

**2018 Monitoring Report for Berth 11 Waterfront
Improvement Project at Portsmouth Naval Shipyard
Kittery, Maine**

January 8, 2018 – January 7, 2019

Submitted to:
**Office of Protected Resources,
National Marine Fisheries Service,
National Oceanographic and Atmospheric Administration**

Submitted by:
**U.S. Department of the Navy
Commanding Officer, Portsmouth Naval Shipyard
Kittery, Maine**

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Part I: Introduction and Project Scope

This report presents a summary of the marine mammal acoustical and observational data associated with the structural repairs to Berth 11 at the Portsmouth Naval Shipyard during the second year of the project (Year 2). This project concludes installation of the king pile and concrete shutter panel bulkhead at Berth 11 A, B, and C, as outlined in the 2018 construction summary below. The pier infrastructure at Berth 11 supports part of the west circuit of the Shipyard's portal crane rail system.

Support of Excavation Systems:

The support of excavation (SOE) systems were needed to protect workers (divers) from potential engulfment from shifting sediments during pre-inspection of the shutter panel wall along the berth. Use of 14" steel H-pile with road plate attached was used along the berth during dredging within the shutter panel wall area. This method was used over the use of sheet pile SOE, because the road plate/H-pile SOE was more conducive to the varied depth of bedrock along the berth.

The table below has been revised from the original project estimates provided in the 2018 IHA application to show only what was installed in 2018. The project had estimated 220 sheets, with 76 installed; 12 road plate/H-pile systems were estimated with 35 installed; 35 rock sockets drilled, with 35 king pile 36" steel H-pile (no noise required to install king pile); and 14" steel H-pile with 26 installed (22 sister/support piles, and 4 for the bulkhead return on 11C) (Table 1-1).

The reason the project had estimated 220 sheet piles, when only 76 were installed is because 144 sheet piles were proposed engulfment protection along the shutter panel wall, however road plate SOE panels were used instead, which is also the reason for the increase in road plates. The road plate system provided the same length of protection along the berth as would the 220 sheet pile. It was projected that 18, 15" timber piles were going to be extracted using the vibratory hammer, however all extractions were performed without the use of noise making activity.

Table 1-1: Year 2 (2018) Completed Construction Activity

| Activity/Method | Timing | *No. of Calendar Days | No. of Hours | Pile Type | No. of Piles Installed | No. of Piles Extracted |
|--|-------------------------------|-----------------------|--|-----------------------|------------------------|------------------------|
| Install Casing & Drill Sockets- Auger Drilling | January 2018 to December 2018 | 185 | 1,203.18 | 36" W-Section Steel | 35 | |
| Install Road Plate/H- Pile SOE-Vibro | January 2018 to December 2018 | 5 | 0.68 | 14" H-Pile Steel | 35 | |
| Remove Road Plate/H-Pile SOE-Vibro | January 2018 to December 2018 | 4 | 0.81 | 14" H-Pile Steel | | 35 |
| Install Sheet Pile (AZ50) Sheet Wall Bulkhead at DD1-Vibro | January 2018 to December 2018 | 9 | 12.57 | 25" Sheet Piles Steel | 74 | |
| Install H-Pile Bulkhead Return @ West End of 11C-Vibro | January 2018 to December 2018 | 2 | 0.31 | 14" H-Pile Steel | 4 | |
| Install Sheet Pile (AZ-50) Bulkhead Return @ West End of 11C-Vibro | January 2018 to December 2018 | 2 | 0.79 | 25" Sheet Piles Steel | 2 | |
| Install Support/Sister Piles-Vibro & Impact Hammer | January 2018 to December 2018 | 19 | 8.49 | 14" H-Pile Steel | 22 | |
| TOTALS | | 226 | 1,226.83 Hours (153.4 - 8hr work periods) | | 172 | 35 |

*Number of Calendar Days column refers to the number of dates we used a tool on that pile type regardless of time spent performing the activity (5 minutes or 8 hours).

The amount of pile-driving days observed were often different than anticipated. Some activities took longer than expected, for example rock socket drilling took significantly longer, while the other activities took much less time than expected with none reaching (or exceeding) 8 hours per day to install.

The AZ50 sheet pile installed at the DD1 wall bulkhead took significantly less time than predicted because the ledge it was driven into was higher than expected (roughly 30ft higher). SOE install and extraction often didn't require the use of the vibratory hammer. On several occasions panels could be seated deep enough upon placement, and extracted by a crane. This was due to the fact that the level of overburden material indicated in the Contract drawings was higher than what was encountered in the field. For example, instead of 8 feet of overburden material that the support of excavation panel had to be driven through that was shown on the contract drawings, we only encountered 1 foot of over burden material at

that location. The weight of the support of excavation plate was enough to settle the support of excavation to the required depth (through the 1 foot of material) without having to use vibratory or hammer driving equipment.

The original schedule submitted for approval of the IHA was an estimation. Additional time was requested in the fall of 2018 as scheduling difficulties required additional time for the work. This process was discussed with NMFS to obtain the additional time and associated Level B takes noted in the revised IHA received on 26 October 2018.

