 18 drilled shafts: Cluster drill DTH (Drill) 78-inch diameter socket	0.2	0.417	117	10
Center Wall—Access Platform Support: 38 drilled shafts: Cluster Drill DTH (Drill) 78-inch outer casing	0.2	0.417	133	11
Center Wall—Temp Launching Piles: 6 drilled shafts: 42-inch diameter shaft, Mono-hammer DTH	0.2	0.417	6	1
Berth 11 End Wall—Install Secant Pile Guide Wall: 60 sheets piles: 28-inch wide Z-shaped sheets—IMPACT Install	0.2	0.417	7	1
Berth 1—Remove Granite Block Quay Wall: 610 cy, Granite block demo, Hydraulic Rock hammering	0.2	0.417	10	1
P310 West Closure Wall—Mechanical Rock Excavation: 985 cy, Excavated bedrock, Hydraulic rock hammering	0.2	0.417	77	6
P310 West Closure Wall—Mechanical Rock Excavation: Drill 19 rock borings (50 cy), 42-inch diameter casing, Mono-hammer DTH	0.2	0.417	24	2
West Closure well—Berth 11 Abutment- Install Piles: Drill 28 shafts, 42-inch diameter casing, Mono-hammer DTH	0.2	0.417	28	2
Berth 11—Remove Shutter Panels: 112 panels, Demolish shutter panels, Hydraulic rock hammering	0.2	0.417	56	5
Berth 11 Face—Mechanical Rock Removal at Basin Floor: 1,020 cy, Excavate Bedrock, Hydraulic rock hammering	0.2	0.417	3	8
Berth 11 Face—Mechanical Rock at Abutment: Drill 192 rock borings (610 cy), 42-inch diameter casing, Mono-hammer DTH	0.2	0.417	24	15
Dry Dock 1 North Entrances—Install Temporary Cofferdam: Install 96 sheet piles, 28-inch wide Z-shaped sheets, IMPACT Install	0.2	0.365	12	1
Berth 1 Top of Wall—Demolition for Waler Installation: 30 lf, Mechanical concrete demolition, Hydraulic rock hammering	0.2	0.417	6	1
Total Estimated Take				85

Hooded Seal

Hooded seals may be present in the project vicinity from January through May, though their exact seasonal densities are unknown. In general, hooded seals are much rarer than the harbor seal and gray seal in the Piscataqua River. One take per month from January to May from Level B harassment of a hooded seal for the Berth 11 Waterfront Improvements Construction project (NMFS 2018b) and for Year 1 construction activities for Dry Dock 1 (NMFS, 2019) was previously authorized. To date, the monitoring for that project and for the density surveys have not recorded a sighting of hooded seal in the project area (Cianbro 2018a, b; NAVFAC Mid-Atlantic 2018, 2019b; Navy 2019; Stantec 2020; Stantec 2021). In order to guard against unauthorized take, the Navy is requesting and NMFS is proposing one take by Level B harassment of hooded seal per month (between the months of January and May) resulting in five total takes of Level B harassment. No take by Level A harassment is anticipated or proposed for authorization.

Harp Seal

Harp seals may be present in the project vicinity January through May. In general, harp seals are much rarer than the harbor seal and gray seal in the Piscataqua River. As discussed above for hooded seals, one take by Level B harassment during each month of construction for the Berth 11 Waterfront Improvements Project (NMFS 2018b) and for year 1 construction activities for Dry Dock 1 (NMFS, 2019) was previously authorized. The monitoring for the Berth 11 Waterfront Improvements Construction and P–310 projects did not record any sightings of harp seal in the project area (Cianbro 2018a, b; NAVFAC Mid-Atlantic 2018, 2019b; Navy 2019; Stantec 2020; Stantec 2021). However, it should be noted that two harp seals (one on 5/12/2020 and one on 5/14/2020) were observed when pile driving activities were not occurring (Stantec 2020). In order to guard against unauthorized take, the Navy is requesting and NMFS is proposing one take by Level B harassment of harp seal per month (between the months of January and May) resulting in five total takes of Level B harassment. No take by Level A harassment is anticipated or proposed for authorization.

Table 15 below summarizes the authorized take for all the species described above as a percentage of stock abundance.

