REQUEST FOR AN INCIDENTAL HARASSMENT AUTHORIZATION UNDER THE MARINE MAMMAL PROTECTION ACT FOR THE SOUTH QUAY WALL RECAPITALIZATION AT NAVAL STATION MAYPORT, JACKSONVILLE, FLORIDA NAVY REGION SOUTHEAST

Submitted to:

Office of Protected Resources,
National Marine Fisheries Service,
National Oceanographic and Atmospheric Administration

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List of Acronyms

B	logarithmic loss
BMP	best management practice
C	linear (scattering and absorption) loss
C-1	Wharf Charlie One
CFR	Code of Federal Regulations
CV	coefficient of variation
dB	decibel
dBA	decibel (A-weighted)
ft.	feet
FR	Federal Register
h	height
Hz	Hertz
IHA	Incidental Harassment Authorization
in.	inch
km	kilometer
kHz	kiloHertz
µPa	microPascal
m	meter
MMPA	Marine Mammal Protection Act
MSDD	Marine Species Density Database
NAVFAC	Naval Facilities Engineering Command
NAVFAC SE	Naval Facilities Engineering Command, Southeast
n.d.	no date
NMFS	National Marine Fisheries Service
NAVSTA	Naval Station
POC	point of contact
PTS	permanent threshold shift
R_1	range from source in meters
R_2	range from driven pile to original measurement location
rms	root-mean-square
SPL	sound pressure level
TL	transmission loss
TTS	temporary threshold shift
U.S.	United States
USFWS	United States Fish and Wildlife Service
W	width
ZOI	Zone of Influence

Executive Summary

In accordance with the Marine Mammal Protection Act (MMPA) of 1972, as amended, the United States Navy is applying for an Incidental Harassment Authorization (IHA) to begin recapitalization of the South Quay Wall at Naval Station Mayport, Jacksonville, Florida. Two species of marine mammals may be present within the waters of the Naval Station Mayport Turning Basin: the bottlenose dolphin (*Tursiops truncatus*), and the West Indian manatee (*Trichechus manatus*). These species may occur year-round. The West Indian manatee is regulated by the U.S. Fish and Wildlife Service (USFWS) and will be managed in compliance with the *Standard Manatee Conditions for In-water Work, 2011*; it is not considered in this application.

The Navy proposes the installation of steel sheet piles as a part of the overall recapitalization project at the South Quay Wall. A total of approximately 240 individual sheet piles will be installed. The project may require up to 18 months for completion; in-water activities are limited to a maximum of 35 days. If pile driving work cannot be completed within the permit period, a second IHA application will be submitted. All piles will be driven with a vibratory hammer. Impact driving will be a contingency employed only if vibratory methods are inadequate; a similar project completed at Wharf C-1 required impact pile driving on only seven of several hundred piles.

The Navy used the updated criteria and thresholds issued by the National Marine Fisheries Service (NMFS) in July 2016 (81 FR 51693) for assessing the potential for hearing loss (including level A harassment in the form of PTS) from pile driving; behavioral criteria were not impacted by the updated thresholds, and so the methodology for assessing behavioral impacts (outlined in Chapter 6) has not changed (National Marine Fisheries Service 2005b, 2009). The Navy used the practical spreading loss equation for underwater sounds and empirically measured source levels from similar pile driving events within the Naval Station Mayport Turning Basin to estimate potential marine mammal exposures. Predicted exposures are described in Chapter 5. Shut-down procedures will ensure no Level A harassments (injury) would occur, but modeling predicted that 58 Level B harassments (behavior) may occur for bottlenose dolphins as a result of pile driving activities associated with the South Quay Wall recapitalization project. Conservative assumptions (including marine mammal densities) used to estimate the exposures have likely overestimated the potential number of exposures and their severity.

Pursuant to the Marine Mammal Protection Act Section 101(a)(5)(D), the Navy submits this application to the National Marine Fisheries Service for an Incidental Harassment Authorization for the incidental taking of bottlenose dolphins during pile driving activities as part of the South Quay Wall Recapitalization project between 15 February 2020 and 14 February 2021. Takes would be in the form of non-lethal, temporary harassment and are expected to have a negligible impact on these species. In addition, takes would not have an immitigable adverse impact on the availability of these species for subsistence use.

1. Description of Activities

A detailed description of the specific activity or class of activities that can be expected to result in incidental taking of marine mammals.

Pursuant to the Marine Mammal Protection Act (MMPA) Section 101(a)(5)(D), the Navy submits this application to National Marine Fisheries Service for an Incidental Harassment Authorization for the incidental, but not intentional, taking of marine mammal species during pile driving activities associated with the South Quay Wall Recapitalization project (project) at Naval Station (NAVSTA) Mayport between 15 February 2020 and 14 February 2021. 50 Code of Federal Regulations (CFR) 216.104 sets out 14 specific items that must be included in requests for take pursuant to Section 101(a)(5)(A) of the MMPA; those 14 items are represented by the 14 sections of this application.

1.1. Proposed Action

The Proposed Action is the recapitalization, of the South Quay Wall at NAVSTA Mayport (Figure 1-1). The Proposed Action will install approximately 240 single sheet piles within five (5) feet of the current South Quay Wall in order to support the pre-existing bulkhead that has been weakened by the formation of voids within the wall. Construction and demolition includes; new sheet pile bulkhead and C-9 connectors to tie to the quay walls located on the east and west of the proposed construction site; self-hardening flowable fill within the voids in the South Quay Wall; the use of concrete between existing and new walls; new concrete cap and partial encasement of new sheet piles, demolition of Building 1565, installation of foam filled fenders and repair by milling and paving the existing asphalt deck paving. Recapitalization will also include replacing area lighting fixtures on anodized aluminum standards, replacing security fencing and installing a cathodic protection system for the steel sheet piling and steel underground utility piping. The recapitalization effort will resolve the increasing steel deterioration of the South Quay Wall, and the formation of corrosion holes and loss of backfill material so that adequate and efficiently configured facilities can provide ships berthing, cold iron support and ordnance handling capability. In 2014, the condition index of the South Quay Wall was assessed as “Fair” but failing. Should recapitalization not occur, the condition index is expected to worsen to “Poor” by the year 2024. Currently, there are localized areas of moderate to advanced deterioration, but these do not significantly reduce the structural capacity. As deterioration continues, it becomes more widespread and some reduction in structural capacity occurs. Already, based on current conditions and an unknown deck load rating, it is recommended that no loading should be done at the South Quay Wall. In-water work is expected to be completed before 14 February 2021.

The project includes the installation of approximately 240 individual sheet piles over the course of 35 days, averaging 7 - 10 sheet piles installed per day, with a maximum of 15 individual piles

installed per day. Of the 35 total days of installation, 30 days were reserved for vibratory driving and the remaining 5 days were reserved for contingency impact driving. The use of impact driving shall be restricted to when vibratory driving is insufficient. A similar project that has been completed at adjacent Wharf C-1 required impact pile driving on only seven out of several hundred piles. Section 1.2 describes the elements of the proposed action in more detail.

FIGURE 1-1. SOUTH QUAY WALL AT NAVSTA MAYPORT

1.2. Project Description

Recapitalization will install 240 single sheet piles within five (5) feet of the current South Quay Wall in order to support the pre-existing bulkhead that has been weakened by the formation of voids within the wall. In-water work includes only pile driving for a new sheet pile bulkhead. The single sheet piles will consist of a series of sheet piles to be driven vertically into the substrate that runs along the edge of the South Quay Wall. These sheet piles will be placed within five (5) feet of the South Quay Wall to ensure stability. The wall will be anchored at the top and fill consisting of clean gravel and/or flowable concrete will be placed behind the wall. Concrete and/or flowable fill will also be used to fill the voids that have formed along the outer edge of the South Quay Wall to prevent the further development of surface settling and voids caused by the formation of interconnected cracks, fissures and holes. A concrete cap will be formed along the top and outside face of the wall to tie the entire structure together and provide a berthing surface for vessels.

Construction activities include:

- installation of new sheet piles
- installation of C-9 connectors
- placing a combination of self-hardening, flowable fill and clean fill between existing and new walls.
- installing new concrete cap which partially encases the new steel wall.
- installing sacrificial anode cathodic protection system for the new steel wall.
- installing new foam filled fenders
- installing new utilities
- repairing wharf deck by milling and re-paving
- replacing area lighting fixtures on galvanized steel standards
- replacing security fencing
- Demolition of Building 1565

The following steps describe the construction sequence for placing the new steel sheet pile system in front of the existing deteriorated wall.

<u>Preparation and Demolition</u>

Existing underwater obstructions and debris that may interfere with the installation of the single sheet piles will be removed utilizing divers and cranes. Along the face of the existing wall the curb and a portion of existing concrete cap will be removed to accommodate the new concrete pavement that will be placed between the new wall and the existing wall. The concrete apron along the waterside perimeter of the wharf and the utilities (including lateral supply lines from utilities such as water, fuel, steam and electrical) will be removed. Building 1565 will be demolished. Utilities include water, fuel, waste, electrical and communications.

Installation of a New Bulkhead

Depending on weight-bearing and structural integrity issues at the current South Quay Wall, either shore-based or barge-based cranes will be used for pile installation. If necessary, a crane barge with a pile installation suite (pile leads, vibratory hammer and an impact hammer) will mobilize to the project site with a material barge. A pile driving template (approximately 25 feet [ft] in length) will be mounted to the crane. This allows the crane to control the alignment of the piles as they are driven. Once the crane is properly aligned, the sheet piles will be driven to the appropriate depth using the vibratory hammer (Figure 2-2). A total of approximately 240 individual sheet piles will be installed. Figures 1-2 and 1-3 illustrate sheet piles as installed at NAVSTA Mayport. Impact pile driving would only be used as a contingency in cases when vibratory driving is insufficient. Once all of the piles are driven, closure plates will be attached between the existing adjacent sheet pile wall and the new wall end terminations. Typically, these are welded in place using underwater welding techniques.

In general, the pile-driving process begins by placing a choker cable around a pile and lifting it into vertical position with a crane. The pile is then lowered into position inside the template and set in place at the mud line. During vibratory driving, the pile is stabilized by the template while the vibratory driver installs the pile to the required tip elevation. Once piles are in position, vibratory installation would take less than 180 seconds to reach the required tip elevation. Time intervals between driving of each pile will vary, but will be a minimum of several minutes due to time required for positioning, etc.

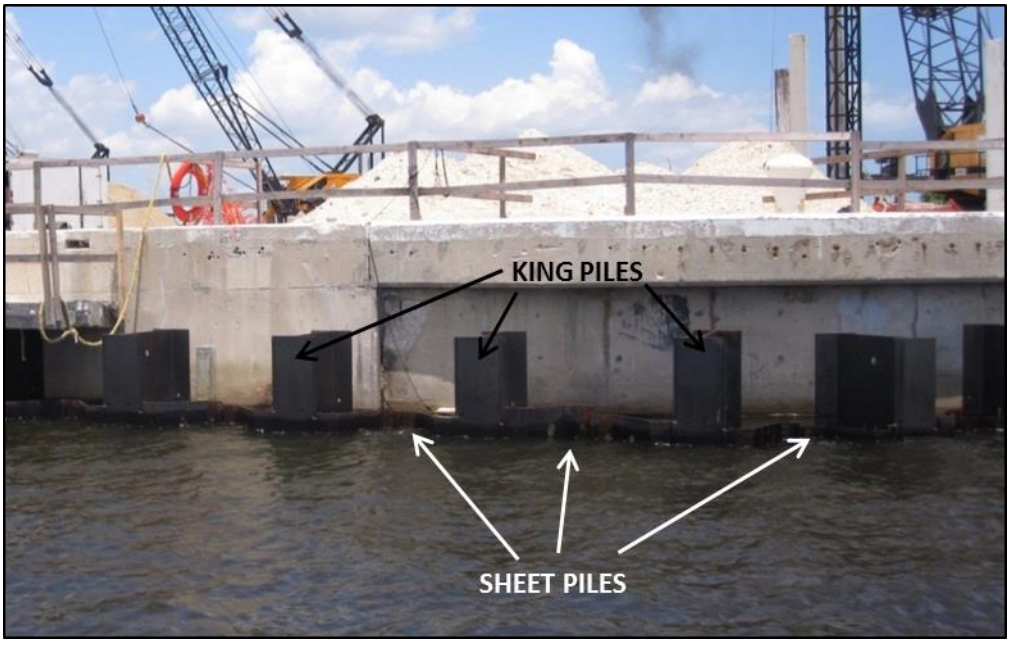
Impact hammers have guides holding the hammer in alignment with the pile while a heavy piston moves up and down, striking the top of the pile, driving the pile into the substrate from the downward force of the hammer.

