DRAFT ENVIRONMENTAL ASSESSMENT

WHARF C-2 RECAPITALIZATION
AT NAVAL STATION MAYPORT, FL

August 2013

Abstract: This environmental assessment identifies and evaluates the potential effects of recapitalizing Wharf Charlie Two at Naval Station Mayport. Recapitalization includes demolishing and replacing the existing concrete pile cap, wharf deck, and utilities and installation of a new steel king pile/sheet pile bulkhead around the existing Wharf Charlie Two.

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EXECUTIVE SUMMARY

The Navy proposes to recapitalize (renovate and modernize) Wharf Charlie Two (C-2) at Naval Station (NAVSTA) Mayport. This recapitalization project includes the demolition and replacement of the existing concrete pile cap, wharf deck, and utilities and installation of a new steel king pile/sheet pile bulkhead around the existing Wharf C-2. The project will result in a wharf footprint increase of approximately 1,322 square meters and a minor increase in lighting on and around the wharf surface.

The need for the proposed action is based on the failing functionality and structural integrity of the wharf, which has deteriorated since it was built in 1960. The continued deterioration has caused material voids and failure of wharf deck paving, which have resulted in load restrictions on the wharf.

Two Alternatives have been evaluated in this Environmental Assessment (EA): an Action Alternative and a No Action Alternative. The Action Alternative includes installation of 120 single sheet piles, 119 king piles and 50 polymeric (plastic) fender piles. A maximum of 70 days of in-water pile driving work will take place over a 12-month period. These piles will be driven using both vibratory and impact driving methods. Impact driving will be a contingency employed only if vibratory methods are inadequate; a similar project that has been completed at adjacent Wharf Charlie One required impact pile driving on only seven piles. Therefore, if impact driving is needed, it will be temporary and of a very short duration. Contingency dredging of up to 4,000 cubic yards of sediment may be conducted if needed; a clamshell dredge would be used if dredging were performed.

Under the No Action Alternative, the Wharf C-2 recapitalization project would not occur, resulting in the continued deterioration of the Wharf’s infrastructure. This would continue to place the structural integrity of the wharf and the continuation of operational requirements in jeopardy. Any further deterioration could result in a complete loss of the wharf at NAVSTA Mayport.

The anticipated impacts of the Action Alternative are primarily noise- related resulting from pile driving. The analysis in the EA indicated these impacts would be short term in nature (maximum of 70 days). The ambient noise and underwater sound associated with pile driving could have an effect on wildlife (fish, birds, marine mammals, federally listed species, and benthic invertebrates) occurring within the project area. As such, this EA analyzed the impacts to these species as well as marine vegetation and essential fish habitat.

In accordance with the Navy’s National Environmental Policy Act (NEPA) policies, all applicable consultations will be obtained as part of this EA.

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LIST OF ACRONYMS AND ABBREVIATIONS

BMPs	best management practices
C-2	Charlie Two
CZMA	Coastal Zone Management Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CVN	aircraft carrier, nuclear
°C	degrees Celsius
dB	decibels
dBA	A-weighted sound level
DOD	Department of Defense
DON	Department of the Navy
DPS	distinct population segment
°F	degrees Fahrenheit
FR	Federal Regulations
ESA	Endangered Species Act
EA	environmental assessment
EIS	environmental impact statement
EFH	essential fish habitat
ft	feet
FDEP	Florida Department of Environmental Protection
FWC	Florida Fish and Wildlife Conservation Commission
FONSI	Finding of No Significant Impact
HAPC	habitat areas of particular concern
Hz	Hertz
IHA	Incidental Harassment Application
kHz	kilohertz

km2	square kilometer
m	meter
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
μPa	microPascals
mg/L	milligrams per liter
NMSDD	Navy Marine Species Density Database
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NAVSTA	Naval Station
OPNAVINST	Chief of Naval Operations Instruction
Pa	Pascals
PTS	permanent threshold shift
rms	root mean squared
SEL	sound exposure level
SPL	sound pressure level
SAFMC	South Atlantic Fishery Management Council
SSP	steel king pile/sheet pile wall system
TTS	temporary threshold shift
U.S.	United States
U.S.C.	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

1 Proposed Action, Purpose and Need

1.1 Introduction

The Navy proposes to recapitalize (renovated and modernize) Wharf Charlie Two (C-2) at Naval Station (NAVSTA) Mayport. NAVSTA Mayport is located in northern Florida east of Jacksonville along the St. Johns River and the Atlantic Ocean (Figure 1-1). NAVSTA Mayport maintains and operates facilities which provide support to the operations of deploying home based and transient Navy ships, aviation units, and staff. NAVSTA Mayport also provides logistic support for operating forces, dependent activities, and other commands as assigned. NAVSTA Mayport covers approximately 3,409 acres and supports more than 60 commands, detachments, and private organizations. NAVSTA Mayport is homeport to 16 surface ships and routinely hosts port visits by various deep draft ships including nuclear-powered aircraft carriers.

1.2 Proposed Action

The proposed action is to recapitalize (renovate and modernize) Wharf C-2 at NAVSTA Mayport. This recapitalization project includes the demolition and replacement of the existing concrete pile cap, wharf deck, and utilities and installation of a new steel king pile/sheet pile bulkhead around the existing Wharf C-2. The project will result in a wharf footprint increase of approximately 1,322 square meters and a minor increase in lighting on and around the wharf surface.

Construction of the wharf will occur over an 18 month period projected to begin on or after September 30, 2013. The project will include installation of approximately 120 single sheet piles, 119 king piles and 50 polymeric (plastic) fender piles. A maximum of 70 days of in-water pile driving work will take place over a 12-month period. These piles will be driven using both vibratory and impact driving methods. Impact driving will be a contingency employed only if vibratory methods are inadequate; a similar project that has been completed at adjacent Wharf Charlie One required impact pile driving on only seven piles. Therefore, if impact driving is needed, it will be temporary and of a very short duration. Section 2.1.2 describes all the elements of the proposed action in more detail.

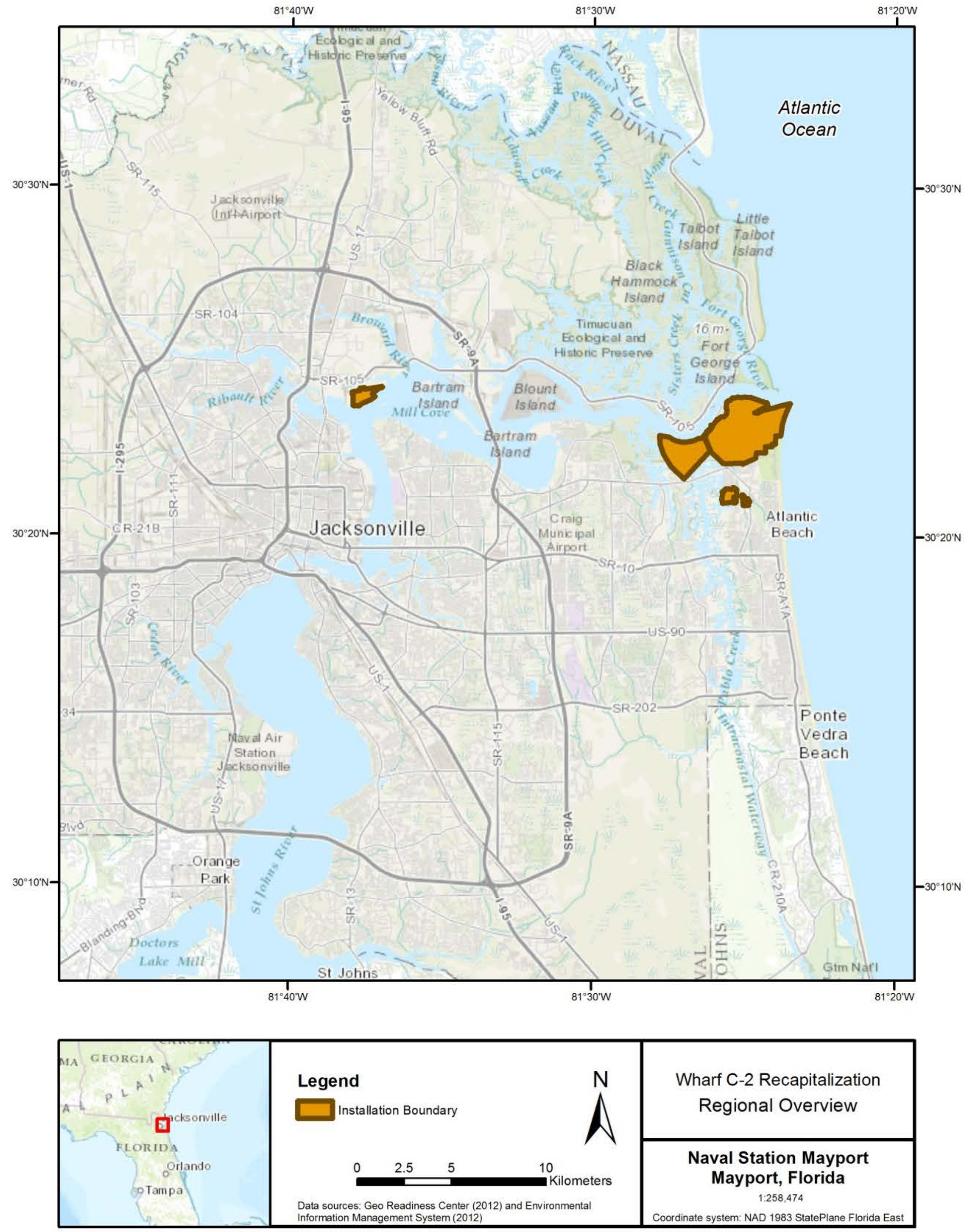

Figure 1-1. NAVSTA Mayport Regional Overview

1.3 Project Area Description

For the purposes of this assessment, the project area includes the NAVSTA Mayport turning basin out to the limit of the most distant of the acoustic thresholds (airborne and in-water) for all protected species being addressed for the Wharf C-2 Recapitalization project In the absence of official airborne criteria for any protected species, the Navy has adopted the City of Jacksonville's airborne noise limit of 65 dBA at any sensitive receptor as the in-air boundary of the project area (Jacksonville Environmental Protection Board 1995). For the proposed action, the most distant underwater threshold is the marine mammal behavioral disturbance (120 dB re 1 μPa rms) threshold. The airborne and underwater zones of influence were modeled (see Sections 3.3.4.2.1 and 3.4.3.2.13) and incorporated into a single-boundary layer (Figure 1-2).