Part 1.1: 2018 IHA Compliance Measures

To comply with the Year 2 Incidental Harassment Authorization (IHA), approved by the Office of Protected Resources (OPR), National Marine Fisheries Service (NMFS) issued in January 8, 2018; marine mammal observers and a coordinator were employed to monitor the presence and behavior of marine mammals during 2/3 of pile-driving activity within the Level B harassment zone of influence and 100% of pile-driving activity within the Level A harassment zone of influence. All other in water activity was observed for marine mammal behavior within 10 meters of the activity being performed (dredging, repositioning of barges). Observers were tasked with preventing harassment of marine mammals by delaying or ceasing pile-driving activity when marine mammals were in an area where they were at risk of injury within the Level B zone. These activity Shutdown zones were implemented prior to risk of Level A or injurious take of a marine mammal.

Hydrosonic LLC completed hydroacoustic monitoring during the Year 2 construction work for a full day of vibratory, drilling and impact hammer use, with concurrent noise generation captured when possible. Hydroacoustic monitoring results and observations are discussed further in the report.

Part 2: Monitoring and Mitigation Measures

2.1: Hydroacoustic Monitoring

Hydrosonic, LLC was contracted to conduct hydroacoustic monitoring to corroborate levels of underwater sound produced by the various types of pile-driving, and evaluate the sound propagation into the surrounding water against 2017 findings (Hydrosonic, LLC, 2018). For additional information and readings, see Hydrosonic Summary Report submitted under separate cover.

Table 2-1: Breakdown of Pile Installation Activity – Drilling, Vibratory, Impact Hammer (Minutes of work)

| Month | Drill (min) | Impact (min) | Vibratory (min) | Grand Total (8hr Day/ Work Periods) |
|---------------------------|--------------------|---------------------|------------------------|--|
| January | 615 | 12 | 80 | 1.5 |
| February | - | 6 | 50 | 0.1 |
| March | - | 36 | 107 | 0.3 |
| April | 2628 | 5 | 29 | 5.5 |
| May | 5743 | 26 | 201 | 12.4 |
| June | 7086 | 52 | 68 | 15.0 |
| July | 7281 | - | 447 | 16.1 |
| August | 9417 | 254 | 29 | 20.2 |
| September | 8847 | - | - | 18.4 |
| October | 12098 | - | - | 25.2 |
| November | 11272 | - | - | 23.5 |
| December | 7217 | 8 | 25 | 15.1 |
| Grand Total (days) | 150.4 | 0.8 | 2.2 | 153.4 |

Figure 2-1: Pile Installation Activity Trend – Drilling, Vibratory, Impact Hammer (Days of Work)

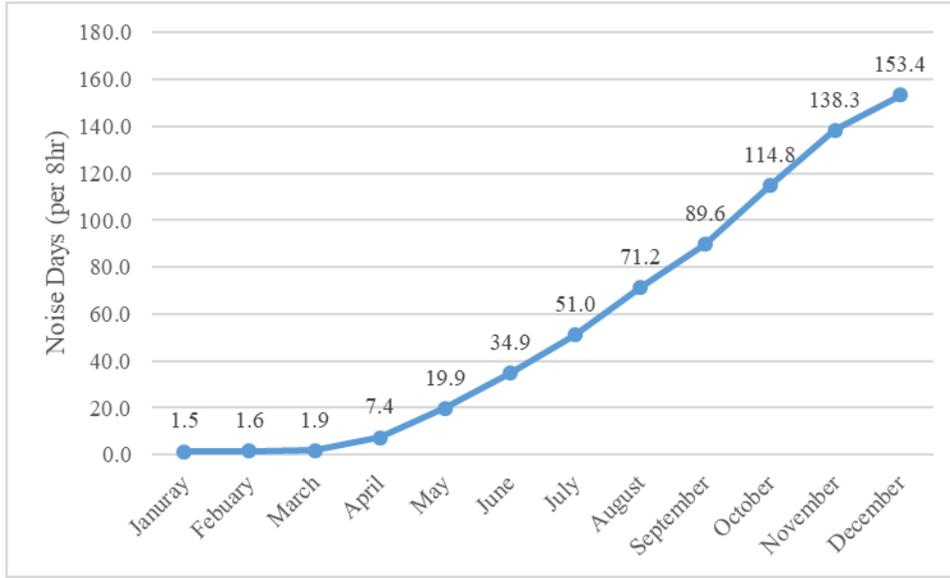
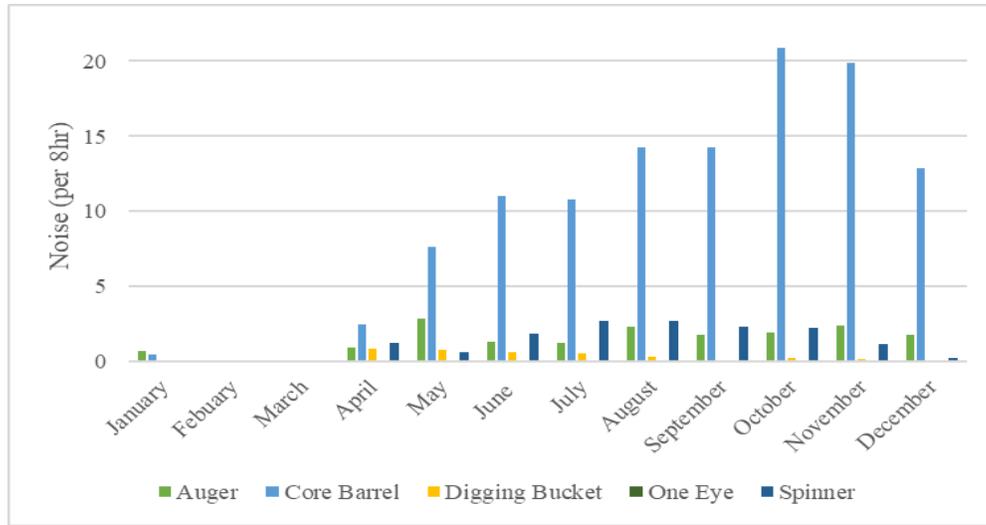