Installation of Anchors

The use of permanent anchoring systems is not expected in the construction of the sheet pile template, however temporary anchors could be used during constructions and would be installed within five (5) feet of the existing South Quay Wall. The installation of an anchor requires that a hole be driven within the sheet pile and an anchor be placed behind (shoreward) the existing wall. After anchor holes are driven, the anchors will be placed in the holes and either end of the anchor is grouted into the soil or the end of the anchor is attached to the tie back wall system. The tie back wall system normally consists of sheet piles of shortened lengths that are buried below grade.

FIGURE 1-2. VIBRATORY INSTALLATION OF SHEET PILE AT NAVSTA MAYPORT

FIGURE 1-3. SHEET PILES AT NAVSTA MAYPORT



Placement of Fill

After the anchors are installed, fill operations will be conducted behind the new wall. This consists of placing either gravel fill or concrete flowable fill into the space behind the wall; trapped water behind the wall would be displaced. The straight design of the proposed new wall (in front of existing dog-legged wall) would necessitate filling approximately 0.22 acres of turning basin water.

Form and Placement of Pile Cap

After the fill operation is completed, the concrete pile cap will be formed and placed along the top of the new steel sheet pile wall. This consists of installing either wood or steel forms along the top of the wall down to some point below mean low water elevation. Water would be removed from the forms, steel reinforcement would be placed in the forms, and concrete would be poured to the required elevations.

Deck and Utility Placement

After the pile cap is in place, a new reinforced concrete apron will be installed and the wharf deck repaired by milling and paving. A new high mast lighting system, new security fencing, and new utilities will be installed to replace those that were removed. The proposed new deck would add approximately 11,400 square feet (1,059 square meters) of new impervious surface to the South Quay Wall area. Two clusters of utility hook-ups (electric, water, and sewer/oily waste) would be available for berthed ships. Natural gas hook-ups would be available for the portable steam generator.

Lighting Fixture Upgrades

Lighting is required to support the maintenance and repair activities associated with the South Quay Wall. Safety and security lighting for personnel required to operate during hours of darkness on the South Quay Wall is also required. In accordance with Unified Facilities Criteria (UFC) 3-530-01 (DoD2012) and UFC 4- 152-01 (DoD 2015), the South Quay Wall lighting should be designed for lighting levels commensurate to lighting zones (LZ) 2 to LZ3. Currently lighting of the quay wall is accomplished utilizing “cobra head” street lights mounted on 30-ft high poles. The estimated lighting levels from these fixtures vary between 3.0 footcandles (30LUX [one lumen per square meter]) and 0.0 footcandles (0LUX). This lighting level is inconsistent with the UFC requirements for working areas of the quay wall. The existing fixtures have a glass refractor on the face of the fixture to direct the light from the source. Refractors tend to allow stray illumination into the night sky causing light pollution.

The new fixtures would offer illumination levels and controls compliant with current UFC standards. The proposed lighting plan would provide pole mounted lighting fixtures, spaced to provide adequate illumination for the entire South Quay Wall. Each 30-foot light pole would have an amber site head with two white flood lights mounted on a bull horn bracket. The white flood lights are for work lighting during periods when ships are loading or unloading. The amber lighting is used for general purpose lighting and operates at a “turtle -friendly” 560-590

nanometers wavelength amber color temperature, substantially reducing the amount of light pollution allowed by the current lighting system. An example of the turtle-friendly lighting is the proposed Lithonia DSX2 with shielding and Amber LEDs. This light is Wildlife Lighting-approved by the Florida Fish and Wildlife Conservation Commission (Florida Fish and Wildlife Conservation Commission 2018).

Summary

The Proposed Action involves installation of approximately 240 single sheet piles, requiring a maximum of 35 days of pile driving. Vibratory installation of piles is expected to take 30 days over a 12-month period. Impact pile driving would only be used as a contingency in cases when vibratory driving is insufficient. Five days have been conservatively allotted for contingency impact driving even though only two days of impact pile driving occurred during the adjacent Wharf C-1 project. Impact pile driving, if it were to be necessary, could occur on the same day as vibratory pile driving, but driving rigs would not be operated simultaneously. Because activities are for the repair of existing facilities only, no increase in level of use or operation is expected. No net change in the amount of vessel traffic in and around the Mayport Turning Basin is expected as a result of the project.

2. Location and Duration of Activities

The dates and duration of such activity and the specific geographical region where it will occur.

NAVSTA Mayport is located at the mouth of the St. Johns River, approximately 15 miles east of the Jacksonville Central Business District in Duval County, Florida. It is bordered to the north by the St. Johns River, to the south by Jacksonville, to the east by the Atlantic Ocean, and to the west by the Village of Mayport and the Atlantic Coastal Waterway (Figure 2-1). The Mayport Turning Basin is a deep-water surface ship berthing facility whose entrance meets the main navigation channel at the mouth of the St. Johns River. Ship berthing facilities are provided at 16 locations along wharves A through F around the turning basin perimeter. The turning basin is approximately 2,000 by 3,000 feet in area, and is connected to the St. Johns River by a 500-ft-wide entrance channel. The South Quay Wall is located along the southern edge of the Mayport Turning Basin (Figure 2–2).

The project area is defined as the immediate vicinity of the South Quay Wall, out to the limit of the most distant of the underwater threshold for all marine mammal species being addressed. The most distant underwater threshold is the marine mammal behavioral disturbance (120 dB re 1 µPa rms) threshold. Average underwater noise levels in the turning basin during 4 days in June 2015 were 128 dB rms. However, since this sample size is not necessarily representative of noise conditions in the basin year-round, the Navy has assumed that the background noise level is at the lowest measured level of 120 dB rms. The distance to the 120 dB threshold is therefore the maximum range at which the Navy expects to exert an environmental impact underwater, and represents a reasonable boundary for the project area (Figure 2-2).

A maximum of 30 days of in-water vibratory pile driving work will take place over a 12-month period during the project. Five additional days were modeled in case contingency impact pile driving becomes necessary, but this duration is an extremely conservative estimate; a similar project that has been completed at adjacent Wharf C-1 required impact pile driving on only seven piles, which required just two days.

FIGURE 2-1. SOUTH QUAY WALL PROJECT REGIONAL OVERVIEW

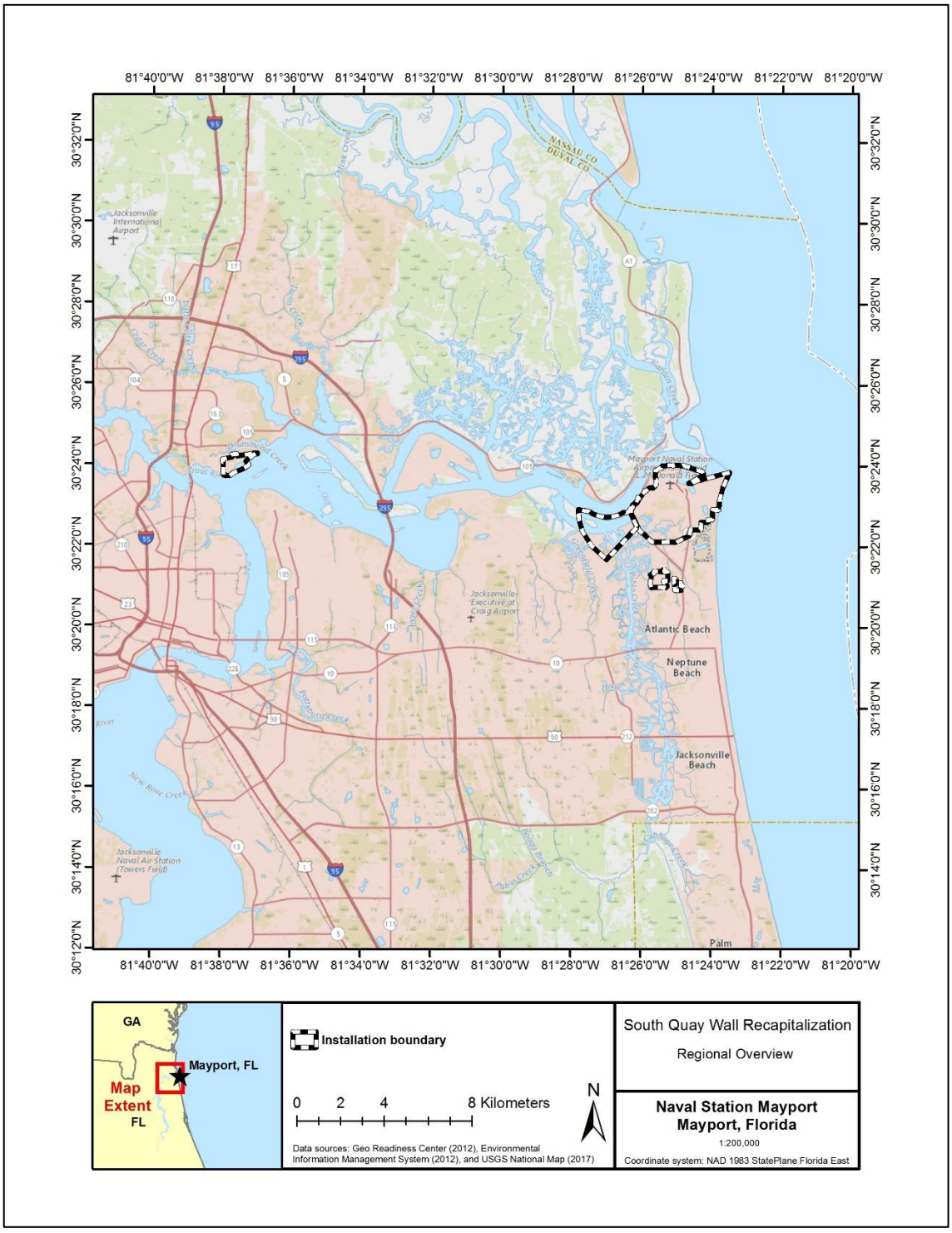
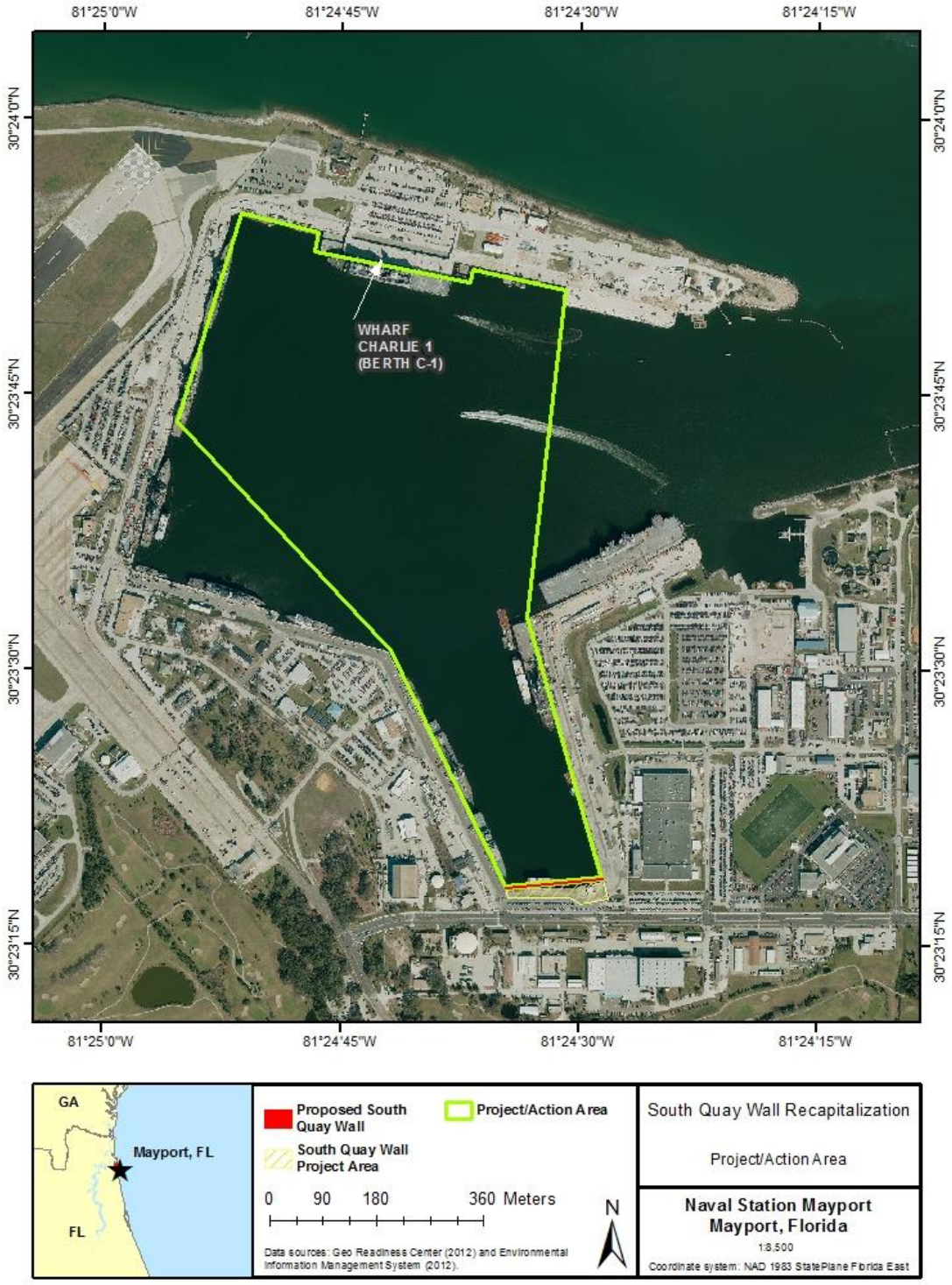