TABLE 15—PROPOSED TAKE ESTIMATES AS A PERCENTAGE OF STOCK ABUNDANCE

Species	Stock (N_{EST})	Proposed Level A harassment	Proposed Level B harassment	Percent of stock
Harbor porpoise	Gulf of Maine/Bay of Fundy (95,543)	15	9	Less than 1 percent.
Harbor seal	Western North Atlantic (61,336)	1,269	1,125	Less than 3 percent.
Gray seal	Western North Atlantic (451,600)	85	75	Less than 1 percent.
Hooded seal	Western North Atlantic (593,500)	0	5	Less than 1 percent.
Harp seal	Western North Atlantic (7.6 million)	0	5	Less than 1 percent.

Proposed Mitigation

Under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, areas of similar significance, and on the availability of the 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 the 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, 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.

Based on our evaluation of the applicant's proposed measures, as well as other measures considered by NMFS, 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.

General

The Navy shall follow mitigation procedures as described below. In general, if poor environmental conditions restrict full visibility of the shutdown zone, pile driving activities would be delayed.

Training

The Navy shall ensure that construction supervisors and crews, the monitoring team, and relevant Navy staff are trained and prior to the start of construction activity, so that responsibilities, communication procedures, monitoring protocols, and operational procedures are clearly understood. New personnel joining during the project shall be trained prior to commencing work.

Avoiding Direct Physical Interaction

The Navy shall avoid direct physical interaction with marine mammals during construction activity. If a marine mammal comes within 10 m of such activity, operations shall cease and vessels will reduce speed to the minimum level required to maintain steerage and safe working conditions, as necessary to avoid direct physical interaction.

Shutdown Zones

The Navy will establish shutdown zones for all pile driving activities. The purpose of a shutdown zone is generally to define an area within which shutdown of the activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). Shutdown zones will vary based on the activity type and marine mammal hearing group (Table 16).

TABLE 16—PILE DRIVING SHUTDOWN ZONE AND MONITORING ZONES DURING PROJECT ACTIVITIES

P–381 Year 1 activity description	Shutdown zone (m)		Level B harassment [1] monitoring zone (m)
	Harbor porpoise	Phocids	
78-inch cluster drill	[2] 200	[2] 50	ROI.
DTH monohammer—42-inch	[2] 200	[2] 50	ROI.
DTH monohammer—9-inch Center wall tie downs	[2] 200	[2] 50	ROI.
DTH monohammer—9-inch tremie tie-downs	[2] 200	[2] 50	ROI.
DTH monohammer—4–6-inch (500)	[2] 200	[2] 50	ROI.
Impact install of sheet piles (16) West Closure Wall Tie-in	[2] 200	[2] 50	ROI.
Impact install of sheet piles (60) Secant pile guide wall; (96) temporary coffer dam	[2] 200	[2] 50	ROI.

TABLE 16—PILE DRIVING SHUTDOWN ZONE AND MONITORING ZONES DURING PROJECT ACTIVITIES—Continued

P–381 Year 1 activity description	Shutdown zone (m)		Level B harassment [1] monitoring zone (m)
	Harbor porpoise	Phocids	
Rock hammering—all durations	[2] 200	[2] 50	ROI.
Rotary drilling—Install 102-inch casing	10	10	ROI.
Rotary drilling—Predrill 102-inch socket	10	10	ROI.
Rotary drilling—Remove 102-inch casing	10	10	ROI.
Vibratory pile driving (16) 28-inch sheets	20	10	ROI.
Vibratory pile driving (60) and (96) 28-inch sheets	20	10	ROI.
Vibratory extraction (238) 28-inch sheets	10	10	ROI.

Notes:
[1] In instances where the harassment zone is larger than the ROI, the entire ROI is indicated as the limit of monitoring.
[2] Reduced Monitoring area distance negotiated with NMFS.
Key: ROI—region of influence.

Soft Start

The Navy shall use soft start techniques when impact pile driving. Soft start requires contractors to provide an initial set of three strikes from the hammer at reduced energy, followed by a 30-second waiting period. Then two subsequent reduced-energy strike sets would occur. A soft start will 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 pile driving activities.