Figure 2-2: Breakdown of Pile Installation Activity – Drilling



2.2: Marine Mammal Monitoring

A minimum of two marine mammal observers were required to be in place during all pile-driving/removal operations. Marine mammal observers were trained using the U.S. Navy Afloat Environmental Compliance Training (2014) to observe the ZOI, identify marine mammals and document any takes as required by the conditions of the 2018 IHA. Observers had no other duties while observing and were positioned in areas to adequately view the full ZOI.

A “take” was defined by the issued 2018 IHA as the sighting of a marine mammal inside the

behavioral (level B) or injurious (level A) zone, during the observation period of 15 minutes before through 30 minutes after pile-driving activity (drilling, vibratory hammer or impact hammer use). Observations began 15 minutes prior to pile-driving activity to ensure no marine mammals were within the level A zone, or document any in the level B zone. Observers were responsible for marine mammal harassment prevention by alerting the crew to delay or cease pile-driving activity when an animal was sighted within or approaching the shutdown zone (75 meters from activity for impact hammer and 55 meters for vibratory hammer). Observers were also responsible for declaring the shutdown zone clear of marine mammals, and allowing the crew to resume pile-driving activity once the mammal was cleared from the zone. Marine mammal sightings and behavior were documented over the course of pile-driving activity as well as work stoppages or delays due to marine mammal presence.

Generally, one observer monitored the 55-meter and/or 75-meter shutdown zone, and one observer monitored the Level B harassment zone as it was initially determined and noted in the 2018 IHA. Observers were located at the best vantage point(s) to observe the zones and dedicated to this task alone. Initially observers were stationed at the Kittery Yacht Club and the NH Port Authority to assure adequate viewing of the predicted ZOI. Observers communicated with the site observer and crew via radio and cell phone. This observation method was utilized during initial use of each type of pile driving activity until background hydroacoustic noise verified the SPL associated with the construction activity was masked by the river background noise at those distances. Observers then moved to a raised platform located at the head of Berth 11 and/or observing off the end of the drilling barge, which provided clear view of the work area, river channel up to Memorial Bridge and down to Goat Island. The following observation methods were implemented:

- Observations began 15 minutes prior to pile-driving activity.
- Observers would use the naked eye and hand-held binoculars to continuously search for marine mammals.
- Distances to animals were based on range finder, and relative to known distances and objects near the observer.
- If a marine mammal was observed entering the behavioral harassment zone, that pile segment would be completed without cessation, unless the animal entered or approached the shutdown zone, at which point all pile-driving activities would be halted.
- If an animal was observed within the shutdown zone during pile-driving, then pile-driving would cease as soon as it was safe to do so.
- Pile-driving could not continue until the animal had voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes (seals) or 30 minutes (porpoises) had passed without re-detection of the animal.
- Observing continued for 30 minutes following the completion of pile-driving activity. Any marine mammals present within the harassment or shutdown zones were documented.
- All marine mammal observations were recorded on the NAVFAC Sighting Form (Appendix A).

Part 3: Summary of Results and Observations

3.1: Acoustic Monitoring Results

Data gathered through 2017 at Berth 11 indicates that the background noise level in the project area was found to be 130dB (Hydrosonic, LLC, May 31, 2017). Background levels were determined based on guidance and the acoustic monitoring protocol issued with the 2017 IHA. These methods were implemented in 2018, NMFS and the Navy concluded the data collected in 2017 was adequate for continued protection of marine mammals.

Level B Zone of Influence:

It should also be noted that many of the AZ-50 pile installed during the completion of the Berth 11 work were located along the interior side of the crane rail and were often installed during low water conditions where only a few feet of the pile was exposed to water. Data analyzed in the 2018 hydroacoustic monitoring report was based on one day of impact hammer use. Monitoring occurred to verify resonated zones for Level A and Level B in 2018. Hydrosonic Summary Report summarizes the resulting PTS thresholds for HF Cetaceans and Pinnipeds as calculated from field conditions. SELcum levels for Level A ZOI calculated in the hydroacoustic reports do not take into account the weighting factors per species as described in the 2018 IHA (and 2016 Acoustical Guidance).

Hydrosonic, LLC calculated the level B ZOI for all impact driving events to be 0.4 meters, based off of 160dB RMS. For vibratory driving the level B ZOI was calculated, based off 120dB RMS, for support piles to be 287.5 meters, SOE 60 meters, sheet pile 5466 meters (Hydrosonic Summary Report, pg 44). This information was collected from one day of each type of activity. Data gathered was not used to modify ZOI, only to verify that the established zones encompassed the full area of influence.

In addition to verifying the zones of influence, sound source verification as described in the IHA received. This included data collected for vibratory installation of 20 sheet piles, impact installation of 4 H-piles, one day of drilling and one day of drilling with concurrent vibratory driving. These results can be found in the separate hydroacoustic report submitted to NMFS (Hydrosonic LLC, 2019).