FIGURE 2-2. SOUTH QUAY WALL RECAPITALIZATION PROJECT AREA



The Mayport Turning Basin is regularly dredged to a depth of 50 feet to allow for berthing of large military vessels. Salinity and temperature data for the project area are summarized in Table 2-1 and Figure 2-3, respectively.

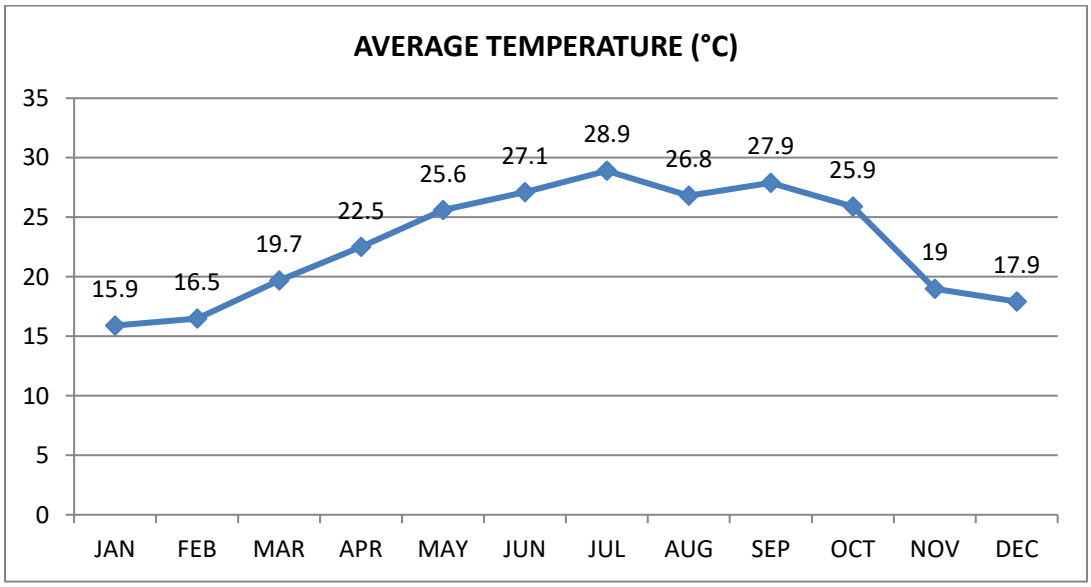
TABLE 2-1. MINIMUM AND MAXIMUM SURFACE AND BOTTOM SALINITIES

LOCATION	TIDE	WATER COLUMN	SALINITY (ppt)
NAVSTA Mayport Turning Basin	Ebb	surface	30.6
		bottom	33.8
	Flood	surface	30.2
		bottom	33.6
NAVSTA Mayport Entrance Channel	Ebb	surface	30.0
		bottom	32.4
	Flood	surface	33.4
		bottom	34.7

Source: U.S. Department of the Navy 2008a.

While water temperatures for the project area are not regularly recorded, average monthly temperatures at the closest NOAA station (Bar Pilot's Dock) ranged from 15.9 degrees Celsius (°C) (60.6 degrees Fahrenheit [°F]) in January to 28.9 °C (84°F) in August (Figure 2-3).

FIGURE 2-3. 2012 MONTHLY WATER TEMPERATURES AT BAR PILOT'S DOCK, FLORIDA



Source: National Oceanic and Atmospheric Administration 2012

3. Marine Mammal Species and Numbers

The species and numbers of marine mammals likely to be found within the activity area

The Navy has reviewed information about marine mammal species occurring in the western Atlantic along the east coast of Florida, and has determined that bottlenose dolphins (relevant stocks listed in Table 3-1) may occur in the vicinity of the project. The West Indian manatee (*Trichechus manatus*) is not regulated by NMFS and therefore is not considered further in this application.

Bottlenose dolphin density was calculated based on surveys of the Mayport Turning Basin during late 2012 and early 2013 (U.S. Department of the Navy 2014).

TABLE 3-1. SPECIES POTENTIALLY OCCURRING IN THE PROJECT AREA

SPECIES and ESTIMATED DENSITY	STOCK	OCCURRENCE and ABUNDANCE BEST (CV) / MIN	STATUS	
			MMPA	ESA
bottlenose dolphin 4.15366 / km^2	Western North Atlantic Offshore	Rare[2] 77,532 (0.40) / 56,053[1]	n/a	n/a
	Western North Atlantic Northern Florida Coastal	Likely – year round 877 (0.49)/595	strategic	
	Jacksonville Estuarine System	Likely - year round, numbers may be slightly lower in winter 412 (0.06) / unknown[3]	strategic	
	Western North Atlantic Southern Migratory Coastal	Seasonal - January to March 3,751 (.06)/ 2,353	strategic	

Sources: U. S. Department of the Navy 2015; U.S. Department of the Navy (2014) Turning Basin Bottlenose Dolphin Surveys; [1]Hayes et al. 2016 [2]Extralimital: there may be a small number of sighting or stranding records, but the activity area is outside the species' range of normal occurrence; Rare: there may be a few confirmed sightings, or the distribution of the species is near enough to the area of concern that the species could occur there; the species may occur but only infrequently or in small numbers; Likely: confirmed and regular sightings of the species occur year-round; [3]National Marine Fisheries Service 2009; this is an overestimate of the stock abundance in the area covered by the study because it includes non-resident and seasonally resident dolphins; most recent SAR has insufficient data on this stock

4. Affected Species Status and Distribution

A description of the status, distribution, and seasonal distribution (when applicable) of the affected species or stocks of marine mammals likely to be affected by such activities.

4.1. Bottlenose Dolphin

Bottlenose dolphins occurring in the South Quay Wall activity area may be individuals belonging to any of the following stocks: the Western North Atlantic Offshore Stock, the Western North Atlantic Northern Florida Coastal Stock, the Jacksonville Estuarine System Stock; and the Western North Atlantic Southern Migratory Coastal Stock.

Along the Atlantic coast of the U.S., where the majority of detailed work on bottlenose dolphins has been conducted, male and female bottlenose dolphins reach physical maturity at 13 years, with females reaching sexual maturity as early as seven years (Mead and Potter 1990). Bottlenose dolphins are flexible in their timing of reproduction. Seasons of birth for bottlenose dolphin populations are likely responses to seasonal patterns of availability of local resources (Urian et al. 1996). Thayer et al. (2003) found bottlenose dolphins in North Carolina to exhibit a strong calving peak in spring, particularly May and June, and a diffuse peak from late spring to early fall. There is a gestation period of one year (Caldwell and Caldwell 1972). Calves are weaned as early as one and a half years of age (Reynolds et al. 2000), and typically remain with their mothers for a period of three to eight years (Wells et al. 1987), although longer periods are documented (Reynolds et al. 2000). There are no specific breeding locations for this species.

Dive durations as long as 15 min are recorded for trained individuals (Ridgway et al. 1969). Typical dives, however, are shallower and have a much shorter duration. Mean dive durations of Atlantic bottlenose dolphins typically range from 20 to 40 seconds at shallow depths (Mate et al. 1995)

Bottlenose dolphins typically occur in groups of 2 – 15 individuals, but significantly larger groups have also been reported (Shane et al. 1986; Kerr et al. 2005). Coastal bottlenose dolphins typically exhibit smaller group sizes than larger forms, as water depth appears to be a significant influence on group size (Shane et al. 1986). Shallow, confined water areas typically support smaller group sizes, some degree of regional site fidelity, and limited movement patterns (Shane et al. 1986; Wells et al. 1987).

Recent surveys have shown that bottlenose dolphins in the vicinity of the South Quay Wall occur in groups of 5 or more, pairs, and individually. Larger groups, observed infrequently, are generally seen at the entrance of the turning basin. These groups navigate into the basin, but generally not very far. A mother / calf pair was observed regularly during the winter and early spring of 2012 / 2013. Bottlenose dolphins are rarely observed lingering in a particular area in

the turning basin; rather, they appear to move purposefully through the basin and then leave (Peters pers. comm. 2013).

Based on surveys being conducted in the NAVSTA Mayport Turning Basin during late 2012 and early 2013 (U.S. Department of the Navy 2014), a density of 4.15366 individuals / km^2 has been estimated for the project area (see Appendix C for the full report and survey details).

5. Incidental Take Authorization Requested

The type of incidental taking authorization that is being requested (i.e., takes by harassment only, takes by harassment, injury, and/or death), and the method of incidental taking.

Under the 1994 Amendments to the MMPA, harassment is statutorily defined as any act of pursuit, torment, or annoyance which:

- **Level A Harassment** has the potential to injure a marine mammal or marine mammal stock in the wild; or,
- **Level B Harassment** 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 but which does not have the potential to injure a marine mammal or marine mammal stock in the wild (National Marine Fisheries Service 2013).

The marine mammal density data used for this analysis was retrieved from the Navy's Marine Species Density Database, and the current turning basin survey effort at NAVSTA Mayport. Table 5-1 summarizes the species densities. The estimated number of exposures that could result for the one year period of construction for the project from 15 February 2020 to 14 February 2021 is summarized in Table 5-2. Estimation of bottlenose dolphin density was based on surveys of the basin, detailed in U.S Department of the Navy (2014).

TABLE 5-1. SPECIES DENSITIES

Species	Highest Density (season)
bottlenose dolphin[1]	4.15366 / km^2 (all)

[1]U.S. Department of the Navy (2014) Survey Report.