Bubble Curtain

A bubble curtain shall be installed across any openings at the entrance of super flood basin to attenuate sound for the sound sources that encompass the entire ROI. The Navy will record hydroacoustic measurements inside and outside of the bubble curtain. Should the results of the recordings inside the bubble curtain show that thresholds are not being exceeded by the activity occurring, that upon review of the data by NMFS, Navy may discontinue use of the bubble curtain for those activities that are not actually exceeding thresholds.

Based on our evaluation of the applicant's planned measures, NMFS has preliminarily determined that the mitigation measures provide the 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.

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

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

▪ Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.,* presence, abundance, distribution, density);

▪ Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) Action or environment (*e.g.,* source characterization, propagation, ambient noise); (2) affected species (*e.g.,* life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.,* age, calving or feeding areas);

▪ Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;

▪ How anticipated responses to stressors impact either: (1) Long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;

▪ Effects on marine mammal habitat (*e.g.,* marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and

▪ Mitigation and monitoring effectiveness.

The Navy shall submit a Marine Mammal Monitoring Plan to NMFS for approval in advance of the start of construction.

Monitoring Zones

The Navy shall conduct monitoring to include the area within the Level B harassment zones (areas where SPLs are equal to or exceed the 160 dB RMS threshold for impact driving and the 120 dB RMS threshold during vibratory pile driving) (see Table 16 above). These monitoring zones provide utility for monitoring conducted for mitigation purposes (*i.e.,* shutdown zone monitoring) by establishing monitoring protocols for areas adjacent to the shutdown zones. Monitoring of the disturbance zones enables observers to be aware of and communicate the presence of marine mammals in the project area, but outside the shutdown zone, and thus prepare for potential shutdowns of activity.

Visual Monitoring

Monitoring shall take place from 30 minutes (min) prior to initiation of pile driving activity (*i.e.,* pre-start clearance monitoring) through 30 min post-completion of pile driving activity. If a marine mammal is observed entering or within the shutdown zones, pile driving shall be delayed or halted. If pile driving is delayed or halted due to the presence of a marine mammal, the activity may not commence or resume until either the animal has voluntarily exited and been visually confirmed beyond the shutdown zone or 15 min have passed without re-detection of the animal. Pile driving activity shall be halted upon observation of either a species for which incidental take is not authorized or a species for which incidental take has been authorized but the authorized number of takes has been met, entering or within the disturbance zone.

Protected Species Observer (PSO) Monitoring Requirements and Locations

PSOs shall be responsible for monitoring, the shutdown zones, the disturbance zones and the pre-clearance zones, as well as effectively documenting Level A and B harassment take. As described in more detail in the Reporting section below, they shall also (1) document the frequency at which marine mammals are present in the project area, (2) document behavior and group composition, (3) record all construction activities, and (4) document observed reactions (changes in behavior or movement) of marine mammals during each sighting. The PSOs shall monitor for marine mammals during all in-water pile activities associated with the project. The Navy shall monitor the project area to the extent possible based on the required number of PSOs, required monitoring locations, and environmental conditions. Visual monitoring shall be conducted by three PSOs. It is assumed that three PSOs shall be located on boats, docks, or piers sufficient to monitor the respective ROIs given the abundance of suitable vantage points (see Figure 11–1 of the application). The PSOs must record all observations of marine mammals, regardless of distance from the pile being driven.

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

Monitoring of pile driving shall be conducted by qualified, PSOs. The Navy shall adhere to the following conditions when selecting PSOs:

- PSOs must be independent (*i.e.,* not construction personnel) and have no other assigned tasks during monitoring periods;
- At least one PSO must have prior experience performing the duties of a PSO during construction activities pursuant to a NMFS-issued incidental take authorization;
- Other PSOs may substitute other relevant experience, education (degree in biological science or related field), or training;
- Where a team of three PSOs are required, a lead observer or monitoring coordinator shall be designated. The lead observer must have prior experience performing the duties of a PSO during construction activity pursuant to a NMFS-issued incidental take authorization; and
- PSOs must be approved by NMFS prior to beginning any activity subject to this rule.

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

- Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface with ability to estimate target size and distance; use of binoculars may be necessary to correctly identify the target;
- Experience and ability to conduct field observations and collect data according to assigned protocols;
- Experience or training in the field identification of marine mammals, including the identification of behaviors;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;
- Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior; 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.