NAVSTA Mayport ship berthing facilities are provided at 16 berthing locations along wharves A through F located around the turning basin perimeter. The turning basin is approximately 2,000 by 3,000 feet (ft) in size, and is connected to the St. Johns River by a 500 ft wide entrance channel. A port security barrier has been installed at the mouth of the turning basin and there is a restricted area that prohibits all persons, vessels, and craft, except those vessels operated by the U.S. Navy, visiting foreign navies, and the U.S. Coast Guard, from entering except in cases of extreme emergency (Figure 1-3). NAVSTA Mayport's approximately one mile-long beach is closed to the general public and is patrolled by the NAVSTA Mayport Security Department.

Wharf C-2 lies along the northern edge of the NAVSTA Mayport turning basin. Wharf C-2 is a single level, general purpose berthing wharf that was constructed in 1960. Wharf C-2 is 608 ft long, 125 ft wide, and has a berthing depth of 50 ft mean lower low water. The wharf is one of two primary deep draft berths and is one of the primary ordnance handling wharfs for the Naval Station. The wharf is a diaphragm steel sheet pile cell structure with a concrete apron, partial concrete encasement of the piling and an asphalt paved deck.

Currently, the wharf is in poor condition due to the advanced deterioration of the steel sheeting and lack of corrosion protection. Due to the structural deterioration of the wharf, load restrictions have been instituted that limit loads to a maximum of 4,500 pounds within 60 ft of the face of the wharf.

1.4 Purpose and Need

Adequate and efficiently configured facilities are required to provide general purpose ordnance loading and maintenance berthing for ships homeported at and visiting NAVSTA Mayport. The purpose of the proposed action is to resolve the increasing deterioration of the bulkhead so facilities can provide adequate ship berthing, cold iron support and ordnance handling capability. Cold iron support encompasses providing shore based power and support to vessels during periods of maintenance and long term shutdown of main and auxiliary engines.

The need for the proposed action is based on the failing functionality and structural integrity of the wharf, which has deteriorated since it was built in 1960. The continued deterioration has caused material voids and failure of wharf deck paving, which have resulted in load restrictions on the wharf.

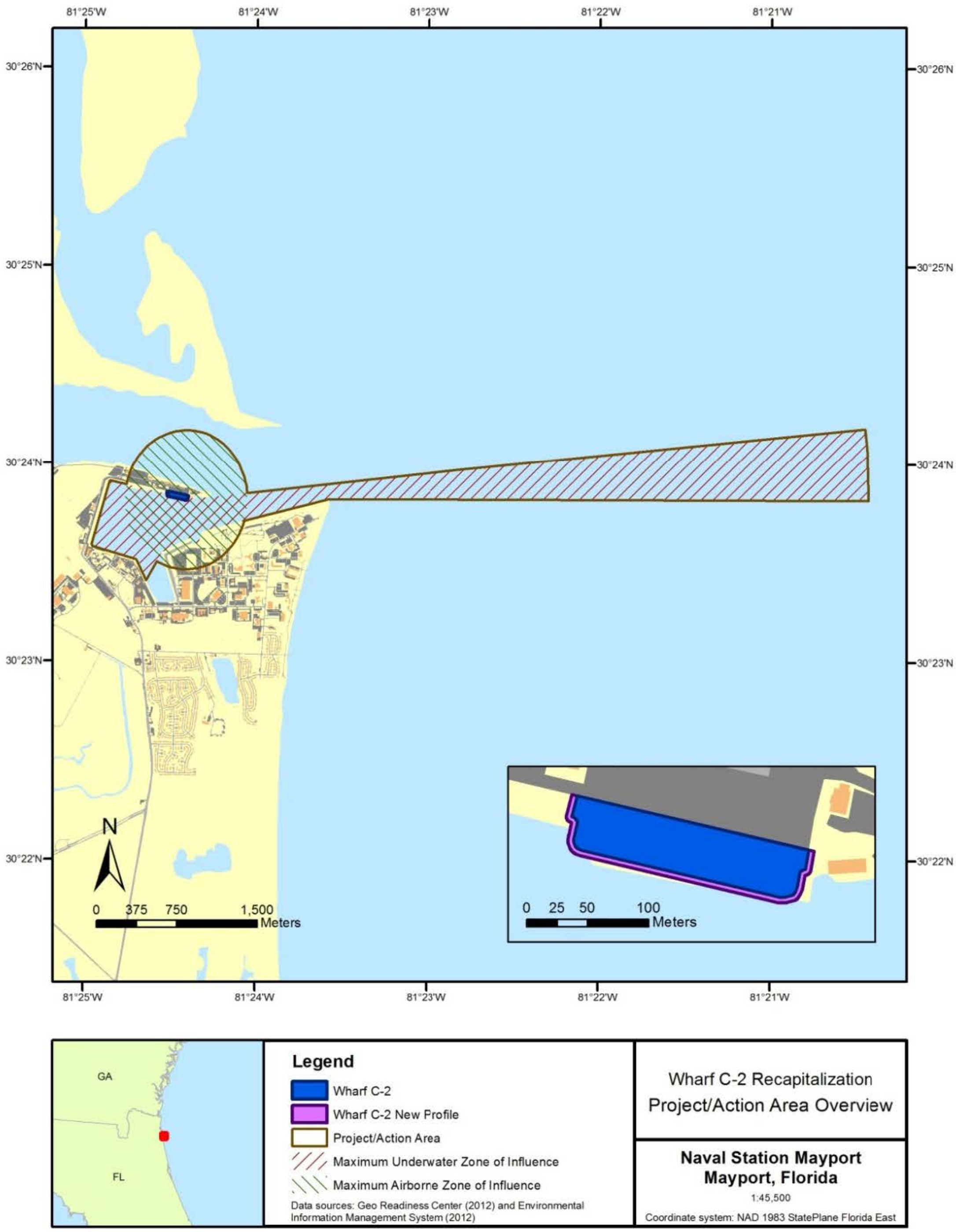

Figure 1-2. Project Area Overview[1]

[1] The project area boundary was defined with a combination of airborne and underwater noise thresholds. Land within the project area (circular portions) is a result of airborne noise thresholds.

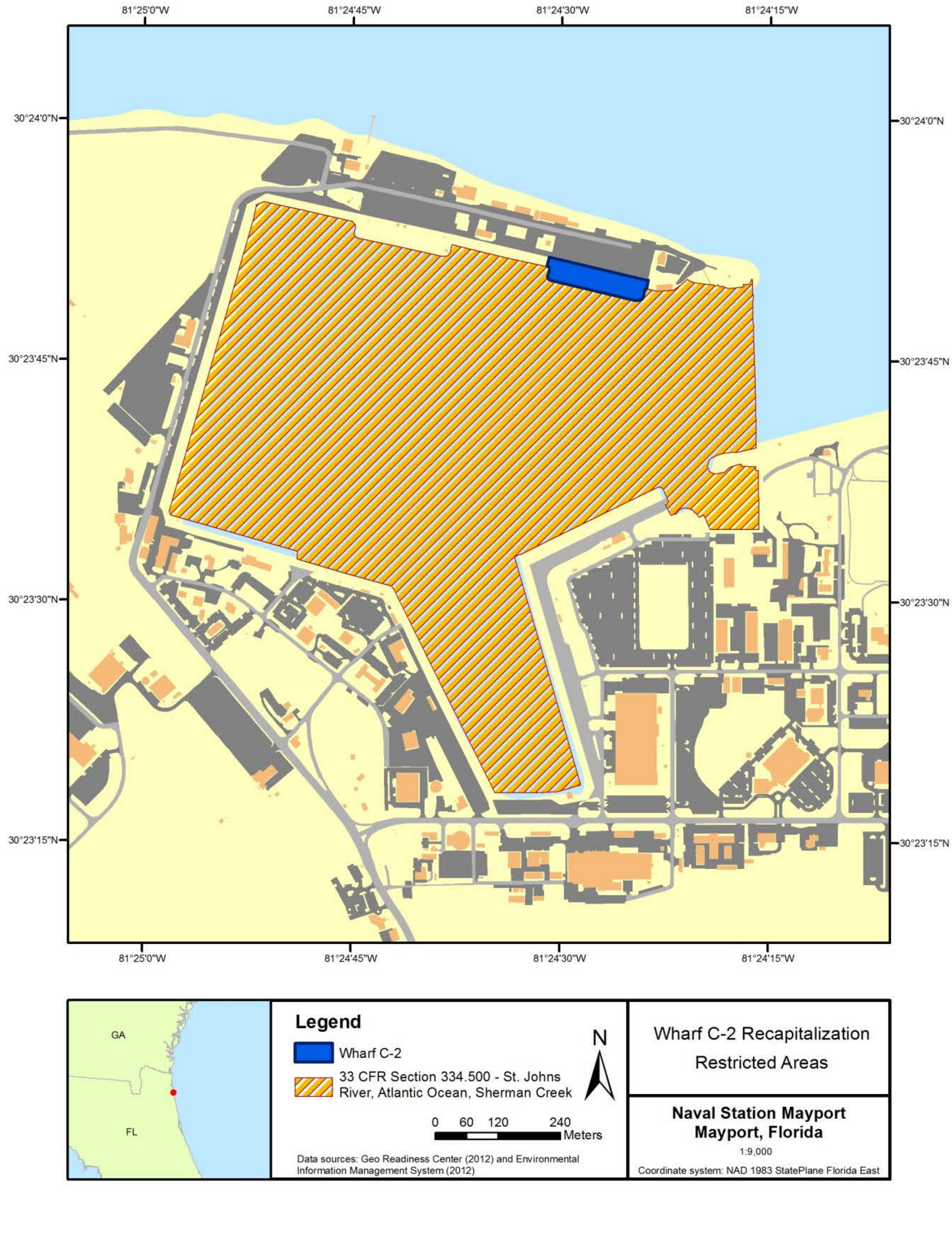

Figure 1-3. Restricted Area

1.5 Environmental Review Process

1.5.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969 requires the consideration of potential environmental consequences of federal actions. Regulations for federal agency implementation of the Act were established by the President's Council on Environmental Quality (CEQ). Under NEPA, federal agencies must prepare an environmental assessment (EA) or an environmental impact statement (EIS) for any major federal action, except those actions that are determined to be "categorically excluded" from further analysis.

An EA is a concise public document that provides sufficient analysis for determining whether the potential environmental impacts of a proposed action are significant, resulting in the preparation of an EIS, or not significant, resulting in the preparation of a Finding of No Significant Impact (FONSI). An EIS is prepared for those federal actions that may significantly affect the quality of the human environment. Thus, if the Navy were to determine that the proposed action would have a significant impact on the quality of the human environment, an EIS would be prepared. An EA should include: brief discussions of the purpose and need for the proposal, the proposed action, the alternatives, the affected environment, the environmental impacts of the proposed action and alternatives, a listing of agencies and persons consulted and a discussion of the cumulative impacts associated with the alternatives.