Assumptions to be considered for the bottlenose dolphin incidental take estimate:

1) Individual animals may have been counted more than once.
2) The number of animals per square kilometer is assumed to be static, therefore indicating a resident population with no "refreshment" of new animals entering or leaving the area. This is not a reasonable real world assumption, but in the absence of specific data on bottlenose dolphin movements in and out of the project area it has been applied for modeling purposes and represents a conservative approach.
3) Animals with a Level B exposure can be re-exposed every 24 hours, according to the standard of analysis for incidental takes. Therefore, while 58 incidental takes are being requested, the same animal could be affected on multiple days instead of 58 different

dolphins being exposed once each. For example, 29 animals could each be exposed to noise levels that reach Level B criteria two times over the course of the 35 day in-water work period.

The density of each species was multiplied by the size of the relevant zone of influence to determine the estimated number of exposures per day. This number was multiplied by the estimated number of pile-driving days to calculate takes for the entire project and rounded appropriately. In the case of a fractional number of estimated exposures per day (0.1 – 0.99), rounding was also performed prior to multiplying by number of days in order to reduce underestimates of takes. The Navy is requesting authorization for a total of 58 Level B (behavioral) incidental takes of bottlenose dolphins over the course of the project (Table 5–2). Exposures may be to any age / reproductive class of the species. The same methodology was used to estimate takes for work at Wharf Bravo, completed in 2017-18. While the number of takes during actual pile driving activities was only 30% the number authorized, the total recorded number of dolphins observed on pile-driving days (which included observations when driving was not underway) was 106% the number authorized, so the estimate is considered reliable. No incidental takes are requested for any other marine mammal species.

While there are no model-predicted Level A exposures, the Navy has committed to avoiding Level A takes during this project and shall monitor the entire injury zone for both types of driving. For vibratory driving, the Level A ZOI extends to 0.2m from the source; for impact driving the Level A zone extends 1.7m. The shutdown zone in all cases will be 15m to preclude physical injury to animals interacting with construction equipment. In-water work shall be shut down should a protected species approach or enter the 15-m shutdown zone. Therefore, no Level A exposures are anticipated or requested.

Methods for developing the incidental take estimate are detailed in Chapter 6 and Appendix B.

TABLE 5-2. ESTIMATED MARINE MAMMAL EXPOSURES

SPECIES	DENSITY (per km^2)	CALCULATED EXPOSURES		TOTALS
		Level A	Level B	
VIBRATORY DRIVING				
bottlenose dolphin	4.15366 / km^2 (all)	0	51	51
CONTINGENCY IMPACT DRIVING				
bottlenose dolphin	4.15366 / km^2 (all)	0	7	7
CALCULATED EXPOSURE TOTALS			**58**	**58**

Sources: U.S. Department of the Navy 2015; U.S. Department of the Navy (2014) Survey Report

Exposed animals could come from any of the four stocks identified in Table 3-1. It is unlikely that takes would occur from the Western North Atlantic Offshore stock, since they are rarely found in the area and would be unlikely to venture into the turning basin. Of the other three stocks, individuals from the Jacksonville Estuarine System and Western North Atlantic Northern

Florida Coastal stocks are likely to be found in the turning basin year-round, while those from the Western North Atlantic Southern Migratory Coastal stock are seasonally present in late winter and early spring. While it is most likely that exposed individuals will belong to either the Jacksonville Estuarine or Western North Atlantic Northern Florida Coastal stocks, takes could occur to any stock.

6. Numbers and Species Taken

By age, sex, and reproductive condition (if possible), the number of marine mammals (by species) that may be taken by each type of taking identified in Section 5, and the number of times such takings by each type of taking are likely to occur.

The methods for estimating the number and types of exposure are described in the sections below, followed by the method for quantifying exposures of marine mammals to sources of energy exceeding those threshold values. Exposure of each was determined by:

- The potential of each species to be impacted by the acoustic sources as determined by the acoustic criterion (81 FR 51693) for marine mammals.
- The potential presence of each species and their estimated density in the zone of influence for the project.
- The area of impact for each pile driving sound source (estimated by taking into account the source levels, propagation loss and thresholds at which each acoustic criterion are met).

Potential exposures were calculated by multiplying the density of each marine mammal species potentially present by the total impacted area for each threshold value by the potential number of days of pile driving.

An introduction to the fundamentals of acoustics and use of the decibel unit can be found in Appendix B.

Assessing whether a sound may disturb or injure a marine mammal involves understanding the characteristics of the acoustic source and the potential effects that sound may have on the animal's physiology and behavior. Although it is known that sound is important for marine mammal communication, navigation, and foraging (National Research Council 2003, 2005), there are many unknowns in assessing impacts such as the potential interaction of different effects and the biological significance of responses by marine mammals to sound exposures (Nowacek et al. 2007; Southall et al. 2007). Furthermore, many factors other than the received level of sound may affect an animal's reaction, such as the animal's physical condition, prior experience with the sound, and proximity to the source of the sound (Nowacek et al. 2007).

Acoustically-mediated behaviors, including social interactions, foraging, and navigation, may be particularly vulnerable to disturbance during pile-driving activities, and it is important to understand the source characteristics of marine mammal vocalizations in order to address potential masking (see Appendix B) and disturbance. The following sections address hearing and sound production of all marine mammals that may be present in the project area during pile driving.

6.1 Hearing and Vocalization for Bottlenose Dolphins

Bottlenose dolphins can typically hear within a broad frequency range of 200 Hz to 160 kHz (Au 1993; Turl 1993), though with exposure during testing some dolphins might receive information as low as 50 Hz (Turl 1993). Electrophysiological experiments suggest the bottlenose dolphin brain has a dual analysis system: one specialized for ultrasonic clicks and another for lower-frequency sounds, such as whistles (Ridgway 2000). Scientists have reported a range of highest sensitivity between 25 and 70 kHz, with peaks in sensitivity at 25 and 50 kHz (Nachtigall et al. 2000). Recent research on the same individuals indicates auditory thresholds obtained by electrophysiological methods correlate well with those obtained in behavior studies, except at the some lower (10 kHz) and higher (80 and 100 kHz) frequencies (Finneran and Houser 2006).

Sounds emitted by bottlenose dolphins have been classified into two broad categories: pulsed sounds (including clicks and burst-pulses) and narrow-band continuous wave sounds (whistles), which usually are frequency modulated. Clicks and whistles have dominant frequency ranges of 110 to 130 kHz and source levels of 218 to 228 dB re 1 μPa-m (Au 1993) and 3.4 to 14.5 kHz and 125 to 173 dB re 1 μPa-m, respectively (Ketten 1998). Whistles are primarily associated with communication and can serve to identify specific individuals (i.e., signature whistles) (Caldwell and Caldwell 1965; Janik et al. 2006). Up to 52% of whistles produced by bottlenose dolphin groups with mother-calf pairs have been classified as signature whistles (Cook et al. 2004).

Sound production is also influenced by group type (single or multiple individuals), habitat, and behavior (Nowacek 2005). Bray calls (low-frequency vocalizations; majority of energy below 4 kHz), for example, are used when capturing fishes, specifically sea trout (*Salmo trutta*) and Atlantic salmon (*Salmo salar*), in some regions (i.e., Moray Firth, Scotland) (Janik 2000). Additionally, whistle production has been observed to increase while feeding (Acevedo-Gutiérrez and Stienessen 2004; Cook et al. 2004). Both whistles and clicks have been demonstrated to vary geographically in terms of overall vocal activity, group size, and specific context (e.g., feeding, milling, traveling, and socializing) (Jones and Sayigh 2002; Zaretsky et al. 2005; Baron 2006). For example, preliminary research indicates characteristics of whistles from populations in the northern Gulf of Mexico significantly differ (i.e., in frequency and duration) from those in the western north Atlantic (Zaretsky et al. 2005; Baron 2006).

6.2 Sound Exposure Criteria and Thresholds

Under the MMPA, NMFS has defined levels of harassment for marine mammals. Level A harassment is defined as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." Level B harassment is defined as "Any act of pursuit, torment, or annoyance which 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."

Since 1997, NMFS has used generic sound exposure thresholds to determine when an activity in the ocean that produces sound might result in behavioral impacts to a marine mammal such that a take by harassment might occur (70 FR 1871). Behavioral harassment (Level B) is considered to have occurred (and thus a "take" is counted) when marine mammals are exposed to impact pile driving below the injury threshold but greater than or equal to 160 dB re 1 µPa rms, and when exposed to vibratory pile driving above 120 dB re 1 µPa rms.

In August 2016 and subsequently in 2018, NMFS issued updated acoustic guidance setting criteria and thresholds for the potential for injurious impacts of sound (Level A harassment) on marine mammal hearing (81 FR 51693). This guidance sets thresholds for permanent and temporary threshold shifts (PTS and TTS, respectively). PTS is considered an injurious impact because the animal's hearing thresholds do not recover to pre-exposure levels.

6.3 Limitations of Existing Noise Criteria

To date, there is no research or data supporting a response by odontocetes to non-impulsive sounds from vibratory pile driving as low as the 120 dB re 1 µPa rms threshold. The application of the 120 dB rms re 1µPa threshold can be problematic because this threshold level can be at or below the ambient noise level of certain locations. For example, noise levels at some industrialized ports in Puget Sound, WA, have been measured at between 120 and 130 dB re 1µPa (Washington State Department of Transportation 2012). As a result, such analyses may be overly conservative, and the threshold level is subject to ongoing discussion due to these issues (74 FR 41684). NMFS is developing new science-based thresholds to improve and replace the current generic exposure level thresholds, but the criteria have not been finalized (79 FR 4672). The 120 dB re 1 µPa rms threshold level for non-impulsive noise originated from research conducted by Malme et al. (1984, 1988) for California gray whale response to non-impulsive industrial sounds such as drilling operations. Based upon observer notes recorded during vibratory pile driving at Wharfs Charlie and Bravo in the Mayport Turning Basin, there was a single instance of dolphins changing direction during pile driving, involving a pod of three dolphins at a distance of 100 m, but it is not known if this behavior was a disturbance response to vibratory noise.

6.4 Ambient Noise

The baseline noise level in the Mayport Turning Basin is referred to as the "ambient noise level". Ambient noise is comprised of sounds produced by a number of natural and anthropogenic sources. Natural noise sources can include wind, waves, precipitation, and biological sources such as shrimp, fish, and cetaceans. These sources produce sound in a wide variety of frequency ranges (Urick 1983; Richardson et al. 1995) and can vary over long (days to years) and short (seconds to hours) time scales. In shallow waters, precipitation may contribute up to 35 dB to the existing sound level, and increases in wind speed of 5 to 10 knots can cause a 5 dB increase in ambient ocean noise between 20 Hz and 100 kHz (Urick 1983). High noise levels may also occur in near shore areas during heavy surf, which may increase low frequency (200 Hz – 2 kHz) underwater noise levels by 20 dB or more within 200 yards of the surf zone (Wilson et al. 1985).

At Mayport, vessel wakes in the St. Johns River may cause breaking waves on shore, contributing to the ambient acoustic environment.

Anthropogenic noise sources also contribute to ambient noise levels, particularly in ports and other high use areas in coastal regions. Normal port activities include vessel traffic (from large ships, support vessels, and security boats), loading and maintenance operations, and other activities (sonar and echo-sounders from commercial and recreational vessels, construction, etc.) which all generate underwater sound (Urick 1983). Additionally, noise produced by mechanized equipment on wharves or adjacent shorelines may propagate underwater and contribute to underwater ambient noise levels.

The underwater acoustic environment in the Mayport Turning Basin is dominated by noise from day-to-day port and vessel activities. The basin is sheltered from most wave noise, but is a high-use area for naval ships, tugboats, and security vessels. When underway, these sources can create noise between 20 Hz and 16 kHz (Lesage et al. 1999), with broadband noise levels up to 180 dB re 1 µPa rms (Table 6-1) Normal port operations, including transits, docking, and maintenance by multiple tugboats and ships would continue. Measurements of background noise in the Mayport Turning Basin were conducted during monitoring of pile driving at Wharf C-2 in June of 2015. 10-second average rms values ranged from 120 – 132 dB rms, with an overall average of 128 dB rms. While this sound level is not necessarily representative of noise levels year-round, it does provide a snapshot view of the acoustic environment within the basin during the season when dolphins are most likely to be present.