Hydroacoustic Monitoring

The Navy shall conduct a sound source verification (SSV) study for all pile types and will follow accepted methodological standards to achieve their objectives. The Navy shall submit an acoustic monitoring plan to NMFS for approval prior to the start of construction. The Navy will collect and evaluate acoustic sound record levels for 10 percent of the new rotary drilling, DTH excavation (DTH mono-hammer and cluster drill), and rock hammering activities conducted as part of P–381 (Table 15). Hydrophones would be placed at locations 10 m (33 ft) from the noise source and, where the potential for Level A harassment exists, at a second representative monitoring location at an intermediate distance between the cetacean and phocid shutdown zones. For the 10 percent of rotary drilling, DTH excavation (DTH mono-hammer and cluster drill), and rock hammering events acoustically measured, 100 percent of the data will be analyzed.

At a minimum, the methodology includes:

- For underwater recordings, a stationary hydrophone system with the ability to measure SPLs will be placed in accordance with NMFS most recent guidance for the collection of source levels.
- Hydroacoustic monitoring will be conducted for 10 percent of each different type of activity not previously monitored as part of P–310 (Table 15). Monitoring will occur from the same locations approved by NMFS for P–310 construction activities. The resulting data set will be analyzed to examine and confirm sound pressure levels and rates of transmission loss for each separate in-water construction activity. With NMFS concurrence, these metrics will be used to recalculate the limits of shutdown and Level B (Behavioral) harassment zones, and to make corresponding adjustments in marine mammal monitoring of these zones for use in the forthcoming rulemaking/LOA application. Hydrophones will be placed in the same manner as for P–310 construction activities. Locations of hydroacoustic recordings will be collected via GPS. A depth sounder and/or weighted tape measure will be used to determine the depth of the water. The hydrophone will be attached to a-weighted nylon cord to maintain a constant depth and distance from the pile/drill/hammer location. The nylon cord or chain will be attached to a float or tied to a static line.
- Each hydrophone (underwater) will be calibrated at the start of each action and will be checked frequently to the applicable standards of the hydrophone manufacturer.
- For each monitored location, a single hydrophone will be suspended midway in the water column in order to evaluate site-specific attenuation and propagation characteristics that may be present throughout the water column.
- Environmental data will be collected, including but not limited to, the following: Wind speed and direction, air temperature, humidity, surface water temperature, water depth, wave height, weather conditions, and other factors that could contribute to influencing the airborne and underwater sound levels (*e.g.,* aircraft, boats, etc.).
- The chief inspector will supply the acoustics specialist with the substrate composition, hammer/drill model and size, hammer/drill energy settings, depth of drilling, and boring rates and any changes to those settings during the monitoring.
- For acoustically monitored construction activities, data from the continuous monitoring locations will be post-processed to obtain the following sound measures:

○ Maximum peak pressure level recorded for all activities, expressed in dB re 1 μPa. This maximum value will originate from the phase of drilling/hammering during which drill/hammer energy was also at maximum (referred to as Level 4).

○ From all activities occurring during the Level 4 phase these additional measures will be made, as appropriate:

- Mean, median, minimum, and maximum RMS pressure level in (dB re 1 μPa)
- mean duration of a pile strike (based on the 90 percent energy criterion)
- number of hammer strikes
- mean, median, minimum, and maximum single strike SEL (dB re μPa^2 sec)

○ Cumulative SEL as defined by the mean single strike SEL + 10*log (number of hammer strikes) (dB re μPa^2 sec).

○ Median integration time used to calculate SPL RMS.

○ A frequency spectrum (pressure spectral density) (dB re μPa^2 per Hz) based on the average of up to eight successive strikes with similar sound. Spectral resolution will be 1 Hz, and the spectrum will cover nominal range from 7 Hz to 20 kHz.

○ Finally, the cumulative SEL will be computed from all the strikes associated with each pile occurring during all phases, *i.e.,* soft start, Level 1 to Level 4. This measure is defined as the sum of all single strike SEL values. The sum is taken of the antilog, with $\log_{10}$ taken of result to express (dB re μPa^2 sec).