3.2: Marine Mammal Observations

Level A takes were defined as injurious takes, which at a distance from underwater noise-making activity can result in severe or permanent hearing damage to marine mammals. A level B take was a behavioral take, at a distance from underwater noise-making activity that can result in a behavioral change in any marine mammal. A behavioral change is considered anything that differs from how the marine mammal would be behaving normally, whether foraging, traveling, or milling.

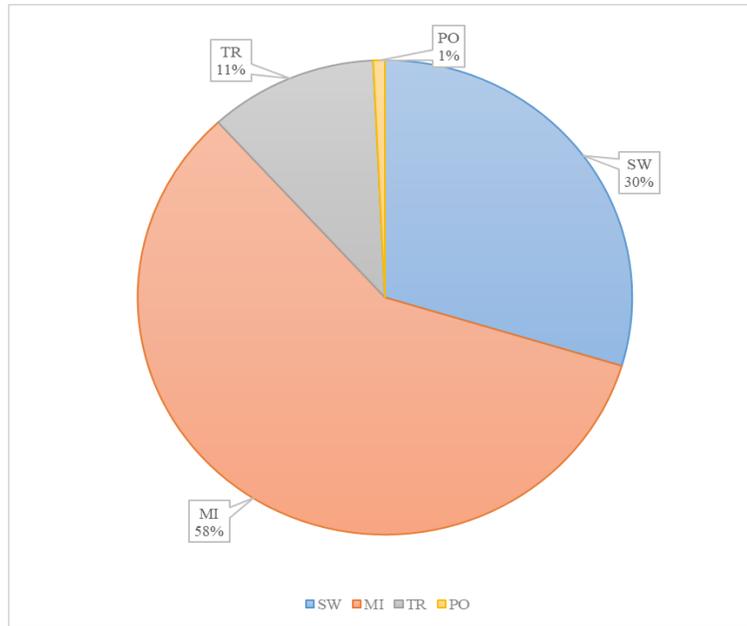
In 2018, harbor seals (*Phoca vitulina*) were sighted the most often (249 individuals), gray seals (*Halichoerus grypus*) were seen the second most often (12 individuals), and harbor porpoises (*Phocoena phocoena*) the least (2 individuals). There were no sightings of the harp seal (*Pagophilus groenlandicus*), or of the hooded seal (*Cystophora cristata*). Harbor porpoises were the only example of high frequency (HF) cetaceans. The harbor, gray, harp, and hooded seals were classified as phocid pinnipeds.

A sighting was defined as an instance when an observer sees a marine mammal surface. If an individual animal was seen multiple times in a single day, all sightings were documented, but the animal was only counted as a “take” once for that day.

3.3: Marine Mammal Sightings & Behaviors

Seals that were sighted in 2018 exhibited a variety of behaviors, categorized by the Sighting Cue & Behavior Codes (Appendix A) provided. The most commonly exhibited seal behaviors were swimming, traveling and milling. Gray seals and harbor seals were observed milling (58%), swimming (30%) and traveling (11%), and harbor porpoises were seen porpoising through the river channel 100% of the observation time. The following chart covers gray seals, harbor seals and porpoise. No other marine mammals were observed in 2018 in the area of the construction activity or ZOI (Figure 3-1).

Figure 3-1: Common Behaviors – Gray Seal, Harbor seal, and Harbor Porpoise



On a typical day, there was one or two sightings of a harbor seal, although there were a few irregularities observed. In the spring of 2018, during weeks 6-8, there was an unexpected increase of seals sighted in the Piscataqua River channel. Not only were seals sighted frequently, but in groups of up to five harbor seals at once. The weeks of April 21, through May 5, there were 77 harbor seals sighted. Due to the high number of sightings, on October 26, 2018 the IHA was revised to include a higher take limit for harbor seals. The take limit for harbor seals was increased from 168 takes, to 265 takes. Additionally, there were very few gray seal sightings for the majority of 2018. Only two gray seals were sighted before November, then, notably, ten were sighted between November 24, and December 16, 2018.

Delays & Shutdowns:

To prevent the incidental harassment of marine mammals, a shutdown zone was put in place. If a marine mammal approached this zone, work would cease to prevent any injury of the individual(s) during any pile-driving activities. The shutdown zone for impact driving work coincided with the level A harassment zone to limit the risk of a Level A take. Vibratory drilling Level A zone was estimated to be close to the activity. To limit any risk of a Level A take from vibratory drilling, the shutdown zone was maintained at the 55m location. Level A take for vibratory hammer use did not occur.

If a marine mammal was observed within the shutdown zone during the observation period, pile-driving would be delayed or ceased (shutdown) as soon it was safe to do so. Pile-driving could only begin or resume once the animal had left the shutdown zone of its own volition or had not been re-sighted for a period of 15 minutes (seals) or 30 minutes (porpoises). During the initial observation period, there was one delay and two shutdowns.

3.4: Environmental Observations

Atmospheric conditions varied widely in the course of this project, ranging from clear skies to rain, however many environmental conditions remained the same. On multiple occasions work was stopped due to thunderstorms. In weather conditions that hindered view of the Level B ZOIs, observers would move to a location with better visibility and clear line of sight for the Level A ZOI. Per requirements of the issued IHA, the Level A zone was observed at all times, with work ceasing or delayed if fog or other conditions

prevented observation. The Level B zone was observed at least 2/3 of the work time.