The existing sources of anthropogenic noise in the Mayport Turning Basin are generally non-impulsive (see Appendix B), intermittent sources such as vessel engines. Vibratory pile driving is an example of a non-impulsive noise source. Impact pile driving is an example of an impulsive noise source; impulsive noise differs from non-impulsive sources in that it is characterized by a fast rise time and, in the case of impact pile-driving, multiple short-duration (50 – 100 millisecond; Illingworth & Rodkin 2001) events. The use of impact driving during the proposed project is limited to instances when vibratory driving fails, and will be limited to a maximum of 20 strikes per pile and one pile installed via impact driving per day. Because of the very limited use of impact pile driving during the proposed action, the Navy expects no long-term change in the average ambient noise environment with respect to impulsive sounds as a result of impact pile driving.

TABLE 6-1. REPRESENTATIVE LEVELS OF NOISE FROM ANTHROPOGENIC SOURCES

Noise Source	Frequency Range (Hz)	Underwater Noise Level (dB re 1 µPa)
Small vessels[1]	250–6,000	151 dB rms at 1 m
Large vessels[2]	20 – 1,500	170 – 180 dB rms at 1 m
Tug docking barge[3]	200–1,000	149 dB rms at 100 m
Vibratory driving of 24-inch steel sheet pile[4]	50 – 1,500	160 dB rms at 10 m; 160 dB SEL at 10 m
Impact driving of 24-inch steel sheet pile[4]	50 – 1,500	190 dB rms at 10 m; 180 dB SEL at 10 m

m = meter; Sources: [1]Lesage et al. 1999; [2]Richardson et al. 1995; [3]Blackwell and Greene 2002; [4]Illingworth & Rodkin 2015

6.5 Underwater Noise from Pile Driving

Noise levels produced by pile driving are influenced by factors including pile type, driving method, and the physical environment in which the activity takes place. A number of studies have examined sound pressure levels recorded from underwater pile driving projects in California and Washington, creating a large body of data for impact driving of steel pipe piles, concrete piles, and some timber piles (California Department of Transportation 2012, U.S. Navy 2017).

Vibratory driving of steel sheet piles was monitored during the first year of construction at the nearby C-2 Wharf at NAVSTA Mayport during 2015. Measurements were conducted from a small boat in the turning basin and from the construction barge itself. Driving periods ranged from approximately 17 seconds to a little over one minute. Sound levels were recorded at a 10-meter distance and the measured dB levels were converted to pressure values to generate 10-second averages of the levels before converting the values back to dB levels. The average and median of the levels resulted in a source level of 156 dB re 1µPa rms (U.S. Navy 2017). This level was used as a proxy for modeling installation of sheet piles at the South Quay Wall. No impact driving was measured at this location; therefore, proxy levels for impact driving have been calculated from other available source levels.

Measured sound pressure levels for 24 in. diameter steel sheet piles are available for impact driving (CALTRANS 2015). The selected sound pressure levels used for modeling steel piles in this application were 156 dB re 1 µPa rms for vibratory driving and 180 dB SEL and 190 dB rms for impact driving.

6.6 Underwater Sound Propagation

Pile driving can generate underwater noise that may result in disturbance to marine mammals within the project area. Modeling sound propagation is useful in evaluating noise levels to determine which marine mammals may be exposed at a given distance from the pile driving activity. The decrease in acoustic intensity as a sound wave propagates outward from a source is known as transmission loss (TL).

The formula for transmission loss is:

$$TL = B * log_{10}\left(\frac{R_1}{R_2}\right) + C * R_1, \text{ where}$$

B = logarithmic (predominantly spreading) loss

C = linear (scattering and absorption) loss

R_1 = range from source in meters

R_2 = range from driven pile to original measurement location (generally 10 m)

The amount of linear loss (C) is proportional to the frequency of a sound. Due to the low frequencies of sound generated by impact and vibratory pile driving, this factor was assumed to be zero for all calculations in this assessment and transmission loss was calculated using only logarithmic spreading. Therefore, using practical spreading (B=15), the revised formula for transmission loss is $TL = 15 \log_{10} (R_1/10)$.

6.7 Calculated Zones of Influence

The practical spreading loss model discussed above was used to calculate the propagation of pile driving sound in and around the Mayport Turning Basin. A total of 35 days of pile driving were modeled; 30 days of vibratory driving, plus 5 days of contingency impact driving. No sound mitigation methods (bubble curtains, cofferdams, etc.) are proposed and therefore no attenuation was included in the acoustic model.

For vibratory driving, the Level A harassment acoustic analysis used the assumption that a maximum of 15 individual sheet piles would be driven each day. It is estimated it will take up to 30 total minutes of pile driving to install 15 sheet piles. For impact driving, modeling assumed a maximum of 20 strikes of the impact hammer per day on a maximum of 1 pile per day, which is expected to take no more than five to ten minutes to complete.

Radii for the Level A zones of influence were calculated using the NOAA Acoustic Criteria Spreadsheet (Appendix D). Level B ZOIs were calculated using the practical spreading loss model out to the noise thresholds of 160 and 120 dB rms for impact and vibratory driving, respectively. ArcGIS 10.3 was used to create GIS polygons representing the marine mammal injury and behavior ZOIs for both impact and vibratory driving of steel sheet piles. AutoCAD files, provide by project engineers, were converted into ArcGIS features. The digital footprint of the proposed SQW was used as a reference to create each ZOI polygon. The distance that each ZOI extended from the proposed project area was calculated by the NMFS User Spreadsheet (Level A) and practical spreading (Level B). The resulting distances were used to calculate the radial length of a maximum ZOI. Polygons buffered at the radial lengths were created using the ArcGIS Spatial Analyst Buffer tool. The ArcGIS Spatial Analyst Erase tool was then used to remove the areas of each polygon that was over land.

To estimate the eastern and western extent of noise propagation, two straight line features were created in ArcGIS that had origins at west and east corners of the proposed project area at the SQW. The line originating at the western corner of the proposed project area extended in a northeastern direction away from the origin, to the first corner of the eastern shore of the basin (near Wharf Foxtrot), and out across the rest of the basin towards Wharf C-2. The line originating at the eastern corner extended in a northwestern direction from the origin, to the first corner of the western shore of the basin (near Wharf Delta), and out across the rest of the basin towards Wharf Bravo. The ArcGIS Trace tool was used to clip the buffered polygons over the line features (Figures 6-1 and 6-2). Additionally, the areas reported in Table 6-2 were derived from these polygons using the ArcGIS Calculate Geometry tool.

TABLE 6-2. CALCULATED DISTANCES TO / AREAS ENCOMPASSED BY THE UNDERWATER MARINE MAMMAL NOISE THRESHOLDS FOR PILE DRIVING

Pile Type	Driving Method	Threshold	Source Level[1,2]	Distance (m)	Area (km^2)
Steel sheet piles	vibratory	MF Level A (injury): 198 dB SEL_{cum}	156 dB rms	0.2	0.0002
		Level B (behavior): 120 dB re 1µPa rms	156 dB rms	2,512	0.4104
	impact (contingency only)	MF Level A (injury): 185 dB SEL_{cum}	180 dB SEL	1.7	0.0006
		Level B (behavior): 160 dB re 1µPa rms	190 dB rms	1,000	0.3540

dB = decibel; rms = root-mean-square; µPa = micro Pascal; MF = mid-frequency cetacean functional hearing group
1 – Level A takes were calculated using sheets A.1 (vibratory) and E.1 (impact) on the NMFS User Spreadsheet, as shown in Appendix D. 2 – For Impact Level A modeling, a single-strike source level of 179 dB SEL was used to calculate cumulative SEL isopleth.

The calculations presented in Table 6-2 assume a field free of obstruction, which is unrealistic because the Mayport Turning Basin does not represent open water conditions (free field) and sounds will attenuate as they encounter land or other solid obstacles. As a result, the distances calculated may not actually be attained at the project area. The actual distances to the behavioral disturbance thresholds for impact and vibratory pile driving are likely to be shorter than those calculated due to the irregular contour of the waterfront and the maximum fetch (farthest distance sound waves travel without obstruction [i.e. line of sight]) at the project area. Table 6-2 also depicts the actual areas encompassed by the marine mammal thresholds during the project.

Figures 6-1 and 6-2 depict the ZOI for bottlenose dolphins, since that is the only species considered in this IHA application. Note: injury zone for vibratory pile driving is not visible due to the size of the zone (> 1 m) and map scale.

Marine mammal densities were multiplied by the size of the applicable zone of influence to estimate number of incidental takes per day. This number was rounded to the nearest whole number and multiplied by the estimated number of pile-driving days to calculate takes for the entire project. (see Chapter 5).