TABLE 17—HYDROACOUSTIC MONITORING SUMMARY

Size	Count	Activity	Number monitored
102-inch	94	Rotary Drill	9
78-inch	94	DTH Cluster Drill	9
42-inch	445	DTH Mono-hammer	10
9-inch	154	DTH Mono-hammer	10
4 to 6-inch	2,701	DTH Mono-hammer	10
NA	252 days	Rock Hammering	10

Marine Mammal Monitoring Reporting

The Navy shall submit a draft report to NMFS within 90 calendar days of the completion of monitoring or 60 calendar days prior to the requested issuance of any subsequent IHA for construction activity at the same location, whichever comes first. The report will detail the monitoring protocol and summarize the data recorded during monitoring. The final report must be prepared and submitted within 30 days following resolution of any NMFS comments on the draft report. If no comments are received from NMFS within 30 days of receipt of the draft report, the report shall be considered final. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments. All draft and final marine mammal monitoring reports must be submitted to *PR.ITP.MonitoringReports@noaa.gov* and *ITP.Egger@noaa.gov.* The report must contain the following informational elements, at minimum, (and be included in the Marine Mammal Monitoring Plan), including:

- Dates and times (begin and end) of all marine mammal monitoring;
- Construction activities occurring during each daily observation period, including:

○ How many and what type of piles were driven and by what method (*e.g.,* impact or vibratory); and

○ Total duration of driving time for each pile (vibratory driving) and number of strikes for each pile (impact driving);

- PSO locations during marine mammal monitoring;
- Environmental conditions during monitoring periods (at beginning and end of PSO shift and whenever conditions change significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance;
- Upon observation of a marine mammal, the following information:

○ PSO who sighted the animal and PSO location and activity at time of sighting;

○ Time of sighting;

○ Identification of the animal (*e.g.,* genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species;

○ Distance and bearing of each marine mammal observed to the pile being driven for each sighting (if pile driving was occurring at time of sighting);

○ Estimated number of animals (minimum/maximum/best);

○ Estimated number of animals by cohort (adults, juveniles, neonates, group composition, etc.;

○ Animal's closest point of approach and estimated time spent within the harassment zone; and

○ Description of any marine mammal behavioral observations (*e.g.,* observed behaviors such as feeding or traveling), including an assessment of behavioral responses to the activity (*e.g.,* no response or changes in behavioral state such as ceasing feeding, changing direction, flushing, or breaching);

- Detailed information about implementation of any mitigation (*e.g.,* shutdowns and delays), a description of specific actions that ensued, and resulting changes in behavior of the animal, if any; and
- All PSO datasheets and/or raw sightings data.

Reporting of Hydroacoustic Monitoring

The Navy shall also submit a draft hydroacoustic monitoring report to NMFS within 60 workdays of the completion of required monitoring at the end of the project. The report will detail the hydroacoustic monitoring protocol and summarize the data recorded during monitoring. The final report must be prepared and submitted within 30 days following resolution of any NMFS comments on the draft report. If no comments are received from NMFS within 30 days of receipt of the draft report, the report shall be considered final. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments. All draft and final hydroacoustic monitoring reports must be submitted to *PR.ITP.MonitoringReports@noaa.gov* and *ITP.Egger@noaa.gov.* The hydroacoustic monitoring report will contain the informational elements described in the Hydroacoustic Monitoring Plan and, at minimum, will include:

- Hydrophone equipment and methods: Recording device, sampling rate, distance (m) from the pile where recordings were made; depth of water and recording device(s);

- Type and size of pile being driven, substrate type, method of driving during recordings (*e.g.,* hammer model and energy), and total pile driving duration;
- Whether a sound attenuation device is used and, if so, a detailed description of the device used and the duration of its use per pile;
- For impact pile driving and/or DTH excavation (DTH mono-hammer and cluster drill) (per pile): Number of strikes and strike rate; depth of substrate to penetrate; pulse duration and mean, median, and maximum sound levels (dB re: 1 μPa): Root mean square sound pressure level (SPLrms); cumulative sound exposure level (SELcum), peak sound pressure level (SPLpeak), and single-strike sound exposure level (SELs-s);
- For vibratory driving/removal and/or DTH excavation (DTH mono-hammer and cluster drill) (per pile): Duration of driving per pile; mean, median, and maximum sound levels (dB re: 1 μPa): Root mean square sound pressure level (SPLrms), cumulative sound exposure level (SELcum) (and timeframe over which the sound is averaged); and
- One-third octave band spectrum and power spectral density plot.
- General Daily Site Conditions.
  - Date and time of activities.
  - Water conditions (*e.g.,* sea state, tidal state).
  - Weather conditions (*e.g.,* percent cover, visibility).