The Beaufort Sea State (BSS) was consistently recorded between 0-2, and tidal conditions were predictably diurnal. A moderate glare was present two hours before dusk, otherwise absent during observations. Overall, visibility from observation points were good.

In addition to pile-driving activity performed on Berth 11, the only other sound sources observed were extensive boat traffic in the river, moderate tanker transportation, and occasional submarine passage due to this location being an active port. The behavioral changes associated with frequent boat travel could not be concluded within the scope of this report.

3.5: Observed Takes - 2018

A total of 2 HF cetaceans Level B takes have been observed in 2018, and 261 Level B pinniped takes, based on the ZOI's authorized in the 2018 IHA (Table 3-3). Vibratory and drilling work are given the same level A and level B zones under the 2018 IHA. For impact work, the 2018 level A zone for pinnipeds and cetaceans are 155m and 340m respectively (Table 3-3). The 2018 level B zone, or behavioral zone for drilling, vibratory, and impact work was 1.5km from noise making activity. All observational data was obtained based on the 2018 IHA modeled isopleth locations as noted in Table 3-3. Zones as noted in the previous sections of this report, obtained from in-situ data and noted in Table 2-1 are included for use in revising the ZOI locations for work in 2018.

For the vibratory/drilling work that has been conducted, four seals were at/within 55m shutdown zone for seals, but it is not certain if the seals entered the Level A ZOI of 23m. Work ceased and the seal was not counted as a Level A take (Table 3-3). The instances occurred on four separated dates. No Level A takes were observed during impact hammer use. All sightings occurred within the shutdown zone during drilling work, so none were classified as level A.

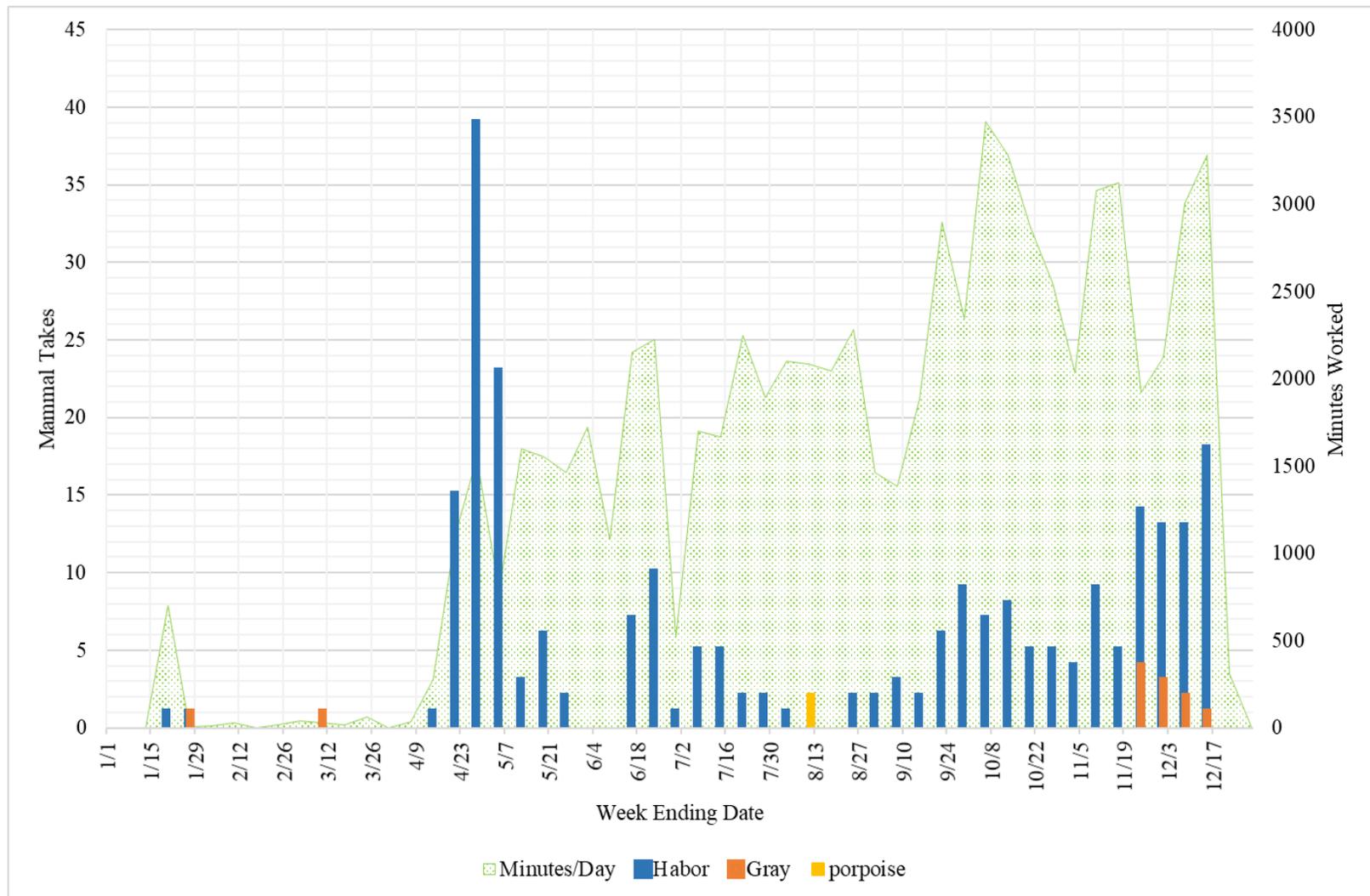
Table 3-1: 2018 Level A and Level B ZOI Threshold Meters (2018 IHA)

| Functional Hearing Group | HF Cetaceans | | Pinnipeds | |
|--|--------------|-----------------|------------|----------------|
| | A | B | A | B |
| Impact Pile Driving | 140 meters | 293 meters | 140 meters | 239 meters |
| Vibratory Pile Driving & Drilling | 55 meters | 7.35 kilometers | 55 meters | 7.35kilometers |