FIGURE 6-1. INJURY AND BEHAVIORAL ZONES OF INFLUENCE FOR MARINE MAMMALS - VIBRATORY DRIVING OF STEEL SHEET PILES

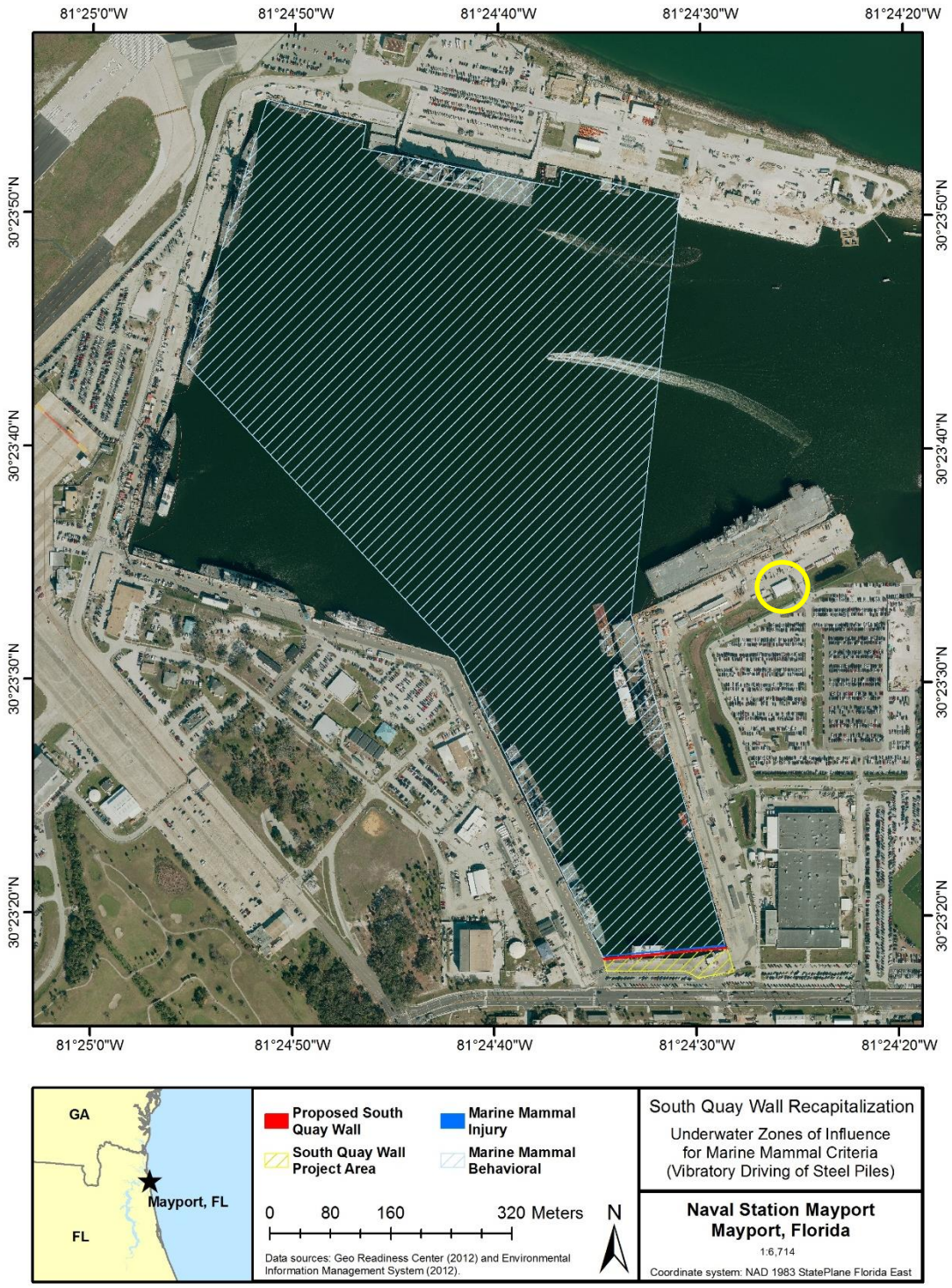
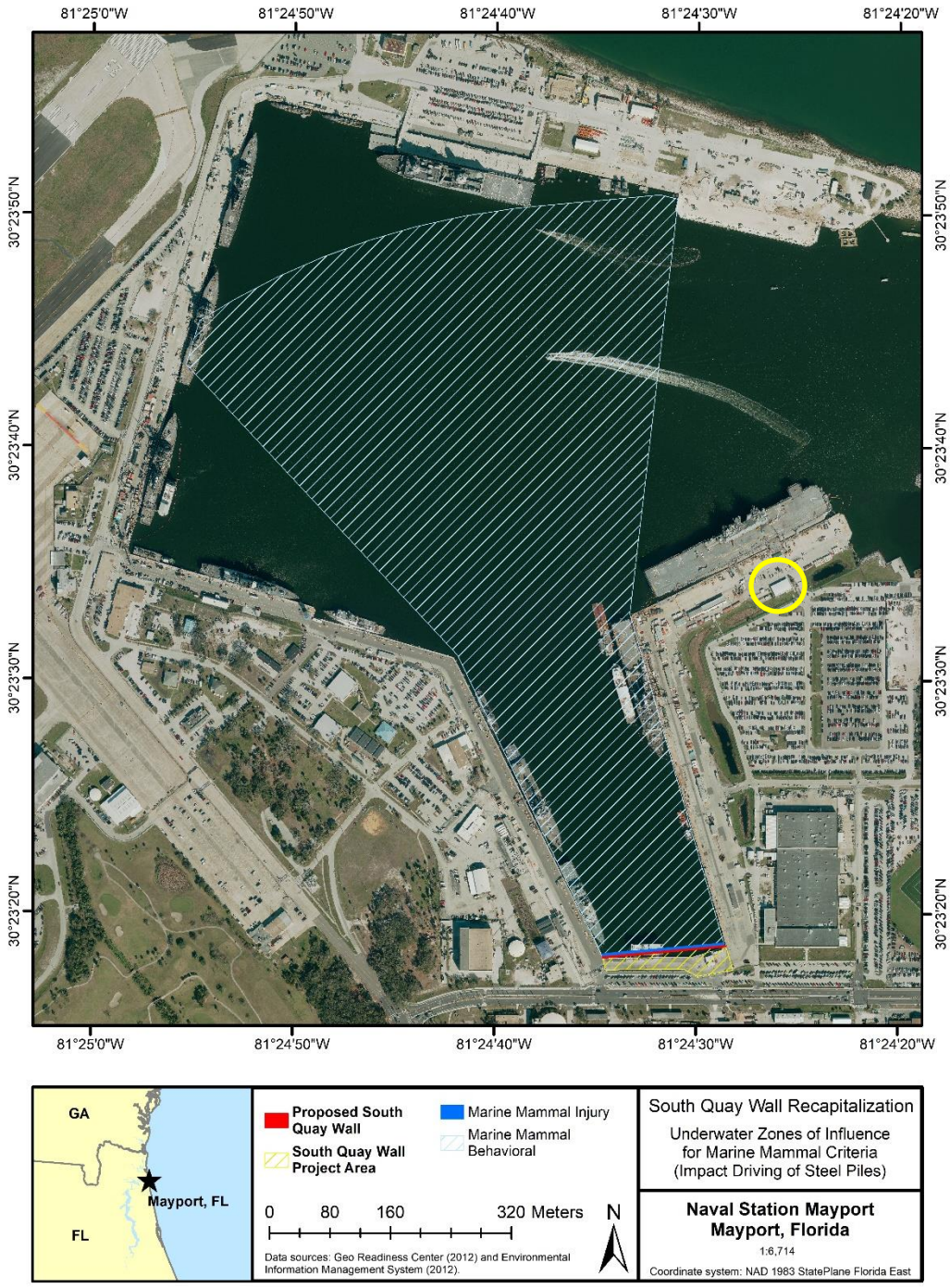


FIGURE 6-2. INJURY AND BEHAVIORAL ZONES OF INFLUENCE FOR MARINE MAMMALS - IMPACT DRIVING OF STEEL SHEET PILES (CONTINGENCY ONLY)



7. Impacts to Marine Mammal Species or Stocks

The anticipated impact of the activity upon the species or stock of marine mammals

The effects of pile driving noise on marine mammals depend on several factors, including:

- Type, depth, intensity, and duration of the pile driving sound,
- the species,
- size of the animal and its proximity to the source,
- depth of the water column,
- substrate of the habitat, and
- sound propagation properties of the environment.

Impacts to marine mammals from pile driving activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the received level and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The farther away from the source, the less intense the exposure will be. The substrate and depth of the habitat affect the sound propagation properties of the environment. Shallow environments are typically more structurally complex, which leads to rapid sound attenuation. In addition, substrates that are soft (i.e., sand), such as those in the Mayport Turning Basin, will absorb and attenuate the sound more readily than hard substrates (rock) which may reflect the acoustic wave. Soft porous substrates will also likely require less time to drive the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source to other locations.

Potential behavioral disturbances are modeled to occur, but the type and severity of these disturbances are difficult to define due to individual differences in response and limited studies addressing the behavioral effects of sounds on marine mammals. The behavioral responses with greatest potential to occur during the proposed project are habituation and temporary relocation (Ridgway et al. 1997; Finneran et al. 2003; Wartzok et al. 2003). The time required to drive each pile by vibratory methods would be less than three minutes. When using impact methods, approximately 20 strikes (no more than five to ten minutes) would be necessary to drive each pile to depth. Given these durations, the potential behavioral disturbances are anticipated to be discreet and brief.

7.1. Potential Physiological Responses

No Level A exposures are expected because of the mitigation measures outlined in Chapter 11 and the conservative modeling assumptions discussed in Chapter 5, but if they occurred, they would be the result of physiological responses to both the type and strength of the acoustic signature (Viada et al. 2008). The only possibility for Level A exposures would be during impact pile driving, and that method would only be used as a contingency in cases when vibratory driving is insufficient (a similar project that has been completed at adjacent Wharf C-1 required

impact pile driving on only seven piles, which required less than two days). Such potential exposures would be mitigated through monitoring, and are not expected to occur. Physiological responses to impact/impulsive sound stimulation range from non-injurious vibration or compression of tissue to injurious tissue trauma, although mitigations would prevent such occurrences during this project. The Navy is aware of how important such mitigations are and understands the risks of injury associated with impulsive sounds. Sound-related trauma can be lethal or sub lethal; lethal impacts are those resulting in immediate death or serious debilitation in or near an intense sound source (Ketten 1995). Ears are the most sensitive organ to pressure and are the organs most sensitive to injury (Ketten 2000). Sub lethal damage to the ear from a pressure wave can rupture the tympanum, fracture the ossicles, and damage the cochlea, cause hemorrhage, or cause leakage of cerebrospinal fluid into the middle ear (Ketten 1995). Sub lethal impacts also include hearing loss, which is caused by exposure to perceptible sounds. Moderate injury implies partial hearing loss. Permanent hearing loss (PTS) can occur when the hair cells of the ear are damaged by a very loud event, as well as by prolonged exposure to noise. PTS is classified as an injurious (Level A) exposure. Instances of temporary threshold shifts (TTS) and/or auditory fatigue are well documented in marine mammal literature as being one of the primary avenues of acoustic impact. Temporary loss of hearing sensitivity has been documented in controlled settings using captive marine mammals exposed to strong sound exposure levels at various frequencies (Ridgway et al. 1997; Kastak et al. 1999; Finneran et al. 2005). While injuries to other sensitive organs are possible, they are less likely since pile driving impacts are almost entirely acoustically mediated, versus explosive sounds which also include a shock wave resulting in damage.

7.2. Potential Behavioral Responses

The intent of the proposed project is to accomplish all pile driving using vibratory pile driving. Impact pile driving would only be used as a contingency in cases when vibratory driving is insufficient. The time required to drive each pile by vibratory methods would be less than 3 minutes, so potential behavioral disturbances are anticipated to be discreet and brief.

Studies of marine mammal responses to vibratory pile driving are limited, but suggest the potential for behavioral disturbance. Marine mammal monitoring at the Port of Anchorage marine terminal redevelopment project (a location with generally high background noise levels [~125 dB rms]) found no response by marine mammals swimming within the threshold distances to noise impacts from construction activities including vibratory and impact pile driving (Integrated Concepts & Research Corporation 2009). However, more recent studies of marine mammal distribution and behavior near windfarm development projects have shown changes to short term behavior and distribution of harbor porpoises and bottlenose dolphins (Graham et al. 2017). When behavioral changes occur, they often involve short-term avoidance of the ensonified area, with animals returning to normal distribution within hours to weeks of the noise ceasing. One study of trained captive bottlenose dolphins in San Diego Bay indicated that vibratory pile driving noise may distract foraging animals from their tasks, but that individuals appeared to acclimate to the novel noise source relatively quickly and compensate for the distraction by increasing the number of echolocation clicks produced (Branstetter et al. 2018). It is worth noting that the studies of wild cetaceans which detected behavioral changes did not take place in industrial harbors like NAVSTA Mayport and had significantly higher source levels than estimated for this project. Habituation may affect the potential for response by animals that

are resident to the area encompassing the Mayport Turning Basin. Based upon observer notes recorded during vibratory pile driving at Wharfs Charlie and Bravo in the Turning Basin, there was a single instance of dolphins changing direction during pile driving, involving a pod of three dolphins at a distance of 100 m, but it is not known if this behavior was a disturbance response to vibratory noise.

Responses to impulsive impact pile driving (if it were to be needed) are expected to be more acute than response to continuous vibratory driving. Controlled experiments with captive marine mammals showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway et al. 1997; Finneran et al. 2003). Observed responses of wild marine mammals to loud impulsive sound sources, including seismic airguns and impact pile driving during construction of windfarms, have been varied, but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002; Dähne et al. 2013; Russell et al. 2016; also see reviews in Gordon et al. 2004; Wartzok et al. 2003; and Nowacek et al. 2007). Source levels from these studies are also much higher than those for this project; lower source levels may lead to decreases in the probability or severity of observed responses.

Regardless of the source, potential behavioral responses to sound are highly variable. The magnitude of each potential behavioral change ultimately determines the severity of the response. A number of factors may influence an animal's response to noise, including its previous experience, its auditory sensitivity, its biological and social status (including age and sex), and its behavioral state and activity at the time of exposure.

A comprehensive review of acoustic and behavioral responses to noise exposure by Nowacek et al. (2007) concluded one of the most common responses is displacement. To assess the significance of displacements, it is necessary to know the areas to which the animals relocate, the quality of that habitat, and the duration of the displacement in the event they return to the pre-disturbance area. Short-term displacement may not be of great concern unless the disturbance happens repeatedly; due to the short duration of in-water work (< 35 days) during this project, chronic displacement of bottlenose dolphins is not expected. Similarly, long-term displacement may not be of concern if adequate replacement habitat is available. The affected habitat within the basin is highly developed and experiences a high level of human use and anthropogenic noise from vessels and port activities, making it poor quality for resting, socializing, and foraging. Animals utilizing this habitat are likely already habituated to most anthropogenic disturbances including pile driving, which has been repeatedly conducted in the basin over the last several years. Potential disturbances due to the proposed pile driving are expected to be intermittent and brief, and animals are expected to return to the area when the pile driving is complete.