This EA will be reviewed by the lead agency, the Navy, representatives of which will make a determination regarding the proposed action and whether a FONSI or an EIS is appropriate. Should the Navy conclude that a FONSI is appropriate; a FONSI summarizing the issues presented in this EA will be prepared. The FONSI would be signed by the Navy and a notice of availability would be published in local newspapers in Jacksonville, Florida.

The Navy has prepared this EA in accordance with applicable federal and state regulations and instructions, as well as with other applicable laws, rules and policies. These include, but are not limited to, the following:

- NEPA as amended by Public Law 94-52, July 3, 1975 (42 U.S.C. 4321 *et seq.*), which requires environmental analysis for major federal actions significantly affecting the quality of the environment.
- CEQ regulations, as contained in 40 Code of Federal Regulations (CFR) Parts 1500 to 1508, which direct federal agencies on how to implement the provisions of NEPA.
- Navy Regulations for Implementing NEPA 32 CFR Part 775.
- Chief of Naval Operations Instruction (OPNAVINST) 5090.1C CH-1.

1.5.2 Agency Coordination and Permit Requirements

This EA will focus its analysis of impacts based on the appropriate and relevant laws, regulations, permits, and licenses that are applicable to the proposed action, including the following (see Appendix A for agency correspondence):

- Permit from the U.S. Army Corps of Engineers, Jacksonville District in accordance with Section 10 of the Rivers and Harbors Appropriation Act of 1899.

- Federal Coastal Consistency Determination concurrence by the Florida Department of Environmental Protection (FDEP), Coastal Management Program in accordance with the Coastal Zone Management Act (CZMA).
- To comply with the Endangered Species Act (ESA) of 1973, as amended, the Navy is consulting with the U.S. Fish and Wildlife Service (USFWS) North Florida Ecological Services Office and the National Marine Fisheries Service (NMFS) Southeast Regional Office under the ESA for federally threatened and endangered species that may be affected by the project.
- To comply with the Migratory Bird Treaty Act (16 United States Code [U.S.C.] 703-712), as amended, the Navy will avoid or minimize the effects of actions associated with the Wharf C-2 Recapitalization project on migratory birds and take active steps to protect birds and their habitat.
- To comply with the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the Navy is consulting with NMFS on activities that may adversely affect Essential Fish Habitat (EFH).
- To comply with the Marine Mammal Protection Act (MMPA) of 1972, as amended, the Navy is applying for an Incidental Harassment Authorization (IHA) permit with NMFS.

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2 Discussion of Alternatives

2.1 Alternatives

National Environmental Policy Act's (NEPA's) implementing regulations (*e.g.*, 40 Code of Federal Regulations [CFR] 1502.14) provide guidance on the consideration of alternatives to a federally proposed action and require rigorous exploration and objective evaluation of reasonable alternatives. All reasonable alternatives must be considered, however, only those alternatives determined to be reasonable relative to their ability to fulfill the purpose and need for the proposed action will be analyzed in the environmental assessment (EA). Reasonable alternatives include those that are practical and feasible. The criteria the Navy used in development of the alternatives were maintaining operational requirements and enhancing the structural integrity of the wharf. The Action Alternative was developed giving due consideration to the purpose and need. This EA analyzes a No Action Alternative and one Action Alternative to achieve the proposed action.

2.1.1 No Action Alternative

Under the No Action Alternative, the Wharf C-2 recapitalization project would not occur, resulting in the continued deterioration of the Wharf's infrastructure. This would continue to place the structural integrity of the wharf and the continuation of operational requirements in jeopardy. The deterioration of Wharf C-2 has already resulted in weight restrictions and crane standoff restrictions which severely limit the usability of the wharf. Any further deterioration could result in a complete loss of the wharf at NAVSTA Mayport. However, the No Action Alternative represents the baseline condition against which potential consequences of the proposed action can be compared. As required by Council of Environmental Quality (CEQ) regulations, the No-Action Alternative is carried forward for analysis in this EA.

2.1.2 Action Alternative

Under the Action Alternative, the Navy will install a new steel king pile/sheet pile bulkhead at Wharf C-2. The new bulkhead will be designed for a 50-year service life.

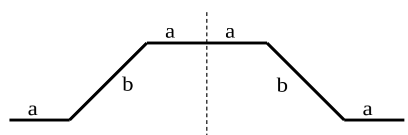
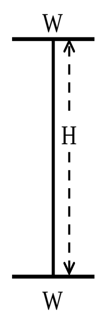
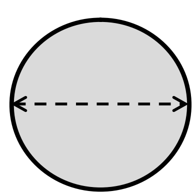
A steel king pile/sheet pile wall system (SSP) consists of large vertical king piles with paired steel sheet piles driven in between and connected to the ends of the king piles. See Table 2-1 for a description of the piles. The wall will be anchored at the top and fill consisting of clean gravel and/or flowable concrete fill is placed behind the wall. 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 (Figure 2-1).

Overall, the project will include installation of approximately 120 single sheet piles, 119 king piles and 50 polymeric (plastic) fender piles. A maximum of 70 days of in-water pile driving work will take place over a 12-month period. Of the 70 days, 50 days are reserved for vibratory hammer driving and the remaining 20 days are reserved for contingency impact driving. Only two days of impact pile driving occurred during the adjacent Wharf Charlie One 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. No net change in the amount of vessel traffic in and around the turning basin is expected as a result of the project.

Contingency dredging may be required within the new wharf footprint. Up to 4,000 cubic yards of sediment would be removed using a clamshell dredge. Dredged sediments would be disposed of in accordance with applicable laws and regulations. Dredging, if needed, would occur outside of the 70 day in-water work window and is expected to take place behind the existing wharf bulkhead. All in-water construction activities shall occur during daylight hours between one hour after sunrise and one hour before sunset.

As part of the recapitalization of the wharf, new lighting fixtures will be installed. Four 50 feet (ft) tall (15 meters [m]) concrete posts each with two 1,000 watt metal halide luminaries are currently planned. Luminaries will be of the full cut off type to minimize stray light. This lighting profile may slightly increase the total amount of light over current conditions on Wharf C-2, but will be comparable to other areas surrounding the basin.

Table 2-1. Pile Descriptions

PILE TYPE AND DETAILS	SHAPE AND DIMENSIONS	ESTIMATED DISTURBANCE FOOTPRINT
AZ19-700 SHEET PILE PAIR A pile in the form of a plank driven in close contact or interlocking with others to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials. A sheet pile may be tongued and grooved if made of timber or concrete, or interlocking if made of metal. Linear length=4×a+2×b = 70.4 in a = 6.81 in b = 21.6 in		Area = W × H W = 55.12 in H = 16.56 in 55.12 in × 16.56 in = 912 in^2 = 0.59 m^2
HZ1080 MB KING PILE In strutted sheet pile excavation, a long guide pile driven at the strut spacing in the center of the trench before it is excavated. Linear length=2×W+H = 77.2 in W = 7.87 in H = 41.47 in		Area = W × H = 7.87 in × 47.47 in = 326 in^2 = 0.21 m^2
CIRCULAR POLYMERIC FENDER PILE Polymeric piles have been used primarily for corner protection, as secondary fender piles, and as primary fender piles for small craft facilities. Diameter = 12 in Circumference = Diameter × π = 37.7 in		Area = Π × r^2 = Π × 36 = 113 in^2 = 0.07 m^2

Sources: Dictionary of Construction 2013 and Integrated Publishing 2013.

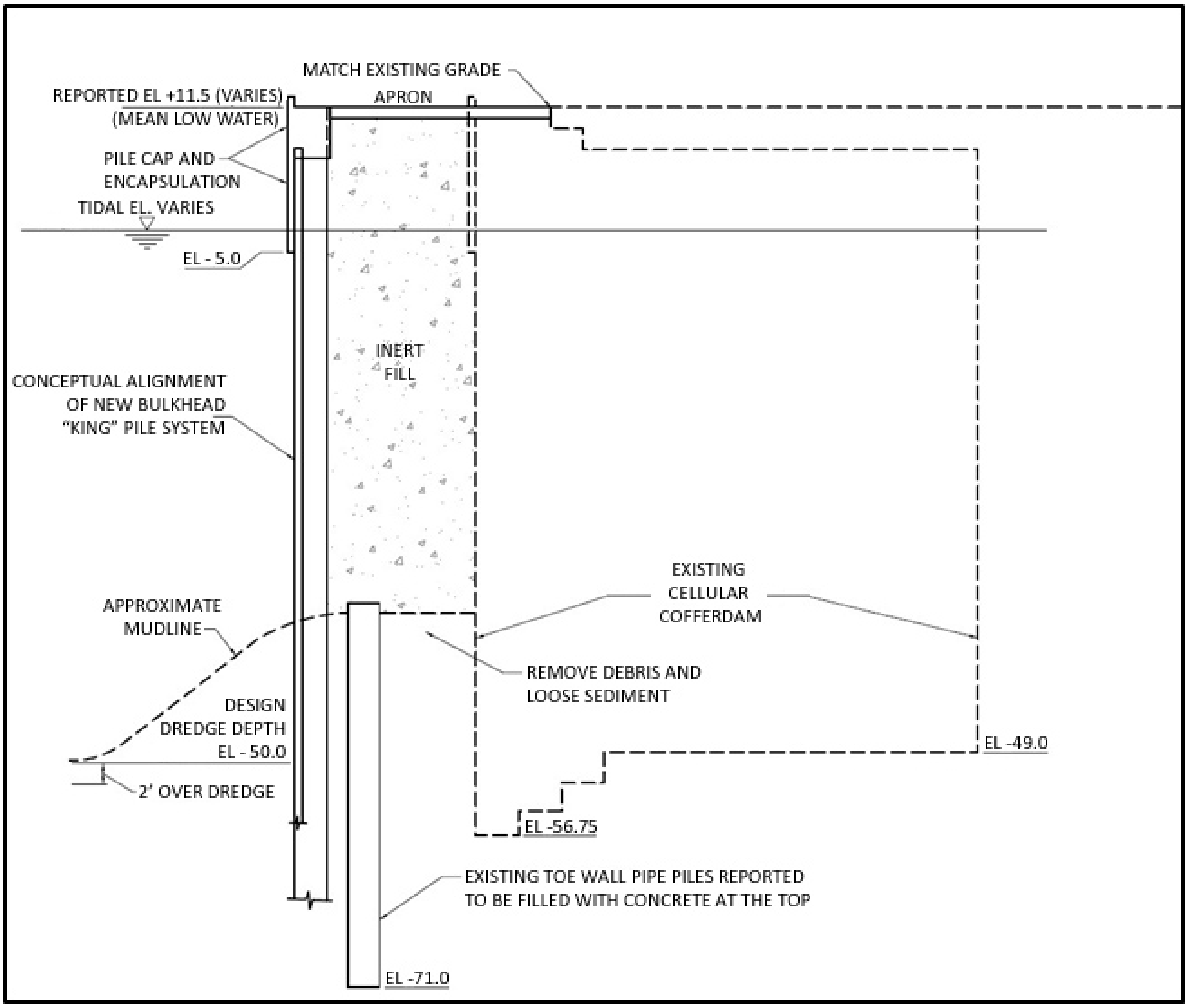


Figure 2-1. Lateral View of Project Plan

The recapitalization construction activities include:

- demolishing existing concrete pile cap, wharf deck and utilities (including lateral supply lines from utilities such as water, fuel, and electrical)
- removing existing timber fender piling
- installing new steel combination wall with tieback anchors
- 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 polymeric fender piles
- 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
- installing stormwater bioretention basin

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

1. Preparation and Demolition

   Existing underwater obstructions and debris that may interfere with the installation of the new SSP wall will be removed utilizing divers and cranes. Up to 30 timber piles will be removed from the project area utilizing a crane. The points where the new SSP is to attach to the existing sheet pile wall will be demolished above and below the waterline to expose the existing steel.