Table 3-2: 2018 Total Take Observations – utilizing 2018 IHA ZOI Locations

| Harbor Seal | | Gray Seal | | Harp Seal | | Hooded Seal | | Harbor Porpoise | |
|-------------|---------|-----------|---------|-----------|---------|-------------|---------|-----------------|---------|
| Level A | Level B | Level A | Level B | Level A | Level B | Level A | Level B | Level A | Level B |
| 0 | 249 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 2 |

Figure 3-2: Noise Duration Vs. Take Observations



The Berth 11 vibratory and impact pile-driving began on January 8, 2018, and on April 17, 2018 rock socket drilling (consisting of the use of various augers, core barrels, and rock drills, connected to a Kelly bar attachment on a Manitowoc 4100S2 crane) began. Prior to April 17, (18) 14" H-piles were installed using an APE model 200 Vibrator/Extractor hammer and APE 30-52 Diesel hammer, accounting for 324 minutes (5.4 hours) of pile-driving activity.

Through the 2018 construction activity period, there have been 249 harbor seal Level B takes with zero Level A; 12 Level B takes of gray seals with zero Level A; 2 Level B takes of harbor porpoises; zero Level B takes of harp seals; and zero Level B takes of hooded seals (Table 3-4). The number of takes was not uniform weekly; however, neither was noise making activity. Number of takes did not correspond to the number of work hours used that week (Figure 3-1).

There were three shutdowns and one delay through the course of 2018. The first shutdown occurred on 7/3/18 when one harbor seal was sighted 40m from drilling activity and work was stopped when the seal was sighted outside work zone. The delay occurred on 7/10/18 when a harbor seal was sighted 25m from drilling activity and work was delayed for 15 minutes with no further sightings. The second shutdown occurred 7/10/18 when a harbor seal was sighted at 30m from drilling activity and work was stopped for 15 minutes with no further sightings. The third shutdown occurred on 12/15/18 when a harbor seal was sighted 50m from drilling activity and work was resumed after 15 minutes with no further sightings.

Part 4: Summary

During the second year of work on Berth 11, work included placement of sheet pile and 14-inch H Pile using the vibratory hammer and impact hammer, and drilling of rock sockets. The drilling work for installation of the king pile was completed for 11C with the process of placing casings and drilling rock sockets within them for the pile to sit. During this time, observers made 263 marine mammal takes overall, with all occurring within the Level B harassment zone, and 4 occurring within the shutdown zone during vibratory hammer use.

- 153.4 8hr work periods were conducted, with 8.3 hours of concurrent noise.
 - 1203.18 hours of drilling
 - 6.6 hours of diesel hammer use
 - 17.03 hours of vibratory hammer use
- 2 HF Cetacean Level B Takes
 - Harbor porpoise (2) with (0) Level A
- 261 Phocid Pinniped Takes
 - Harbor Seal (249) with (0) Level A
 - Gray Seal (12) with (0) Level A
 - Harp Seal (0)
 - Hooded Seal (0)
- 2018 IHA Revised October 26, 2018
 - Time limit increased.
 - Take limit for harbor seals increased from 168 to 265.

Due to the extended noise making work schedule and abnormal uptick in sightings occurring in the early summertime, the 2018 IHA was revised to allow an increase of marine mammal takes (harbor seals in particular). In a three-week period, between April 21, and May 5, 2018, there was 77 harbor seal sightings, accounting for 46% of the originally authorized 2018 takes.

The overall lower acoustic readings are believed to be the result of the field conditions (sediment types, land mass and background acoustics) which result in attenuation and/or masking of the noise generated by the drilling or hammer use. As noted previously, the impact hammer used to install the support pile is largely conducted in low to very low tidal conditions, resulting in less sound transferred from the pile