Marine mammals exposed to pile driving sound over the course of the project would likely avoid affected areas if they experience noise-related discomfort, although avoidance behavior was not observed during recapitalization activities at Wharfs Charlie and Bravo in the Turning Basin. As described in the section above, individual responses to pile driving noise are expected to be variable. Some individuals may occupy the project area during pile driving without apparent discomfort while others may be displaced with undetermined long-term effects. Avoidance of the affected area during pile driving operations would reduce or eliminate the likelihood of injury impacts, but would also reduce access to foraging areas, although whether or not foraging

opportunities in the project area are better than in areas outside the ZOI is not known. Noise-related disturbance may also inhibit some marine mammals from entering / exiting the Mayport Turning Basin. Given the duration of the project there is a potential for displacement of marine mammals from the affected area due to these behavioral disturbances during the in-water work period. However, the time required to drive each pile by vibratory methods would be less than sixty seconds, so potential behavioral disturbances are anticipated to be discreet and brief. Further, since pile driving will only occur during daylight hours, marine mammals transiting the activity area or foraging or resting in the project area at night will not be affected.

Habituation is a response that occurs when an animal's reaction to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok et al. 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. The opposite process is sensitization—when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. Behavioral state or differences in individual tolerance levels may affect the type of response as well. For example, animals that are resting may show greater behavioral change in response to disturbing noise levels than animals that are highly motivated to remain in an area for feeding (Richardson et al. 1995; National Research Council 2003; Wartzok et al. 2003). Indicators of disturbance may include sudden changes in the animal's behavior or avoidance of the affected area. A marine mammal may show signs that it is startled by the noise and/or it may swim away from the sound source and avoid the area. Increased surfacing time and temporary cessation of foraging in the project area could indicate disturbance or discomfort in marine mammals.

Effects of pile driving activities will be experienced by individual marine mammals, but will not cause population-level impacts or affect the continued survival of the species because the brief and intermittent nature of pile driving is unlikely to cause long term disruptions to biologically significant behaviors important for survival (e.g. foraging, mating).

7.3. Conclusions Regarding Impacts to Species or Stocks

Individual marine mammals may be exposed to high sound pressure levels during pile installation, which may result in Level B behavioral harassment. Any marine mammals exposed (harassed) may change their normal behavior patterns (i.e., swimming speed, foraging habits, etc.) or be temporarily displaced from the area of construction. Any exposures will likely have only a minor effect on individuals and no effect on their populations. The sound generated from vibratory pile driving is non-impulsive, which is not known to cause injury to marine mammals, and mitigations are in place to ensure injury does not occur. Each discreet vibratory pile driving action is also brief, requiring less than three minutes to completely drive a pile. Impact pile driving is anticipated to be seldom used, and only when vibratory driving is insufficient and mitigation is expected to prevent adverse physiological impacts to marine mammals from impact pile driving. Nevertheless, potential behavioral disturbances are unavoidable. The expected level of unavoidable exposure (defined as acoustic harassment) is presented in Chapter 6. This level of effect is not anticipated to have any adverse impact bottlenose dolphins' population recruitment, survival, or recovery (in the case of listed species).

8. Impact on Subsistence Use

The anticipated impact of the activity on the availability of the species or stock of marine mammals for subsistence uses.

Potential marine mammal disturbances resulting from the project will be limited to populations for which there is no known historic or current subsistence use. Therefore, no impacts on the availability of species or stocks for subsistence use are considered.

9. Impacts to Marine Mammal Habitat and the Likelihood of Restoration

The anticipated impact of the activity upon the habitat of the marine mammal populations, and the likelihood of restoration of the affected habitat.

Activities associated with the project are expected to result in removal of a small amount of low-quality habitat in the Mayport Turning Basin between the new and existing bulkheads, and disturb sediments, and benthic and forage fish communities, on a temporary, highly localized scale. The turning basin is dredged regularly to allow for deep draft naval ships' berthing; the last dredging took place during the spring of 2015. This, combined with the amount of vessel traffic in the relatively confined space of the turning basin and the transition to the federal navigation channel, has resulted in a determination the South Quay Wall project area encompasses relatively low quality habitat for most marine species.

Pile installation and deployment of anchors and / or spuds from barges may result in temporary, small scale disturbance of benthic communities and marine vegetation in the immediate vicinity of the project. Benthic organisms may be disturbed, buried or crushed by anchors and/or spuds; this may result in a temporary degradation or loss of isolated foraging habitat for marine mammals. However, sediments and marine vegetation are expected to return to their prior conditions and cover within a short time of the conclusion of the in-water work.

The new surfaces associated with the piles and exposed concrete will likely result in establishment of fouling communities on South Quay Wall itself, and may attract fish and benthic organisms resulting in very small scale shifts in prey distribution.

Overall, small-scale, temporary changes to habitat and community assemblages in the immediate project area are expected to occur, but natural sedimentation and succession / recruitment will likely return the project footprint to pre-construction conditions within a short amount of time after in-water work is completed.

10. Impacts to Marine Mammals from Loss or Modification of Habitat

The anticipated impact of the loss or modification of the habitat on the marine mammal populations involved.

The project is not expected to have any habitat-related effects that could cause significant or long-term consequences for individual or populations of marine mammals because of the relatively small footprint and existing disturbed conditions. Further, all impacts will be temporary, with in-water pile driving work being completed in a maximum of 35 non-consecutive days. Information provided in Chapter 9 (Impacts on Marine Mammal Habitat and the Likelihood of Restoration) indicates there may be temporary impacts, but those impacts would be limited to the immediate area within the Mayport Turning Basin. Impacts will cease upon the completion of activities associated with the project.

11. Means of Affecting the Least Practicable Adverse Impacts –

The availability and feasibility (economic and technological) of equipment, methods, and manner of conducting such activity or other means of affecting the least practicable adverse impact upon the affected species or stocks, their habitat, and on their availability for subsistence uses, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Minimization Measures

The Navy shall employ the measures listed in this section to avoid and minimize impacts to marine mammals and their habitats. Best Management Practices (BMPs) are intended to avoid and minimize potential environmental impacts. BMPs and minimization measures are included in the construction contract plans and specifications and must be agreed upon by the contractor prior to any construction activities. Upon signing the contract, it becomes a legal agreement between the contractor and the Navy. Failure to follow the prescribed BMPs and minimization measures is a contract violation.

As specified in Chapter 13 of this document, a separate monitoring plan has been submitted for this project; please refer to that document for additional details.

General Construction Best Management Practices

1. All work shall adhere to performance requirements of the Clean Water Act, Section 404 permit and Section 401 Water Quality Certification. No in-water work shall begin until after issuance of regulatory authorizations.
2. The construction contractor is responsible for preparation of an Environmental Protection Plan. The plan shall be submitted and implemented prior to the commencement of any construction activities and is a binding component of the overall contract. The plan shall identify construction elements and recognize spill sources at the site. The plan shall outline BMPs, responsive actions in the event of a spill or release, and notification and reporting procedures. The plan shall also outline contractor management elements such as personnel responsibilities, project site security, site inspections, and training.
3. No petroleum products, lime, chemicals, or other toxic or harmful materials shall be allowed to enter surface waters.
4. Washwater resulting from washdown of equipment or work areas shall be contained for proper disposal, and shall not be discharged unless authorized.
5. Equipment that enters surface waters shall be maintained to prevent any visible sheen from petroleum products.
6. No oil, fuels, or chemicals shall be discharged to surface waters, or onto land where there is a potential for re-entry into surface waters shall occur. Fuel hoses, oil drums, oil or fuel transfer valves, fittings, etc. shall be checked regularly for leaks, and be maintained and stored properly to prevent spills.
7. No cleaning solvents or chemicals used for tools or equipment cleaning shall be discharged to ground or surface waters.

8. Construction materials shall not be stored where high tides, wave action, or upland runoff could cause materials to enter surface waters.
9. Barge operations shall be restricted to tidal elevations adequate to prevent grounding of a barge.

Pile Installation Best Management Practices

1. Oil-absorbent materials shall be used in the event of a spill if any oil product is observed in the water.
2. All creosote-treated material and associated sediments shall be disposed of in a landfill that meets Florida environmental standards.
3. Pilings that break or are already broken below the waterline may be removed by wrapping the piles with a cable or chain and pulling them directly from the sediment with a crane. If this is not possible, they shall be removed with a clamshell bucket. To minimize disturbance to bottom sediments and splintering of piling, the contractor shall use the minimum size bucket required to pull out piling based on pile depth and substrate. The clam shell bucket shall be emptied of piling and debris on a contained barge before it is lowered into the water. If the bucket contains only sediment, the bucket shall remain closed and be lowered to the mud line and opened to redeposit the sediment. Sediments associated with broken pile removal (if any) shall be contained on a barge. If a barge is not utilized, piles and sediments may be stored in a containment area near the construction site.
4. Any floating debris generated during installation shall be retrieved. Any debris in a containment boom shall be removed by the end of the work day or when the boom is removed, whichever occurs first. Retrieved debris shall be disposed of at an upland disposal site.
5. Whenever activities that generate sawdust, drill tailings, or wood chips from treated timbers are conducted, tarps or other containment material shall be used to prevent debris from entering the water.
6. If excavation around piles to be replaced is necessary, hand tools or a siphon dredge shall be used to excavate around piles to be replaced.

Timing Restrictions

All in-water construction activities shall occur during daylight hours (one hour post sunrise to one hour prior to sunset[1]). Non in-water construction activities could occur between 6:00 AM and 10:00 PM during any time of the year.

Additional Minimization Measures for Marine Mammals

The following minimization measures shall be implemented during pile driving to avoid marine mammal exposure to Level A injurious noise levels generated from impact pile driving and to reduce to the lowest extent practicable exposure to Level B disturbance noise levels.

[1] Sunrise and sunset are to be determined based on the National Oceanic and Atmospheric Administration data which can be found at http://www.srrb.noaa.gov/highlights/sunrise/sunrise.html.

Coordination

The Navy shall conduct a pre-construction briefing with the contractor. During the briefing, all personnel working in the project area shall watch the Navy's Marine Species Awareness Training video.

Acoustic Minimization Measures

Vibratory installation shall be used to the extent possible to drive steel piles to minimize higher sound pressure levels associated with impact pile driving.

Soft Start

The objective of a soft-start is to provide a warning and / or give animals in close proximity to pile driving a chance to leave the area prior to an impact driver operating at full capacity; thereby, exposing fewer animals to loud underwater and airborne sounds. A soft start procedure shall be used at the beginning of each day's in-water pile driving or if pile driving has ceased for more than 30 minutes, for impact driving only.

The contractor shall provide an initial set of strikes from the impact hammer at reduced energy, followed by a 30-second waiting period, then two subsequent sets. (The reduced energy of an individual hammer cannot be quantified because they vary by individual drivers. Also, the number of strikes will vary at reduced energy because raising the hammer at less than full power and then releasing it results in the hammer "bouncing" as it strikes the pile resulting in multiple "strikes").

Standard Conditions

Conditions in this section include those that will be followed for the protection of all ESA-listed species, not only those being addressed in this application. The contractor will adhere to all requirements of the following:

- 2011 Standard Manatee Conditions for In-Water Work
- Sea Turtle and Smalltooth Sawfish Construction Conditions
- Southeast Regional Marine Mammal and Sea Turtle Viewing Guidelines

Sea Turtle Lighting Conditions

- Lighting on construction equipment shall be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the nearby marine turtle nesting beach while still being consistent with human safety requirements.

- All permanent exterior lighting fixtures associated with the wharf redevelopment should be assessed by NAVSTA Mayport Environmental Department and designed according to the NAVSTA Mayport Light Management Plan to minimize light contribution to urban sky glow which could be visible from the marine turtle nesting beach.