   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. Utilities include water, fuel, waste, electrical and communications.

2. Installation of New Bulkhead

   Crane barges will be used in lieu of shore-based equipment due to weight bearing and structural integrity issues on the current Wharf C-2. 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 ft in length) will be mounted to the crane barge. This allows the crane barge to control the alignment of the piles as they are driven. Once the crane barge is properly aligned, the king piles will be driven to the appropriate depth using the vibratory hammer (Figure 2-2). Sheet piles will be driven in pairs between the king piles to complete the template[2] (Figure 2-3). A total of 120 single sheet piles and 119 king piles will be installed. Installation of up to three templates per pile-driving day is anticipated. Impact driving will be a contingency employed only if vibratory methods are inadequate; a similar project that has been completed at adjacent Wharf Charlie One required impact pile driving on only seven piles. Once all of the piles are driven, closure plates are attached between the existing adjacent sheet pile walls 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 mudline. During vibratory driving, the pile

[2] Templates are prefabricated or site constructed steel frames into which piles are set to hold piles in the proper position and alignment during driving (Hannigan 2011).

is stabilized by the template while the vibratory driver installs the pile to the required tip elevation.

Impact hammers have guides that hold 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.

Once piles are in position, installation typically takes 45 seconds to reach the required tip elevation depending on site conditions (i.e., bedrock, loose soils, etc.), driving method, and equipment used.

Figure 2-2. Vibratory Installation of Sheet Piles at NAVSTA Mayport

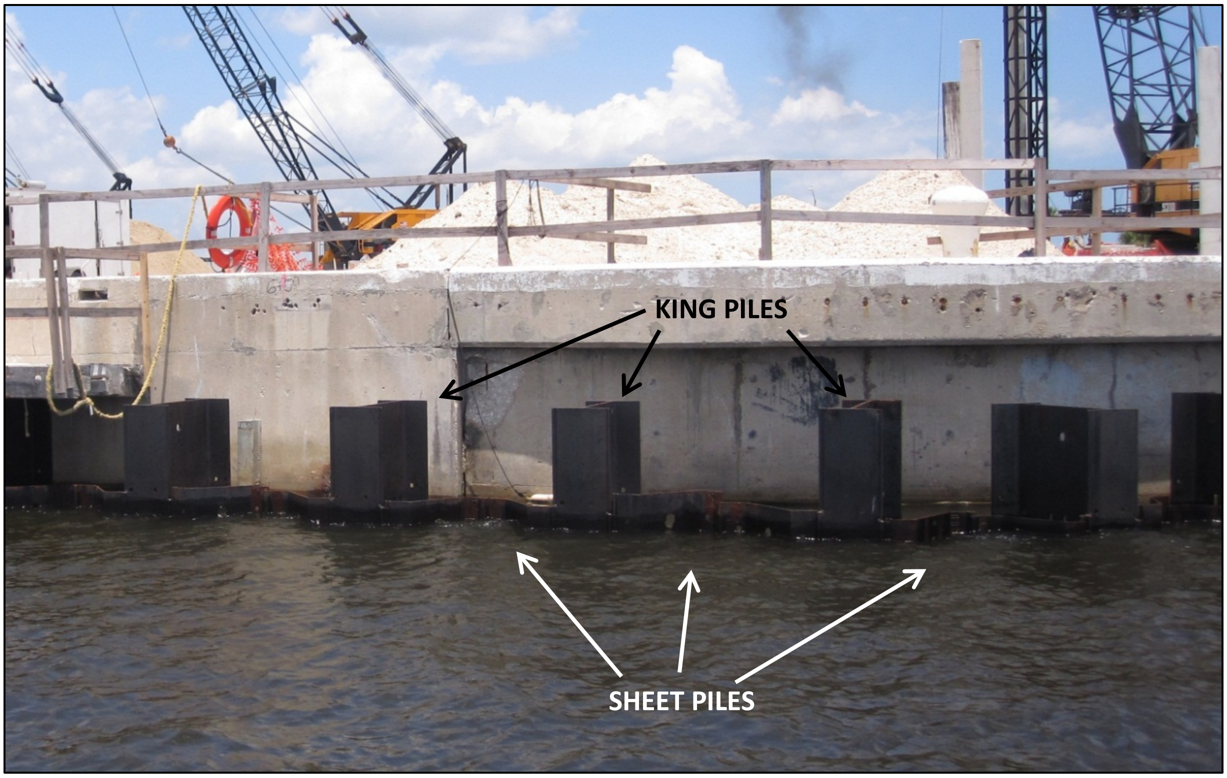


Figure 2-3. Sheet and King Piles at NAVSTA Mayport

Figure 2-4. Polymeric Fender Piles

3. Installation of Anchors

   There are multiple types of anchoring systems that can be utilized for a sheet pile wall. These methods include a grouted soil anchor system and a tie back wall system. Regardless of the method, anchor rods will be installed from the new SSP wall to the anchor system. This will require drilling through the old wall to the anchor location behind the wall. In general, this anchor location may lie 40-60 ft behind (shoreward) the existing wall. After the anchor holes are driven, the anchors will be placed in the holes and either the 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.

4. Placement of Fill Behind Wall

   After the anchors are installed, fill operations will be conducted behind the new wall. This will consist of placement of either gravel fill or concrete flowable fill into the space behind the wall; trapped water behind the wall is displaced.

5. Form and Placement of Pile Cap

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

   After the concrete has cured sufficiently, the forms will be removed. A total of 50 polymeric (plastic) fender piles will then be installed (Figure 2-4).

6. Deck and Utility Replacement

   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.

7. Installation of Stormwater Retention Basin

   Construction will result in an increase to impervious surface of 10,100 square feet (.23 acres) located between the existing bulkhead and the new bulkhead. This would cause a slight decrease in infiltration of precipitation and result in localized impacts to stormwater flow in the basin. However, these minor impacts would be localized at the development site and minimized through adherence to best management practices and the Stormwater Pollution Prevention and Environmental Resource Permit conditions (required if total combined impervious surface associated with the proposed development is greater than 9,000 square feet).

   Post development stormwater treatment will be required for the new impervious areas. The expanded wharf surface area will not provide any practical areas for the treatment of stormwater. Therefore, NAVSTA Mayport is proposing to collect and treat stormwater from an impervious storage and vehicle parking area located several hundred feet north of Wharf C-2. Stormwater will be directed to an adjacent grassy area where it will be treated in a dry retention biobasin prior to release into the St.

Johns River. This location is the closest practical compensatory treatment area to Wharf C-2 and will be capable of treating an area of 16,770 square feet and have a volume of 2,307 cubic feet. The Stormwater Treatment Basin will include four ten foot wide riprap overflows and will be located approximately 50-75 feet from the existing riprap shoreline.

2.2 Alternatives Considered but Eliminated from Detailed Analysis

The development process for this EA considered other alternatives to the recapitalization of Wharf C-2. Two alternatives were considered, but eliminated from further consideration due to location, feasibility, operational and other impacts. A summary of each of the alternatives eliminated from further consideration is discussed below.

2.2.1 Leasing Berthing Space

The Navy considered leasing berthing space as an alternative to recapitalizing Wharf C-2. However, no berthing space is available in proximity to both operational and personnel support facilities at NAVSTA Mayport to make leasing berthing space a feasible option. Therefore, leasing berthing space would not be considered a reasonable alternative to the proposed action.

2.2.2 Constructing a New Wharf

The Navy considered demolishing Wharf C-2 and constructing a new wharf in its place. However, this option would cost more than recapitalization and would require more time to complete. This timeline would result in NAVSTA Mayport losing the ability to utilize the wharf to meet operational requirements for a longer period of time than the proposed action. Therefore, demolition of Wharf C-2 and construction of a new wharf would not be a viable alternative to the proposed action.

3 Affected Environment and Environmental Consequences

This chapter describes existing environmental conditions of resources potentially affected by the proposed action and the No Action Alternative. This chapter also identifies and assesses the environmental consequences of the proposed action. The affected environment and environmental consequences are described and analyzed according to categories of resources. The categories of resources addressed in this Environmental Assessment (EA) are listed in Table 3-1.

Table 3-1. Resource Areas and Chapter Locations

Resource	Section	Resource	Section
Sediments and Water Quality	3.1	Fish	3.7
Air Quality	3.2	Sea Turtles	3.8
Noise	3.3	Birds	3.9
Marine Mammals	3.4	Environmental Health and Safety	3.10
Marine Vegetation	3.5	Socioeconomics	3.11
Marine Invertebrates	3.6		

A couple of resource areas have been eliminated from further discussion as it was concluded that these resources areas would not be impacted by the proposed action. The resources excluded from the analysis and the reasons for excluding these resources are as follows:

- Cultural Resources – The Navy has determined and the Florida State Historic Preservation Office has concurred that the wharf does not represent a significant cultural resource and the proposed action will not incur effects on historic property structures (Department of Navy 2001). In regard to submerged archaeological resources, the history of dredging within the project area indicates that no significant submerged archaeological resources will be identified in the course of this project. Therefore, the activities described under the proposed action would not have an impact on cultural resources. The Navy has determined that no historic properties will be affected from the proposed action.
- Recreational and Commercial Fishing – Recreational and commercial fishing does not occur in the project area at NAVSTA Mayport. This area is restricted from access by the general public per 33 Code of Federal Regulations (CFR) 334.500. Therefore, the activities described under the proposed action would not have an impact on recreational and commercial fishing.