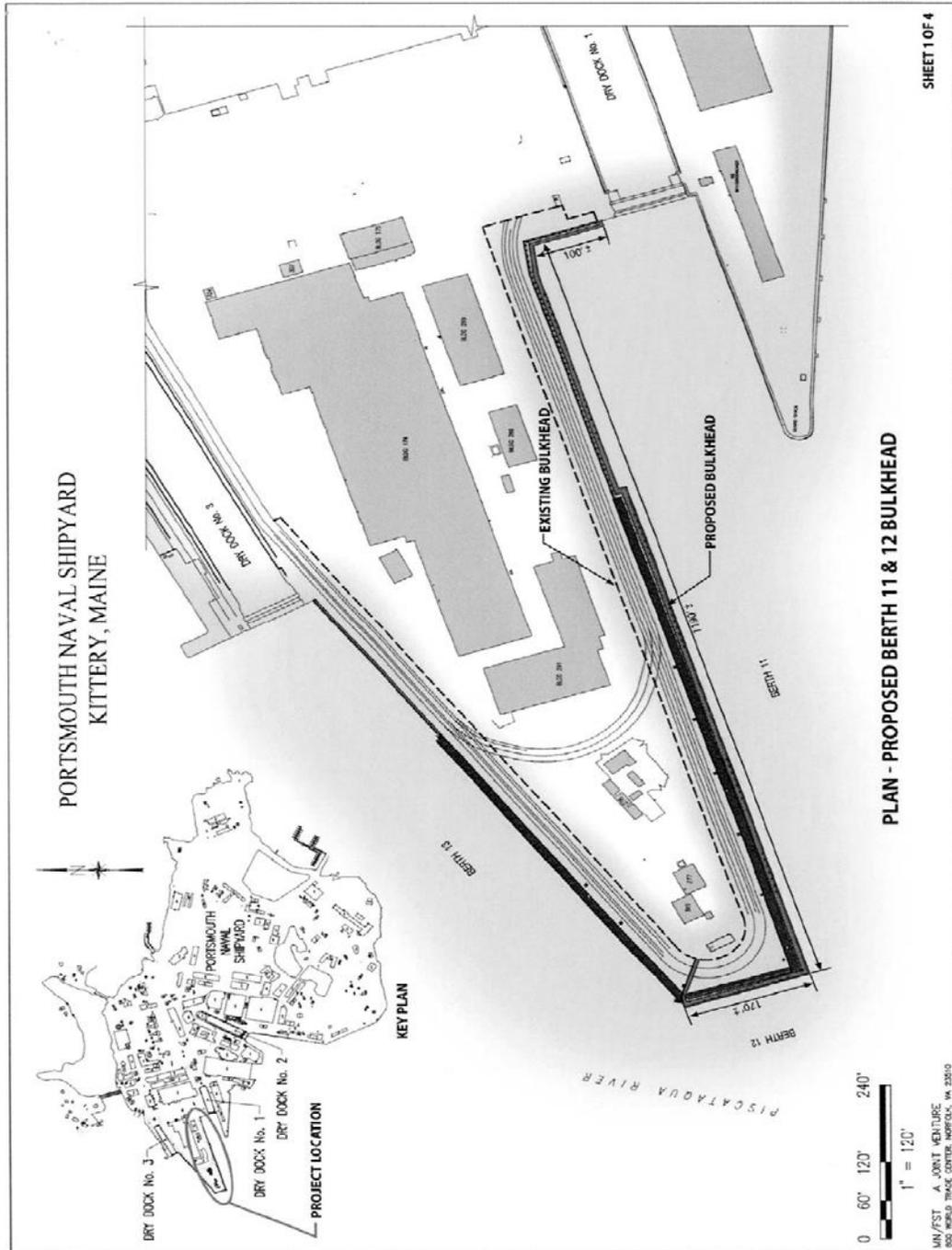
to the water. The 2018 IHA was issued based on estimated and practical data gathered in 2017, and confirmed in the course of 2018.

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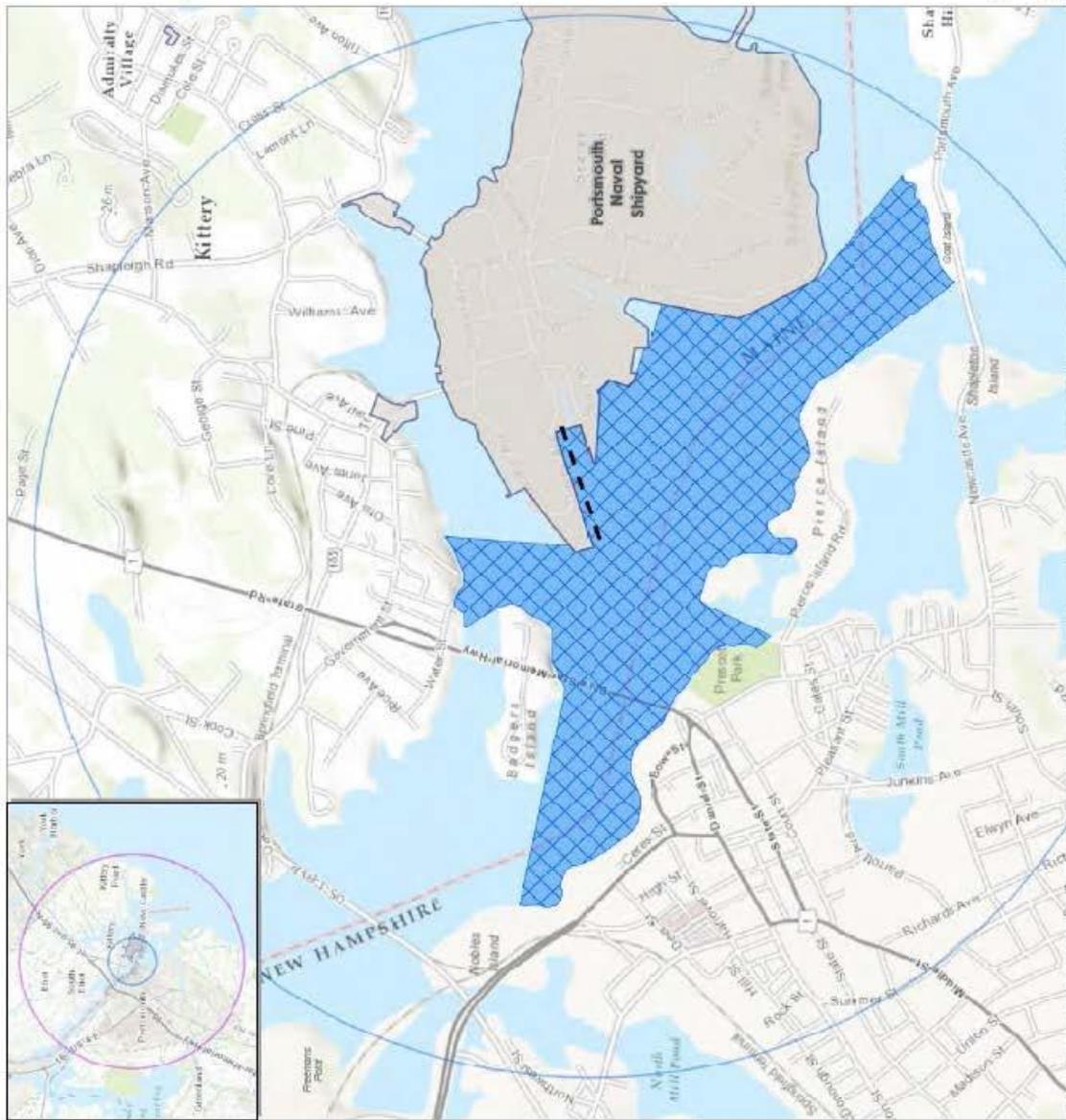
Appendix A: Maps and Forms