Visual Monitoring and Shutdown Procedures

A separate Marine Species Monitoring Plan will be submitted to NMFS and USFWS; it includes all details for monitoring. Major components of the monitoring plan are summarized below.

Observers and Procedures

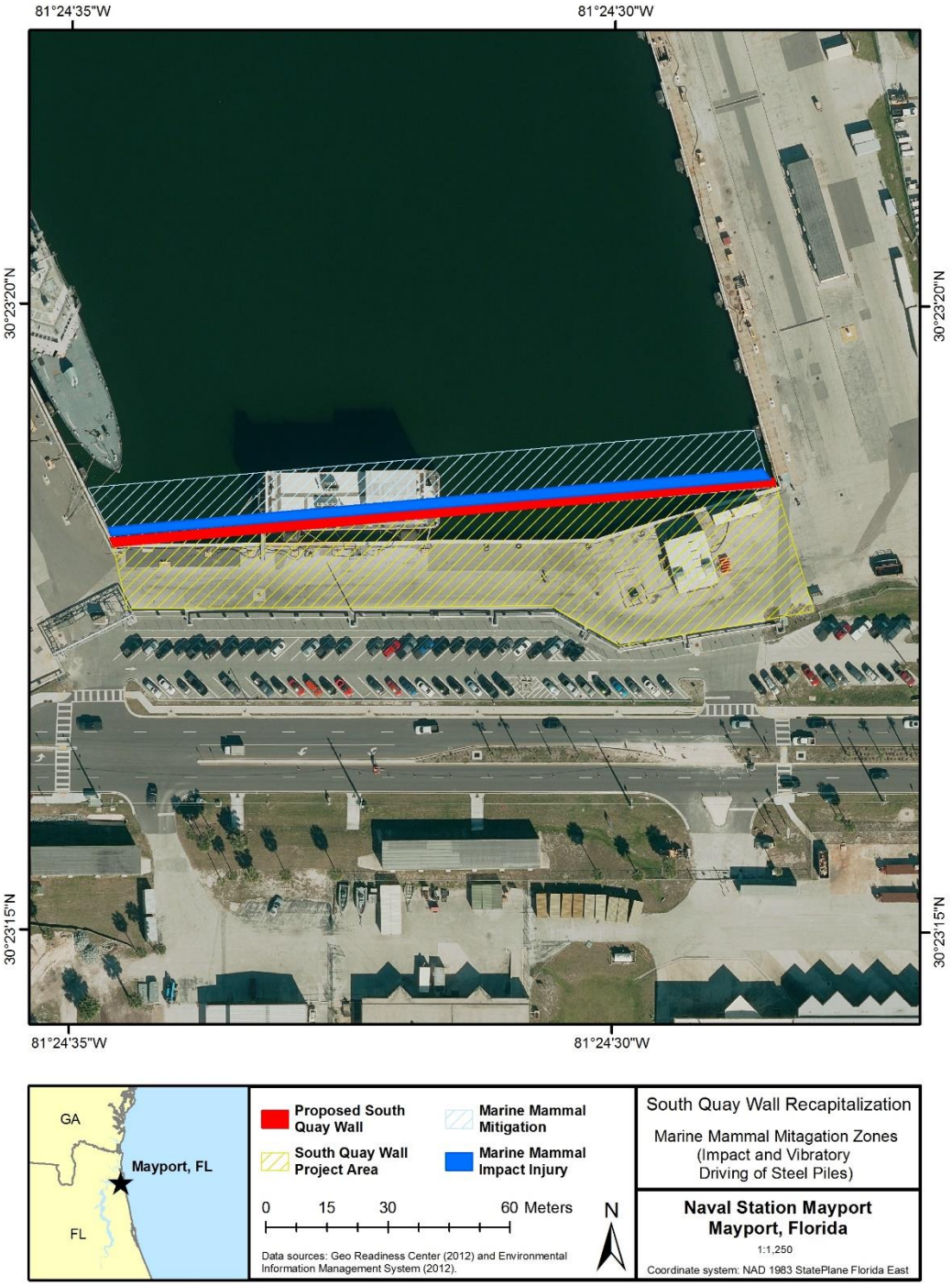
The Navy shall conduct a pre-construction briefing with the contractor. During the briefing, all contractor personnel working in the project area will watch the Navy's Marine Species Awareness Training video. An informal guide will be included with the Monitoring Plan to aid in identifying species should they be observed in the vicinity of the project.

At all times during in-water work, two marine species observers ("observers") designated by the contractor will be placed at the best vantage point(s) practicable to monitor for protected species and implement shutdown/delay procedures when applicable by calling for the shutdown to equipment operators. The observers shall have no other construction related tasks while conducting monitoring. Potential locations for the two marine mammal observers include the construction barge and the top floor of the Port Operations building (the yellow-circled building in Figures 6-1 and 6-2), which has a view of the entire turning basin.

Methods

The observers shall monitor the entire shutdown zone (Figure 11-1) before, during, and after pile driving. The shutdown zone for all in-water work (i.e. during impact and vibratory pile driving) shall be 15 m (50 ft.) from the pile being driven. The observers will have full visibility of the shutdown zone regardless of the type of driving taking place, and will be able to immediately report a marine mammal observation and initiate shutdown procedures.

FIGURE 11-1. SHUTDOWN ZONES FOR VIBRATORY AND (CONTINGENCY ONLY) IMPACT PILE DRIVING



The observer(s) shall be placed at the best vantage point practicable (e.g. from a small boat, construction barges, on shore, or any other suitable location) to monitor for marine species and implement shutdown/delay procedures when applicable by calling for the shutdown to the equipment operator(s). Elevated positions are preferable; it shall be the contractor's responsibility to ensure that appropriate safety measures are implemented to protect observers on elevated observation points. If a boat is used for monitoring, the boat will maintain minimum distances from all species (should they occur) as described in the Southeast Region Marine Mammal and Sea Turtle Viewing Guidelines.

During all observation periods, observers would use binoculars and the naked eye to search continuously for marine mammals and ESA-listed species (with the exception of fish, which are not likely to be visible from the surface). If the shutdown zone is obscured by fog or poor lighting conditions, pile driving will not be initiated, and will cease if already in progress, until the entire shutdown zone is visible.

Pre-Activity Monitoring

The shutdown zone will be monitored for 30 minutes prior to in-water construction/demolition activities. If a protected species is observed in or approaching the shutdown zone, the activity shall be delayed until the animal(s) leaves the shutdown zone. Activity would resume only after the observer has determined, through re-sighting or by waiting 15 minutes that the animal(s) has moved outside the shutdown zone. The observer(s) will notify the monitoring coordinator/construction foreman / point of contact (POC) when construction activities can commence.

Activity Monitoring

The shutdown zone will always be a minimum of 15 m (50 ft.) to prevent injury from physical interaction of protected species with construction equipment (Figure 11-1).

If a protected species approaches or enters a shutdown zone during any in-water work, activity will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without re-detection of the animal. Note: protected fish species will not likely be visible to observers at the surface.

Bulkhead sheet pile installation shall be completed only after confirmation that no manatees or marine turtles will be trapped in the area to be filled between the existing and new bulkheads.

Post-Activity Monitoring

Monitoring of the shutdown zone will continue for 30 minutes following the completion of the activity.

Data Collection

The following information will be collected on sighting forms used by observers:

- Date and time that pile driving activities begin and end
- Construction activities occurring during each observation period
- Weather parameters identified in the acoustic monitoring (e.g., wind, temperature, percent cloud cover, and visibility)
- Tide and sea state

If a protected species approaches or enters the shutdown zone, the following information will be recorded once shutdown procedures have been implemented:

- Species, numbers, and if possible sex and age class of the species
- Behavior patterns observed, including bearing and direction of travel
- Location of the observer and distance from the animal(s) to the observer

If possible, photographs of the animal(s) will be taken and forwarded to the Naval Facilities Engineering Command Southeast Environmental point of contact.

Data collection forms shall be furnished to the Environmental point of contact within a mutually agreeable timeframe.

Interagency Notification

If the Navy encounters an injured, sick, or dead marine mammal, NMFS will be notified immediately. Such sightings will be called into the NMFS Stranding Coordinator for the Southeast:

Erin Fougeres, Ph.D.
Marine Mammal Stranding Program Administrator
NOAA Fisheries
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701
e-mail: erin.fougeres@noaa.gov
office: 727-824-5323
fax: 727-824-5309

The Navy will provide NMFS with the species or description of the animal(s), the condition of the animal (including carcass condition if the animal is dead), location, the date and time of first discovery, observed behaviors (if alive), and photo or video (if available).

In preservation of biological materials from a dead animal, the finder (i.e. marine mammal observer) has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed. Observers should not handle dead animals.

Reporting

A draft report of any incidents of marine mammals entering the shutdown zone will be forwarded to NMFS / USFWS no later than 14 May 2021. A final report would be prepared and submitted to NMFS within 30 days following receipt of comments on the draft report from NMFS.

In the event that the project requires more than one year of in-water work, a report on the first year of pile driving would be submitted to NMFS no later than 60 days prior to the projected issuance date.

12. Minimization of Adverse Effects on Subsistence Use

Where the proposed activity would take place in or near a traditional Arctic subsistence hunting area and/or may affect the availability of a species or stock of marine mammal for Arctic subsistence uses, the applicant must submit either a plan of cooperation or information that identifies what measures have been taken and/or will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses. A plan must include the following:

(i) A statement that the applicant has notified and provided the affected subsistence community with a draft plan of cooperation;

(ii) A schedule for meeting with the affected subsistence communities to discuss proposed activities and to resolve potential conflicts regarding any aspects of either the operation or the plan of cooperation;

(iii) A description of what measures the applicant has taken an/or will take to ensure that proposed activities will not interfere with subsistence whaling or sealing; and

(iv) What plans the applicant has to continue to meet with the affected communities, both prior to and while conducting activity, to resolve conflicts and to notify the communities of any changes in the operation.

As detailed in Chapter 8, no impacts on the availability of species or stocks for subsistence use are considered. Therefore, no minimization efforts are applicable.

13. Monitoring and Reporting Measures

The suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species, the level of taking or impacts on populations of marine mammals that are expected to be present while conducting activities and suggested means of minimizing burdens by coordinating such reporting requirements with other schemes already applicable to persons conducting such activity. Monitoring plans should include a description of the survey techniques that would be used to determine the movement and activity of marine mammals near the activity site(s) including migration and other habitat uses, such as feeding.

A separate Marine Species Monitoring Plan is being submitted to NMFS. It includes all details for project monitoring efforts.

14. Research

Suggested means of learning of, encouraging, and coordinating research opportunities, plans, and activities relating to reducing such incidental taking and evaluating its effects.

At this time the Navy does not anticipate any specific research conducted in conjunction with the project.

The Navy strives to be a world leader in marine species research and has provided more than $100 million over the past five years to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to increase the understanding of marine species physiology and behavior.

The Navy sponsors 70 percent of all U.S. research concerning the effects of human-generated sound on marine mammals and 50 percent of such research conducted worldwide. Major topics of Navy-supported research include the following:

- Gaining a better understanding of marine species distribution and important habitat areas
- Developing methods to detect and monitor marine species before and during training
- Understanding the effects of sound on marine mammals
- Developing tools to model and estimate potential effects of sound

The Navy has sponsored several workshops to evaluate the current state of knowledge and potential for future acoustic monitoring of marine mammals. The workshops brought together acoustic experts and marine biologists from the Navy and outside research organizations to present data and information on current acoustic monitoring research efforts and to evaluate the potential for incorporating similar technology and methods into Navy activities. The Navy supports research efforts on acoustic monitoring and will continue to investigate the feasibility of passive acoustics as a potential monitoring tool. Overall, the Navy will continue to research and contribute to university/external research to improve the state of the science regarding marine species biology and acoustic effects. These efforts include monitoring programs, data sharing with NMFS from research and development efforts, and future research as previously described.

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