3.1 Sediments and Water Quality

3.1.1 Regulatory Overview

The waters of the United States are protected under Section 404 of the Clean Water Act of 1972. Waters of the United States are defined by the Clean Water Act as surface waters, rivers, lakes, estuaries, coastal waters, and wetlands. Water quality describes the chemical and physical composition of water as affected by natural conditions and human activities. The Clean Water Act established the basic structure for regulating discharges of pollutants into waters of the United States. The Clean Water Act contains the requirements to set water quality standards for all contaminants in surface waters. The United States Environmental Protection Agency (USEPA) is the designated regulatory authority to implement pollution control programs and other requirements of the Clean Water Act.

The Clean Water Act requires that the surface waters of each state be classified according to designated uses. Florida has five surface water classifications (62-302.400 Florida Administrative Code) with specific criteria applicable to each class of water: Class I–Potable Water Supplies; Class II–Shellfish Propagation or Harvesting; Class III–Recreation, Propagation, and Maintenance of a Healthy, Well- Balanced Population of Fish and Wildlife; Class IV–Agricultural Water Supplies; and Class V–Navigation, Utility, and Industrial Use.

Section 303(d) of the Clean Water Act addresses impaired waters, which are those waters that are not meeting their designated uses (e.g., drinking, fishing, swimming, shellfish harvesting, etc.). Based on Section 303(d) of the Clean Water Act and the Florida Watershed Restoration Act, total maximum daily loads must be developed for all impaired waters. One water body may have several total maximum daily loads, one for each pollutant that exceeds the water body's capacity to absorb it safely. Florida classifies the Lower St. Johns River as a Class III water body, with a designated use of recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife. The Lower St. Johns River was included on the 1998 303(d) list as impaired for nutrients. The river was verified as impaired by nutrients based on elevated chlorophyll-a levels (i.e., algal organic matter) in both the fresh and estuarine portions of the river, and was included on the verified list of impaired waters for the Lower St. Johns River Basin. The total maximum daily loads for the main stem of the Lower St. Johns River Basin were adopted by the Florida Department of Environmental Protection (FDEP) in June 2008. The Class III dissolved oxygen criterion for freshwaters is a minimum dissolved oxygen of 5 milligrams per liter (mg/L), and the criterion for estuarine zones is a minimum dissolved oxygen of 4 mg/L, with a minimum daily average of 5 mg/L (USEPA 2008).

The water body identification for the mouth of the St. Johns River is 2213A, which includes the NAVSTA Mayport turning basin, entrance channel, beaches, and the federal navigation channel and continues upriver to where the St. Johns River meets the Atlantic Intracoastal Waterway (USEPA 2008). Table 3-2 lists the total maximum daily loads and pollutant load allocations adopted by rule for the estuarine portion of the Lower St. Johns River.

Table 3-2. Total Maximum Daily Loads Components for the Estuarine Portion of the Lower St. Johns River

Parameter	Total Maximum Daily Load (kg/yr)	Wasteload Allocation (kg/yr)	Load Allocation (kg/yr)
Total Nitrogen	1,376,855	1,027,590	349,265

Source: United States Environmental Protection Agency 2008

3.1.2 Affected Environment

3.1.2.1 Marine Sediments

The NAVSTA Mayport turning basin was constructed during the early 1940s by dredging the eastern part of Ribault Bay. Dredge material from the basin was used to fill parts of Ribault Bay and other low-lying areas in order to elevate the land surface. The basin was originally dredged to a depth of −29 feet (ft) mean lower low water and, in 1952, was deepened to a depth of −40 ft mean lower low water to provide access to larger ships. Prior to 1960, the turning basin was dredged to −42 ft mean lower low water. In 2012, the U.S. Army Corps of Engineers completed a project to deepen the NAVSTA Mayport entrance channel and turning basin. The turning basin is currently maintained at an average depth of −50 ft mean lower low water (plus two ft of overdepth), with ship berths ranging in depth from −30 to −50 ft mean lower low water. The basin is a deepwater surface ship berthing facility whose entrance channel meets the main navigation channel at the mouth of the St. Johns River. The NAVSTA Mayport entrance channel is approximately 500 ft wide extending approximately 5,000 ft until it joins with the federal navigation channel. Its depth ranges between −51 to −42 ft mean lower low water (DON 2008).

Sediment sampling and testing conducted in March 2007, in support of the Proposed Homeporting of Additional Surface Ships at NAVSTA Mayport EIS; indicated sediments within the turning basin consist primarily of fine grained materials (e.g., silt and clay). Six sediment samples from existing depths to depths of −56 ft mean lower low water were collected. Water depths in the turning basin ranged from −40 to −45 ft mean lower low water. The sediment that lies on the surface is silt/clay across the basin, ranging in thickness from 3 to 10 ft (DON 2008).

Five of the six March 2007 sediment samples were analyzed for the presence of chemical contaminants. Testing was conducted for bulk chemical parameters including metals, polychlorinated biphenyls, semi-volatile organics or polycyclic aromatic hydrocarbons, pesticides, and inorganics. The majority of these tests did not detect the presence of any contaminants in the dredge profile. The analyses did, however, find low concentrations of metals, some polycyclic aromatic hydrocarbons analytes, and some polychlorinated biphenyls parameters in the samples. Of the substances detected in the turning basin sediments, only one metal (arsenic) and two of the polycyclic aromatic hydrocarbons (acenaphthene and fluorine) had concentrations exceeding National Oceanic and Atmospheric Administration Effects Range Low thresholds in two of the five sediment samples collected. These three incidents of exceedance are only slightly above the Effects Range Low threshold and are well below the Effects Range Medium levels. All of the other detected concentrations of metals, polycyclic aromatic hydrocarbons, and polychlorinated biphenyls are well below the respective Effects Range Low levels (DON 2008).

Overall, the testing results generally reflected a low contamination level for marine sediments in the NAVSTA Mayport turning basin to depths of −56 ft mean lower low water. Additionally, the contaminant levels of the March 2007 results correlate favorably with those found during testing conducted prior to recent maintenance dredging projects at NAVSTA Mayport (DON 2008).

3.1.2.2 Water Quality

Based on available data, the water quality in the NAVSTA Mayport turning basin and entrance channel meets the FDEP Class III Marine Water Quality Standards (DON 2007a). Tides within the NAVSTA Mayport entrance channel are semi-diurnal (two highs and two lows per day). The mean and spring tidal ranges at the NAVSTA Mayport turning basin are 4.5 ft to 5.3 ft respectively. Average salinities in the basin range from 33 parts per thousand during flood flow to 15 to 26 parts per thousand during ebb flow, depending on tidal range and freshwater flow conditions (DON 2000). Water quality measurements taken during March 2007 in the NAVSTA Mayport turning basin yielded a range of surface temperatures from 64.9 to 68.2 degrees Fahrenheit (ºF) and salinity readings from 29.4 to 30.1 parts per thousand. These are normal readings for this season and area (DON 2008).

Due to the close proximity of the Atlantic Ocean, the presence of semi-diurnal tides and other hydrodynamic influences, flushing occurs continually within the turning basin. As part of an elutriate analysis, turning basin surface water samples were collected in March 2000 and analyzed for metals and semivolatile organic compound. No detectable concentrations of these substances were found in the samples, illustrating the relatively high quality of water and sediment in the NAVSTA Mayport turning basin (DON 2000).

There is only limited information readily available of dissolved oxygen levels in the turning basin or entrance channel. Data collected in 1993 revealed no significant stratification from the surface to −40 ft depths. Despite the deep water depths and hot summertime conditions, the maximum dissolved oxygen change from top to bottom was 1.43 parts per million (part per million is equivalent to mg/l) and minimum change was 0.20 parts per million. No values were less than 4.0 parts per million and a number of readings were above 5.0 parts per million suggesting that good mixing is ongoing (DON 2000).

3.1.3 Environmental Consequences

3.1.3.1 No Action Alternative

Under the No Action Alternative the recapitalization of Wharf C-2 would not occur. Baseline conditions for water resources, as described above, would remain unchanged. Therefore, there would be no impacts to water resources from implementation of the No Action Alternative.

3.1.3.2 Proposed Action

3.1.3.2.1 Marine Sediments

Under the proposed action, marine sediment would be disturbed and subsequently suspended in the water column. The use of the vibratory hammer and impact hammer could cause the fine silt and clay layers to be susceptible to liquefaction and subsequent contraction. As a result, the sediments would quickly settle back to the bottom of the project area or be carried out with tidal flow. Such suspension would be localized to the immediate area of the pile being driven.

Construction activities would not result in the discharge of wastes containing metals or otherwise alter the concentrations of trace metals in bottom sediments. Nor would construction activities result in the discharge of high levels of contaminants or otherwise alter the concentrations of organic contaminants in bottom sediments. However, because the magnitude of metal and organic compound concentrations in sediment can vary as a function of grain size (higher concentrations typically are associated with fine-grained sediments due to higher interior surface areas), small changes to grain size associated with construction-related disturbances to bottom sediments could result in minor changes in metal and organic compound concentrations. However, due to the small scale of temporary operations and the general lack of sediment contaminants in the project area, there would be no significant impacts to sediments from implementation of the proposed action.

3.1.3.2.2 Water Quality

The proposed action would not result in direct discharges of waste into the marine environment. Construction-related impacts to water quality would be limited to short term, temporary and localized changes associated with re-suspension of bottom sediments from pile installation and barge and tug operations, such as anchoring and propeller wash, as well as accidental spills of fuel into the turning basin. These changes would be spatially limited to the construction corridor, including areas potentially impacted by anchor drag and areas immediately adjacent to the driving sites that could be impacted by plumes of resuspended bottom sediments that are not expected to violate water quality standards. Fuel spills are unlikely as boats, barges, and equipment would be fueled offsite.

Best management practices would be used during all activities to reduce the likelihood of deleterious materials entering the waterway. As a result, accidental spills or discharges of deleterious materials would not be expected to adversely impact marine water quality at the project area.

The proposed action would not discharge any wastes containing materials with an oxygen demand into the turning basin. However, pile installation would resuspend bottom sediments, which may contain chemically reduced organic materials. Subsequent oxidation of sulfides, reduced iron, and organic matter associated with the suspended sediments would consume some dissolved oxygen in the water column. The amount of oxygen consumed would depend on the magnitude of the oxygen demand associated with suspended sediments (Jabusch et al. 2008). The impacts of sediment re-suspension from pile installation on dissolved oxygen concentrations would be minimal.