Berth 11 Bulkhead



Initial ZOI

Figure 6-1
 Zone of Influence
 for Underwater Vibratory Hammer
 and Underwater Impact Hammer
 at Berth 11 (A, B, and C)
 Portsmouth Naval Shipyard
 York County, Maine



Source: ESRI 2013; Department of Defense 2014.

NAVFAC Sighting Form

Project name: _____ of _____ Page _____ of _____
 Lead observer: _____ Date: _____
 Project location: _____ Lead observer contact info: _____

| Effort Info | | | | Sighting Info* | | | | |
|--|--|-----------|---|----------------|---|---|---|---|
| Event | Time of Event (Start and end if applicable) | Observer* | Visibility Info (e.g. wind, glare, swell) Include Weather and Tide Data here | Species | Distance to Animal (from Observer) | # of Animals Group Size (min/max/best) # of Calves | Animal Movement Relative to Pile Driving Equipment/ Behavior Code | Behavior Change/ Response to Activity/ Other Comments |
| Start Monitoring – End Monitoring Vibratory – Impact Sighting – Delay – Shutdown | : : | | | | yds | / / — calves | toward or away parallel none Behavior Code: _____ | |
| Start Monitoring – End Monitoring Vibratory – Impact Sighting – Delay – Shutdown | : : | | | | yds | / / — calves | toward or away parallel none Behavior Code: _____ | |
| Start Monitoring – End Monitoring Vibratory – Impact Sighting – Delay – Shutdown | : : | | | | yds | / / — calves | toward or away parallel none Behavior Code: _____ | |
| Start Monitoring – End Monitoring Vibratory – Impact Sighting – Delay – Shutdown | : : | | | | yds | / / — calves | toward or away parallel none Behavior Code: _____ | |
| Start Monitoring – End Monitoring Vibratory – Impact Sighting – Delay – Shutdown | : : | | | | yds | / / — calves | toward or away parallel none Behavior Code: _____ | |
| Start Monitoring – End Monitoring Vibratory – Impact Sighting – Delay – Shutdown | : : | | | | yds | / / — calves | toward or away parallel none Behavior Code: _____ | |
| Start Monitoring – End Monitoring Vibratory – Impact Sighting – Delay – Shutdown | : : | | | | yds | / / — calves | toward or away parallel none Behavior Code: _____ | |

*Note location of observer and any marine mammal sightings with date/time on project map

Sighting Form revised October 15, 2013
 NAVFAC MIDLANT POC: Jessica Bassi, Email at Jessica.bassi@navy.mil or Phone at 757-341-0493

Sighting Cue & Behavioral Codes

Sighting Codes (Sighting cue & Behavior Codes)

Behavior codes

| Code | Behavior | Definition |
|------|------------------|---|
| BR | Breaching | Leaps clear of water |
| CD | Change Direction | Suddenly changes direction of travel |
| CH | Chuff | Makes loud, forceful exhalation of air at surface |
| DI | Dive | Forward dives below surface |
| DE | Dead | Shows decomposition or is confirmed as dead by investigation |
| DS | Disorientation | An individual displaying multiple behaviors that have no clear direction or purpose |
| FI | Fight | Agonistic interactions between two or more individuals |
| FO | Foraging | Confirmed by food seen in mouth |
| MI | Milling | Moving slowly at surface, changing direction often, not moving in any particular direction |
| PL | Play | Behavior that does not seem to be directed towards a particular goal; may involve one, two or more individuals |
| PO | Porpoising | Moving rapidly with body breaking surface of water |
| SL | Slap | Vigorously slaps surface of water with body, flippers, tail etc. |
| SP | Spyhopping | Rises vertically in the water to "look" above the water |
| SW | Swimming | General progress in a direction. Note general direction of travel when last seen [Example: "SW (N)" for swimming north] |
| TR | Traveling | Traveling in an obvious direction. Note direction of travel when last seen [Example: "TR (N)" for traveling north] |
| UN | Unknown | Behavior of animal undetermined, does not fit into another behavior |