Reporting of Injured or Dead Marine Mammals

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, the Navy shall report the incident to NMFS Office of Protected Resources (OPR) (*PR.ITP.MonitoringReports@noaa.gov*), NMFS (301–427–8401) and to the Greater Atlantic Region New England/Mid-Atlantic Stranding Coordinator (866–755–6622) as soon as feasible. If the death or injury was clearly caused by the specified activity, the Navy must immediately cease the specified activities until NMFS OPR is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of this rule. The Navy shal not resume their activities until notified by NMFS. The report must include the following information:

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

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' 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).

To avoid repetition, this introductory discussion of our analyses applies to all of the species listed in Table 3, given that many of the anticipated effects of this project on different marine mammal stocks are expected to be relatively similar in nature. Where there are meaningful differences between species or stocks in anticipated individual responses to activities, impacts of expected take on the population due to differences in population status, or impacts on habitat, they are described independently in the analysis below.

Construction activities associated with the project, as outlined previously, have the potential to disturb or displace marine mammals. Specifically, the specified activities may result in take, in the form of Level A and Level B harassment from underwater sounds generated by pile driving activities, rotary drilling, rock hammering, and DTH. Potential takes could occur if marine mammals are present in zones ensonified above the thresholds for Level A and Level B harassment, identified above, while activities are underway.

No serious injury or mortality would be expected even in the absence of the proposed mitigation measures. A bubble curtain shall be installed across any openings at the entrance of super flood basin to attenuate sound for the sound sources that encompass the entire ROI (Figure 2). During all impact driving, implementation of soft start procedures and monitoring of established shutdown zones will be required, significantly reducing the possibility of injury. Given sufficient notice through use of soft start (for impact driving), marine mammals are expected to move away from an irritating sound source prior to it becoming potentially injurious. In addition, PSOs will be stationed within the action area whenever pile driving, rotary drilling, rock hammering and DTH activities are underway. The Navy shall employ the use of three PSOs to ensure all monitoring and shutdown zones are properly observed. For hooded and harp seals which are a rare species in within the project area, we do not anticipate any take by Level A harassment.

The Navy's proposed activities and associated impacts will occur within a limited area. Most of the work will occur behind the existing super flood basin walls that would act as a barrier to sound and would contain underwater noise to within a small portion of the Piscataqua River. Exposures to elevated sound levels produced during pile driving activities may cause behavioral disturbance of some individuals, but they are expected to be mild and temporary and further minimized by the use of a bubble curtain and soft starts. As described previously, the mitigation and monitoring measures are expected to further reduce the likelihood of injury as well as reduce behavioral disturbances.

Effects on individuals that are taken by Level B harassment, as enumerated in the Estimated Take section, 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). Most likely, individual animals will simply move away from the sound source and be temporarily displaced from the area, although even this reaction has been observed primarily only in association with impact pile driving. The activities analyzed here are similar to 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. These reactions and behavioral changes are expected to subside quickly when the exposures cease. Level B harassment will be minimized through use of mitigation measures described herein. including the soft starts and the use of the bubble curtain, which was not quantitatively factored into the take estimates.

Regarding Level A harassment particularly for harbor seals and gray seals, monitoring and shutdown protocols, and a bubble curtain implemented during DTH excavation (DTH mono-hammer and cluster drill) and hydraulic rock hammering would minimize potential for take by Level A harassment. For pinnipeds, the calculated Level A harassment likely overestimates PTS exposure because: (1) Seals are unlikely to remain in the Level A harassment zone underwater long enough to accumulate sufficient exposure to noise resulting in PTS, and (2) the estimate assumes that new seals are in the Level A harassment zone every day during pile driving. Further as discussed above, take by Level A harassment would be minimized due to implementation of monitoring, shutdown procedures and a bubble curtain. Nonetheless, we have considered the potential impacts of these PTS takes occurring in this analysis. The degree of PTS that may incur from the Navy's activities are not expected to impact marine mammals such that their reproduction or survival could be affected. Similarly, data do not suggest that a single instance in which an animal accrues PTS (or TTS) and is subject to behavioral disturbance would result in impacts to reproduction or survival. If PTS were to occur, it would be at a lower level likely to accrue to a relatively small portion of the population by being a stationary activity in one particular location.