Contingency clamshell dredging may result in removal of up to 4,000 cubic yards of sediments within the new wharf footprint. The water column near the proposed dredging would experience temporary physical impairment due to an increase in total suspended solids during dredging operations. Sediment is suspended in the surrounding water during dredging with a clamshell type dredge in the following ways: (1) the clamshell strikes the seabed, closes and is withdrawn; (2) sediment escapes into the water column from inside the bucket, and; (3) sediment that has adhered to the sides of the bucket falls away as it is lifted from the water. Dredging activities would result in sediment disturbance and a temporary increase of suspended sediments in the project area. Disturbance of the sediment may also result in the release of dissolved hydrogen sulfides into the water column resulting in a concurrent decrease in dissolved oxygen. However, it is unlikely that dredging activities would release enough nutrients or dissolved hydrogen sulfide to produce low dissolved oxygen levels in the St. Johns River estuary. The temporary impacts to the water column associated with the increase in turbidity from dredging would cease following completion of the clamshell dredging activities. The Navy will apply for necessary dredging permits, and adhere to all requirements, including any mitigation measures. As a result, impacts of dredging to water quality are short term and temporary in nature and are not considered significant.

Installation of piles would resuspend bottom sediments within the immediate construction area, resulting in short-term and localized increases in suspended sediment concentrations that, in turn, would cause increases in turbidity levels. Barge and tug operations could also resuspend bottom sediments. The suspended sediment/turbidity plumes would be generated periodically, in relation to the level of in-water construction activities. The disturbed sediments would be a mix of fine grained silt and clay. The majority of these sediments would resettle within minutes of disturbance. Construction activities would not result in persistent increases in turbidity levels or cause changes that would violate water quality standards because processes that generate suspended sediments, which result in turbid conditions, would be short-term and localized and suspended sediments would disperse and/or settle rapidly.

Construction activities would not result in persistent increases in turbidity levels or cause changes that would violate water quality standards because they are limited in temporal and spatial scope and suspended sediments would disperse and/or settle rapidly.

Installation of a Stormwater Treatment Basin in an adjacent area immediately north of Wharf C-2 will mitigate potential impacts to water quality from the increase in impervious surfaces. The riprap overflows and riprap shoreline would diffuse the freshwater overflow into the St. Johns River resulting in a minor improvement in water quality in the project area.

In accordance with the Coastal Zone Management Act (CZMA), a Federal Consistency Determination was submitted to the FDEP. The Navy concluded that the Proposed Action is consistent with Florida's Coastal Management Program. The Federal Consistency Determination and agency correspondence can be found in Appendix A.

In conclusion, there would be no significant impacts to water quality from implementation of the proposed action.

3.2 Air Quality

3.2.1 Regulatory Overview

Air quality in a given location is described by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The significance of the pollutant concentration is determined by comparing it to the federal and state ambient air quality standards. The Clean Air Act and its subsequent amendments established the National Ambient Air Quality Standards for seven "criteria" pollutants:

- carbon monoxide (CO)

- nitrogen dioxide (NO_2)
- sulfur dioxide (SO_2)
- ozone (O_3)
- particulate matter (PM) less than 10 microns (PM_{10})
- PM less than 2.5 microns ($PM_{2.5}$)
- lead (Pb).

These standards represent the maximum allowable atmospheric concentrations that may occur while ensuring protection of public health and welfare, with a reasonable margin of safety. Short-term standards (1-, 8-, and 24-hour periods) are established for pollutants contributing to acute health effects, while long-term standards (quarterly and annual averages) are established for pollutants contributing to chronic health effects. The FDEP, Division of Air Resource Management has adopted the National Ambient Air Quality Standards, with some exceptions and additions. In particular, the Florida sulfur dioxide standards are more stringent than the National Ambient Air Quality Standards. The state and national ambient air quality standards are presented in Table 3-3.

Table 3-3. National and Florida State Ambient Air Quality Standards

Air Pollutant	Averaging Time	Florida Standard	National Ambient Air Quality Standards	
			Primary	Secondary
Carbon Monoxide (CO)	8-hour 1-hour	9 ppm[a] 35 ppm	9 ppm 35 ppm	-- --
Lead (Pb)	Calendar Quarter Rolling 3 month average[b]	1.5 μg/m^3 --	-- 0.15 μg/m^3	-- 0.15 μg/m^3 (1)
Nitrogen Dioxide (NO_2)	Annual[c] 1-hour	100 μg/m^3 (0.05 ppm) --	0.053 ppm 0.1 ppm	100 μg/m^3 --
Ozone (O_3)	8-hour[d]	--	0.075 ppm	0.075 ppm
Particulate Matter (PM_{10})	Annual 24-hour	50 μg/m^3 150 μg/m^3	-- 150 μg/m^3	-- 150 μg/m^3
Particulate Matter ($PM_{2.5}$)	Annual 24-hour	-- --	15 μg/m^3 35 μg/m^3	15 μg/m^3 35 μg/m^3
Sulfur Dioxide (SO_2)	Annual 24-hour 3-hour 1-hour[e]	60 μg/m^3 (0.02 ppm) 260 μg/m^3 (0.10 ppm) 1300 μg/m^3(0.5 ppm) --	-- -- -- 75 ppb (4)	-- -- 0.5 ppm --

Notes:

a. ppm= parts per million; μg/m3= micrograms per cubic meter.

b. Final rule signed October 15, 2008. The 1978 lead standard (1.5 μg/m3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

c. The official level of the annual NO2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

d. Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, USEPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

e. Final rule signed June 2, 2010. The 1971 annual and 24-hour SO2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Sources: USEPA 2012a, as of October 2011

A locality's air quality status and the stringency of air pollution standards and regulations depend on whether monitored pollutant concentrations attain the levels defined in the National Ambient Air Quality Standards. Ambient air quality concentrations are expressed in parts per million or micrograms per cubic meter, but the standard used for describing existing and proposed air emissions is expressed in tons of pollutant per year. To ensure the National Ambient Air Quality Standards are achieved and/or maintained, the Clean Air Act requires each state to develop a State Implementation Plan. According to the plans outlined in the State Implementation Plan, designated state and local agencies implement regulations to control sources of criteria pollutants.

The Clean Air Act provides that federal actions occurring in nonattainment and maintenance areas shall not hinder future attainment with the National Ambient Air Quality Standards and will conform to the applicable State Implementation Plan (i.e., Florida's State Implementation Plan). Duval County is considered by the USEPA to be in attainment for all criteria pollutants. Because Duval County is in attainment with all criteria pollutants, the General Conformity rule does not apply, nor are there any requirements posed by the FDEP for a conformity analysis of the proposed action.

Pollutants considered in this EA are SO_2 and other compounds (i.e., oxides of sulfur or SOx); volatile organic compounds, which are precursors to O_3; nitrogen oxides (NOx), which are also precursors to O_3, and include NO_2 and other compounds; CO; PM_{10}; and $PM_{2.5}$. These criteria pollutants are generated by the types of activities (e.g., construction and mobile source operations) associated with the proposed action. Airborne emissions of lead (Pb) are not included because there are no known significant lead emissions sources in the region or associated with the proposed action.

3.2.2 Affected Environment

Jacksonville has a humid subtropical climate, with mild weather during winters and hot weather during summers. High temperatures average 64 to 91 degrees Fahrenheit (°F) (18-33 degrees Celsius [°C]) throughout the year. High heat indices are not uncommon for the summer months in the Jacksonville area. High temperatures can reach mid to high 90s with heat index ranges of 105 to 115 °F. Rainfall averages around 52 inches a year, with the wettest months being June through September. During winter, the area can experience hard freezes during the night. Such cold weather is usually short lived. Jacksonville has suffered less damage from hurricanes than other East Coast cities. The city has only received one direct hit from a hurricane since 1871, although Jacksonville has experienced hurricane or near-hurricane conditions more than a dozen times due to storms passing through the state from the Gulf of Mexico to the Atlantic Ocean (ClimateZone 2012).

The air quality affected environment for NAVSTA Mayport is Duval County, including the city of Jacksonville. Duval County is currently in attainment with all criteria pollutant standards.

While not regulated by the FDEP like other conventional air pollutants, greenhouse gases are reportable in certain scenarios to USEPA. Greenhouse gases include: carbon dioxide (CO_2), methane (CH_4), nitrous oxides (N_2O), and fluorinated gases such as Chlorofluorocarbons: compounds consisting of chlorine, fluorine, and carbon and Hydrochlorofluorocarbons: compounds consisting of hydrogen and sulfur hexafluoride (SF_6) (USEPA 2012b).

3.2.3 Environmental Consequences

3.2.3.1 No Action Alternative

Under the No Action Alternative the recapitalization of Wharf C-2 would not occur. Baseline air quality conditions, as described above, would remain unchanged. Therefore, there would be no impacts to air quality from implementation of the No Action Alternative.

3.2.3.2 Proposed Action

As stated above, Duval County is presently in attainment of all National Ambient Air Quality Standards criteria pollutants.

The following assumptions were made in calculating total estimated emissions:

Table 3-4. Emissions Anticipated Associated with the Proposed Action

Construction Activities and Emission Sources	Emissions of Criteria Pollutants, tons/year				
	VOC	CO	NOx	SO_2	PM
Direct Emissions					
Construction Vehicles/Equipment Exhausts	3.5	10.9	47.5	3.1	3.1
Indirect Emissions					
Construction Vehicles – On-Road	1.2	7.8	10.0	0.44	0.018
Total Emissions (Direct and Indirect, Combined)	**4.7**	**18.7**	**57.5**	**3.5**	**3.1**
Applicable Conformity de minimis Thresholds, tons/yr	100		100	100	

As illustrated in the Table 3-4, the potential air emissions associated with the proposed action would not be anticipated to exceed the Florida State or National Ambient Air Quality Standards thresholds or greenhouse gas reporting thresholds established by the USEPA. The activities proposed would be anticipated to be minimal and temporary in nature and no permanent emissions would be anticipated. Therefore, there would be no significant impacts to air quality from implementation of the proposed action.

3.3 Noise

3.3.1 Fundamentals of Acoustics

Sound is an oscillation in pressure, particle displacement, or particle velocity, as well as the auditory sensation evoked by these oscillations, although not all sound waves evoke an auditory sensation (i.e., they are outside of an animal’s hearing range) (ANSI S1.1-1994). Sound may be described in terms of both physical and subjective attributes. Physical attributes may be directly measured. Subjective (or sensory) attributes cannot be directly measured and require a listener to make a judgment about the sound. Physical attributes of a sound at a particular point are obtained by measuring pressure changes as sound waves pass. The following material provides a short description of some of the basic parameters of sound.

Sound is generated by both natural (e.g., wind, waves, animals, etc.) and artificial (e.g., machinery, engines, etc.) sources, and can be characterized by the physical properties of frequency (number of sound-wave cycles per second, measured in Hertz [Hz]) and amplitude (the magnitude of the variations in pressure within the medium, measured in Pascals [Pa]) (Kinsler et al. 1999). These physical characteristics are related to the perceptual qualities “pitch” and “loudness”; in general, higher frequency sounds are perceived as having higher pitch, and higher amplitude sounds within a receiver’s hearing range are louder.