The project is also not expected to have significant adverse effects on any marine mammal habitat. The project activities will not modify existing marine mammal habitat since the project will occur within the same footprint as existing marine infrastructure. Impacts to the immediate substrate are anticipated, but these would be limited to minor, temporary suspension of sediments, which could impact water quality and visibility for a short amount of time but which would not be expected to have any effects on individual marine mammals. The nearshore and intertidal habitat where the project will occur is an area of consistent vessel traffic from Navy and non-Navy vessels, and some local individuals would likely be somewhat habituated to the level of activity in the area, further reducing the likelihood of more severe impacts. The closest pinniped haulout used by harbor and gray seals is 2,414 m (1.5 mi) away on the opposite side of the island and not within the ensonified area. There are no other biologically important areas for marine mammals near the project area.

In addition, impacts to marine mammal prey species are expected to be minor and temporary. Overall, the area impacted by the project is very small compared to the available surrounding habitat. The most likely impact to prey will be temporary behavioral avoidance of the immediate area. During construction activities, it is expected that some fish and marine mammals would temporarily leave the area of disturbance, thus impacting marine mammals' foraging opportunities in a limited portion of the foraging range. But, 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 proposed for authorization;
- No Level A harassment is anticipated or proposed for authorization for hooded seals and harp seals;
- Level A harassment proposed for authorization for harbor and gray seals will be minimized with a bubble curtain and shutdown zones and is expected to be of a lower degree that would not impact the fitness of any animals;
- Anticipated incidents of Level B harassment consist of, at worst, temporary modifications in behavior;
- The required mitigation measures (*i.e.,* bubble curtain, shutdown zones) are expected to be effective in reducing the effects of the specified activity;
- Minimal impacts to marine mammal habitat/prey are expected;
- The action area is located within an active marine shipyard area,
- There is one pinniped haulouts in the vicinity of the project area, but it is on the opposite side of Seavey Island and not within the ensonified area; and
- There are no known biologically important areas in the vicinity of the project, based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat and, taking into consideration the implementation of the monitoring and mitigation measures, NMFS finds that the total marine mammal take from the 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) of the MMPA for specified activities other than military readiness activities. The MMPA does not define small numbers, 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. When the predicted number of individuals to be taken is fewer than one third of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

Take of five of the marine mammal stocks proposed for authorization will comprise at most approximately 3 percent or less of the stock abundance (Table 16). The number of animals proposed for authorization to be taken from these stocks would be considered small relative to the relevant stock's abundances even if each estimated take occurred to a new individual, which is an unlikely scenario. Based on the analysis contained herein of the proposed activity (including the 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)

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 Navy for the taking of marine mammals incidental to modification and expansion of the Portsmouth Naval Shipyard Dry Dock 1 in Kittery, Maine, effective for 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

NMFS requests comment on these analyses, the proposed authorization, and any other aspect of this Notice of Proposed IHA for the proposed issuance of an IHA to the Navy for the taking of marine mammals incidental to modification and expansion of the Portsmouth Naval Shipyard Dry Dock 1 in Kittery, Maine, effective for one year from the date of issuance. NMFS also requests comment on the potential for a 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 NMFS' final decision on the request for MMPA authorization.

On a case-by-case basis, NMFS may issue a one-time, 1-year IHA renewal with an expedited public comment period (15 days) when: (1) Another year of identical or nearly identical activities as described in the Specified Activities section is planned or (2) the activities would not be completed by the time the IHA expires and a second IHA would allow for completion of the activities beyond that described in the *Dates and Duration* section, 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 proposed 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); and

(2) A preliminary monitoring report showing the results of the required 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: February 25, 2022.

Kimberly Damon-Randall,

Director, Office of Protected Resources, National Marine Fisheries Service.

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