Within this EA, measurements of sound will be given as sound pressure levels (SPL) in units called decibels (dB). The dB scale provides a simplified relationship between sound pressure and the way it is perceived by the mammalian ear, expressing the logarithmic strength of measured sound pressure relative to a standardized reference pressure. Because the dB scale is logarithmic, each additional dB indicates an exponential increase in sound pressure. Each increase of 20 dB reflects a ten-fold increase in pressure, i.e., an increase of 20 dB means ten times the pressure, 40 dB means one hundred times the pressure, 60 dB means one thousand times the pressure, and so on.

The reference pressure used when calculating SPL in dB depends on the medium in which the sound was measured. For airborne sounds, the reference value is 20 microPascals (μPa, or 10^{-6} Pascals), expressed as “dB re 20 μPa”. For measurements of underwater sound, the standard reference pressure is 1 μPa, and is expressed as “dB re 1μPa”. Because sound levels measured in air and water are not directly comparable it is important to include the correct reference pressure when giving a sound level in dB.

3.3.1.1 A- weighting

Airborne sounds are commonly referenced to human hearing using a method which weights sound frequencies according to measures of human perception, de-emphasizing very low and very high frequencies which are not perceived well by humans. This is called A-weighting, and the decibel level measured is called the A-weighted sound level (dBA). Sounds given in dBA are assumed to be referenced to 20 μPa unless otherwise noted.

3.3.1.2 Noise

Noise is undesired sound (ANSI S1.1-1994), which can interfere with normal activities or diminish the quality of the environment (USACHPPM 2006), and can affect both human and non-human listeners. For humans, when sounds interfere with speech, disturb sleep, or interrupt routine tasks, they become noise.

Excessive noise exposure may cause hearing damage, physiological stress responses, and changes to behavior, which may affect the health and quality of life for receivers (Richardson et al. 1995). Human exposure to noise is regulated by ordinances at local, state, and federal levels (see Section 3.3.1). Noise in natural environments is less strictly regulated, and controlled mostly by agencies managing the relevant species (addressed in Sections 3.4, 3.7, 3.8 and 3.9).

3.3.2 Regulatory Overview

3.3.2.1 Airborne Noise

3.3.2.1.1 Noise Ordinances

The City of Jacksonville enforces a noise control ordinance, Rule 4, Noise Pollution Control (Jacksonville Environmental Protection Board 1995; United States Department of Commerce 1965). Portions of the noise control ordinance applicable to facility construction in the project area are listed below:

- No construction equipment may be operated between 10:00 p.m. and 7:00 a.m., unless specifically permitted for a particular project by the City (Rule 4.208.A);
- No construction or maintenance equipment may be operated during daytime hours that emit a noise level that exceeds 65 dBA to residential areas and quiet recreation areas and sensitive receptors such as schools, retirement homes, medical facilities, churches, and undeveloped lands (Rule 4.208.C); and

- No construction equipment or maintenance equipment may be operated during nighttime hours that emit a noise level exceeding 60 dBA (Rule 4.208.D).

3.3.2.1.2 Occupational Health and Safety Regulations

Navy regulations regarding noise are found in the 2001 Navy Occupational Safety and Health Program Manual (Chief of Naval Operations Instruction [OPNAVINST] 5100-19D), which is directed at preventing occupational hearing loss and assuring auditory fitness for all Navy personnel. The Navy's Occupational Exposure Level over an 8-hour time-weighted average in any 24-hour period is 84 dB in the dBA. When noise exposures are likely to exceed 84 dBA, hearing-protective devices are required.

3.3.2.2 Underwater Noise

Underwater noise is regulated only with respect to noise exposure by some marine mammal and fish species, and is addressed in Sections 3.4 and 3.7.

3.3.3 Affected Environment

For the purposes of this assessment, the project area includes the NAVSTA Mayport turning basin out to the limit of the most distant of the acoustic thresholds (airborne and in-water) for all protected species being addressed for the Wharf C-2 Recapitalization project In the absence of official airborne criteria for any protected non-human species, the Navy has adopted the City of Jacksonville's airborne noise limit of 65 dBA at any sensitive receptor as the in-air boundary of the project area (Jacksonville Environmental Protection Board 1995). For the proposed action, the most distant underwater threshold is the marine mammal behavioral disturbance (120 dB re 1 µPa rms) threshold. Under certain conditions, areas in and outside of the turning basin may have average ambient noise levels exceeding the 120 dB threshold. However, given the lack of actual ambient sound recording data for this location, the Navy has assumed ambient noise levels are below 120 dB re 1 µPa 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. The airborne and underwater zones of influence were modeled (see Sections 3.3.4.2.1 and 3.4.3.2.13) and incorporated into a single-boundary layer (Figure 1-2). Most of the affected area is industrialized, with multiple sources of noise contributing to the ambient acoustic environment in air and underwater. The following sections describe the current ambient noise conditions in air and underwater.

3.3.3.1 Airborne Ambient Noise

Ambient noise is comprised of sounds from natural and manmade sources. Natural sounds include wind, rain, thunder, water movement such as surf, and wildlife. Sound levels from these sources are typically low, but can be pronounced during violent weather events. Sounds from natural sources are generally not considered undesirable. Ambient background noise in urbanized areas typically varies from 60 to 70 dBA, but can be higher; suburban neighborhoods experience ambient noise levels of approximately 45 to 50 dBA (USEPA 1974).

In industrialized areas such as the NAVSTA Mayport Waterfront, noise sources may include common construction equipment, such as trucks, cranes, compressors, generators, pumps, and other equipment that might typically be employed along industrial waterfronts (WSDOT

2010a). Typical source levels for common industrial noise sources are given in Table 3-5. Maximum noise levels reach 99 dBA when multiple sources of noise are operating simultaneously, assuming an increase of 3 dB per doubling of sound intensity (WSDOT 2010a). These maximum noise levels are intermittent in nature, may occur sporadically on any given day with construction or other waterfront activity.

Table 3-5. Maximum Noise Levels at 50 feet for Common Construction Equipment

Equipment Type	Maximum Noise Level
Impact pile driver	109
Vibratory pile driver	96
Scraper	90
Backhoe	90
Crane	81
Pumps	81
Generator	81
Front loader	79
Air Compressor	78
Note: Maximum Sound Pressure Levels in dBA	

Sources: WSDOT 2008; Illingworth & Rodkin 2012

The Navy has previously measured airborne ambient noise levels at an industrial waterfront in a high-use area of Naval Base Kitsap, Bangor, in the Puget Sound area of Washington (DON 2011). Daytime noise levels ranged from 60 dBA to 104 dBA, with average values of approximately 64 dBA. Evening and nighttime levels ranged from 64 to 96 dBA, with an average level of approximately 64 dBA. Given the level of activity at NAVSTA Mayport and the measured sound levels in a similar area, the Navy estimates that ambient airborne noise levels at the NAVSTA Mayport turning basin currently average between 60 and 65 dBA.

3.3.3.1.1 Sensitive Noise Receptors

A sensitive noise receptor is defined as a location or facility where people involved in indoor or outdoor activities may be subject to stress or considerable interference from noise (USEPA 1971). Such locations or facilities often include residential dwellings, hospitals, nursing homes, educational facilities, libraries, and parks or other outdoor recreational areas.

Most off-Station sensitive noise receptors are located at least 1.5 miles from the Wharf C-2, though Huguenot Park is located 0.5 miles across the St. Johns River from the wharf. On NAVSTA Mayport, noise sensitive receptors include Pelican's Point Recreational Vehicle Park, Bachelor Quarters (including transient quarters), Navy Lodge, Gateway Inn and Suites, Medical and Dental Clinic, Chapel, Child Development Center, and NAVSTA Mayport Family Housing.

3.3.3.2 Underwater Ambient Noise

Underwater 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 both 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 kilohertz (kHz) (Urick 1983). High noise levels may also occur in nearshore 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 NAVSTA 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 from mechanized equipment on wharves or adjacent shorelines may propagate underwater and contribute to underwater ambient noise levels.

The underwater acoustic environment in the NAVSTA Mayport turning basin is likely to be 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. 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 root mean squared (rms) (Table 3-6). During the proposed action, normal port operations, including transits, docking and maintenance of multiple tugboats and ships would continue, and noise contributions from these sources would remain at current levels.

Dredging may be necessary as part of the proposed action. If so, a clamshell dredge would be used to remove up to 4,000 cubic yards of sediment from the increased footprint area of Wharf C-2. Dredging is likely to temporarily increase noise levels in the turning basin during operations; previously recorded sound levels from clamshell dredges ranged from 136 to 165 dB re 1 μPa at ranges of 12 to 25 meters. Dredging would only be used as a contingency, and any increases in noise level will be short-term and temporary.

Table 3-6. Representative Levels of Underwater Noise from Anthropogenic Sources

Noise Source	Peak Frequency Range (Hz)	Underwater Source Level (re 1μPa)	Reference
Small vessels	250–6,000	151 dB rms at 1 m	Lesage et al. 1999
Large vessels (underway)	20–1,500	170–180 dB rms at 1 m	Richardson et al. 1995
Tug docking barge	200–1,000	149 dB rms at 100 m	Blackwell and Greene 2002
Vibratory driving of 24-inch steel pipe pile	50–1,500	159 dB rms at 10 m	Illingworth & Rodkin 2012
Impact driving of 24-inch steel pipe pile	50–1,500	186 dB rms at 10 m	WSDOT 2010b

dB=decibel, rms=root mean squared, m=meter

3.3.4 Environmental Consequences

3.3.4.1 No Action Alternative

Under the No Action Alternative the recapitalization of Wharf C-2 would not occur. Baseline ambient noise conditions, as described above, would remain unchanged. Therefore, there would be no impacts to ambient noise from implementation of the No Action Alternative.

3.3.4.2 Proposed Action

The proposed recapitalization of Wharf C-2 would result in a temporary increase in airborne and underwater noise in the project area. Noise would be generated by a variety of sources, including pile driving, barges, trucks, cranes, and other construction equipment. As shown in Tables 3-5 and 3-6, pile driving is expected to generate the highest noise levels in both air and water. In the absence of pile driving noise, the maximum construction noise from equipment such as the crane, generator, etc. running simultaneously would be less than that of the vibratory pile driver (WSDOT 2008). Pile driving would occur during regular work hours (between one hour post-sunrise and one hour prior to sunset). Impact and vibratory hammers would never operate simultaneously.

3.3.4.2.1 Airborne Noise

The proposed action would result in a temporary increase in airborne noise levels in the project area. Estimated source levels for airborne noise from pile driving are given in Table 3-7; source levels were selected from published literature. Because there are no available airborne sound pressure level measurements from steel sheet and king piles, data from 24 inch diameter steel pipe piles were used to estimate the airborne sound source levels (see Table 2-1).

Table 3-7. Estimated Source Levels for Airborne Pile Driving Noise

Driving method	Source Level
Vibratory[1]	96 dBA at 15 m (50 ft)
Impact[2]	100 dBA at 11 m (36 ft)
Note: m=meter dBA= A-weighted decibel scale ft=feet	

Sources: [1] Illingworth & Rodkin 2012; [2] WSDOT 2010b

The source level selected for impact driving does not represent the maximum measured level for a 24 inch pipe pile (109 dBA; Illingworth & Rodkin 2012), which was obtained during short-term driving of a single pile in rocky sediment during the Navy Test Pile Program in Bangor, Washington in 2011. The selected source level shown in Table 3-7 was obtained during driving of a 24 inch pipe pile for a bridge replacement in Washington (WSDOT 2010b). Because softer sediments (such as those found in the NAVSTA Mayport turning basin; see Section 3.1.2.1) reduce the amount of force needed to drive a pile to desired depth, in turn reducing noise from pile reverberation (Kinsler et al. 1999), the non-maximal source level estimate selected is a reasonable assumption for airborne noise levels from pile driving at NAVSTA Mayport.

Estimates of airborne noise propagation from pile driving were based on the assumption that airborne construction noise behaves as a point-source, propagating in a spherical manner, with a 6 dB decrease in sound pressure level per doubling of distance (WSDOT 2008)[3]. The hard-site conditions proposed by WSDOT (2008) apply to both the over-water and over-land (mostly paved or hard surfaces) portions of the in-air project area.

Noise associated with vibratory pile driving is expected to attenuate to 65 dBA within 0.34 miles (550 m) of the source; impact pile driving noise is expected to attenuate to 65 dBA at 0.40 miles (650 m). During both impact and vibratory pile driving, airborne noise levels are expected to exceed 84 dBA (the threshold for hearing protection) within 246 ft (75 m) of the incident pile. These estimates assume a free flowing medium (e.g. over water) without obstructions, which is a reasonable assumption for the majority of the project area. Vegetation and buildings within the land areas of the proposed action may obstruct sound transmission in the project area; however, this model did not include possible attenuation from land-based obstructions (e.g. vegetation and buildings). The ranges given are therefore a conservative estimate of the affected area.

The following sections address the potential impacts of noise on the human environment within and around NAVSTA Mayport. Short term effects of a slight increase in ambient noise levels on sensitive bird species are discussed in Section 3.9.

3.3.4.2.2 Human Environment

The following analysis of the effects of noise on the human environment within the project area considers the intensity and the duration of airborne noise that would be generated by the proposed action and whether this noise would be harmful to humans or disrupt human activities. Activities within the project area include NAVSTA Mayport operations (i.e. vessel traffic, security patrols, loading and maintenance of vessels), routine operations of non-waterfront activities at NAVSTA Mayport, and recreational activities outside of base property.

Routine operations at the NAVSTA Mayport waterfront include loading, maintenance, and transits of large vessels and security operations. Current ambient noise levels are assumed to be consistent with other industrialized waterfront areas, with maximum noise levels ranging to approximately 100 dBA for short periods (seconds – minutes). During both impact and vibratory pile driving, sound levels may exceed 84 dBA up to 246 ft (75 m) from the incident pile; personnel within this range will be required to wear hearing protection (OPNAVINST 5100-19D). Noise levels at ranges greater than 246 ft (75 m) are unlikely to adversely affect personnel accustomed to working in an industrial environment; therefore, no significant impacts to daily operations or personnel are expected.

[3] RL=SL-TL
Where: RL is the Received Level of sound, SL is the Source Level of sound and TL is the Transmission Loss.

$TL=20\times\log_{10}(R_1/R_2)$ (R_1 is the distance from the source in meters, and R_2 is the distance in meters at which the SL measurement was taken).

$RL=210-20\times\log_{10}(10/R_2)$	$RL=210-20\times\log_{10}(20/R_2)$
RL=210-20	RL=210-26
RL=190 dB	RL=184 dB

**A doubling in distance from 10 meters to 20 meters results in a 6dB reduction in the sound pressure.

Recreational activities such as boating, kayaking, and fishing occur on the St. Johns River adjacent to NAVSTA Mayport. Recreational users could be exposed to noise levels exceeding permissible residential exposure levels, as they could be closer to the construction than land based receptors. Noise levels from vibratory and impact pile driving are expected to exceed 65 dBA in an area that includes a portion of the St. Johns River (Figure 3-1). Exposure to noise within the 65 dBA zone would not be injurious, but could result in behavioral disturbances such as increased respiration and elevated heart rates. Increases in noise levels in public areas adjacent to NAVSTA Mayport would be temporary and intermittent, occurring on a maximum of 70 days over a 12 month span. Adverse effects would be limited to behavioral disturbance, and would not be expected to significantly impact recreational users of the St. Johns River.

3.3.4.2.2.1 Sensitive noise receptors

Generally, noise impacts are considered adverse if they expose sensitive receptors to noise levels in excess of applicable standards established in the noise ordinance. The only sensitive noise receptor that may be exposed to noise levels exceeding the threshold set forth in the City of Jacksonville noise ordinance (65 dBA in daytime; 60 dBA at night) due to the proposed action is the Pelican's Roost RV Park (Figure 3-1). Noise levels of 65 dBA are only expected to reach this locations in the unlikely event that impact pile driving is needed. If impact driving is necessary, there will be no more than 20 strikes per day, with a total estimated duration of 45 minutes per day. Because of the low likelihood of impact driving during the proposed action and the minimal duration of increased noise should impact driving become necessary, the Navy expects no significant impacts to sensitive noise receptors.

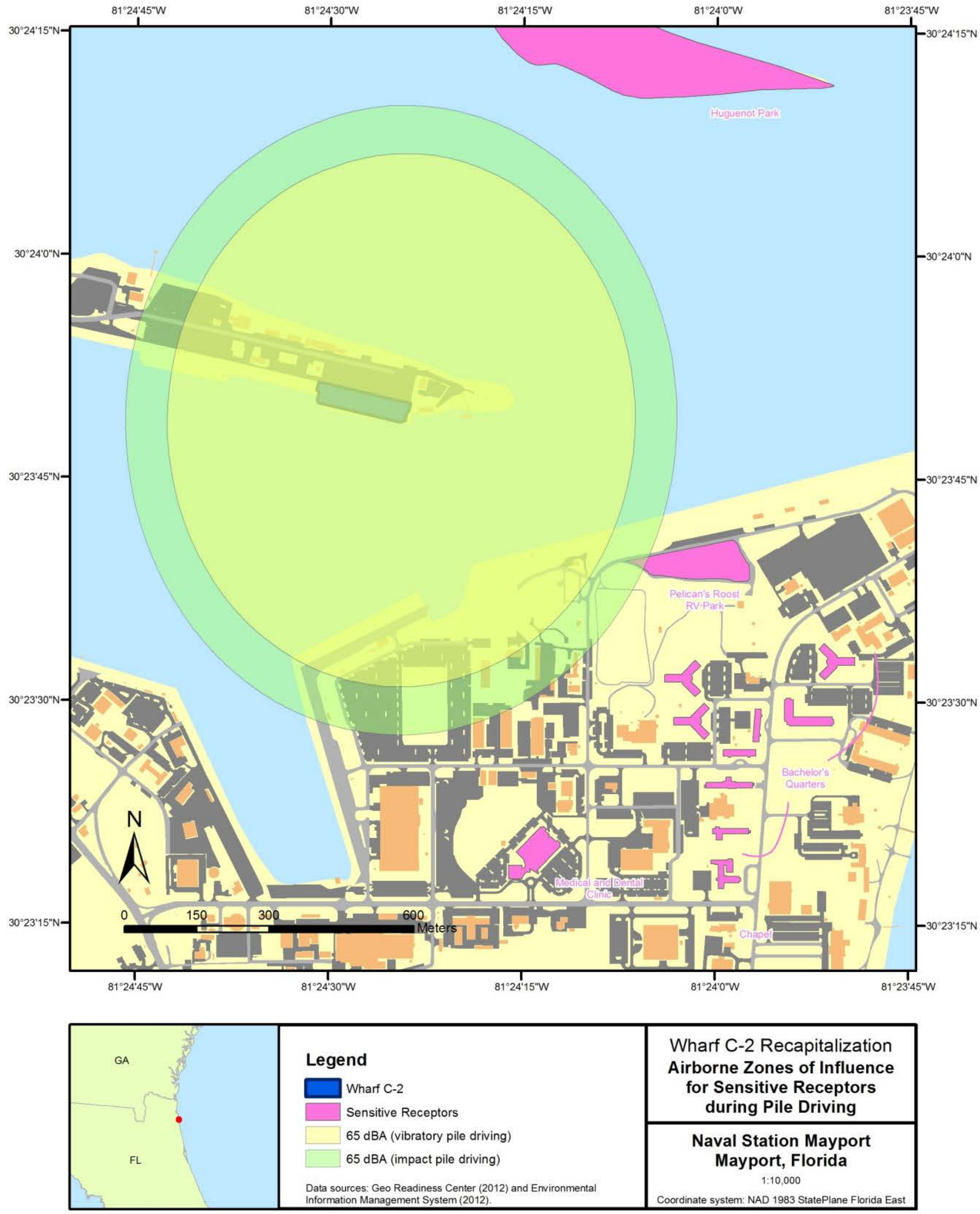


Figure 3-1. Naval Station Mayport Airborne Zones of Influence for Sensitive Receptors During Pile Driving

3.3.4.2.3 Underwater Noise

This section addresses potential effects of noise from pile driving associated with the proposed action on the existing underwater noise environment. A detailed analysis of the underwater noise propagation from both types of pile driving and the effects of noise on marine species are addressed in Sections 3.4 (Marine Mammals) and 3.7 (Fish).

At present, underwater ambient noise in the project area is likely to be dominated by sounds from normal port operations, which can exceed 180 dB re 1 µPa close to the source and will continue during and after the proposed action. These sounds are non-impulsive and intermittent, occurring sporadically during normal port activities. Noise from vibratory pile driving associated with the proposed action is unlikely to alter the existing ambient noise within the project area because of its relatively low source level (approximately 157 dB re 1 µPa rms at 10 m) and non-impulsive nature. Noise from impact pile driving has higher source levels (approximately 186 dB re 1 µPa at 10m) and is impulsive in nature, with a fast rise time and multiple short-duration (50–100 millisecond; Illingworth & Rodkin 2001) events. Introduction of high-amplitude impulsive sound may temporarily alter the ambient noise environment in the basin; however, the use of impact driving during the proposed project is limited to instances when vibratory driving fails, and will include a maximum of 20 strikes per day (estimated total net duration of 45 minutes of driving of any type per day). Because of the very limited use of impact pile driving during the proposed action, the Navy expects no change in the average ambient noise environment in the NAVSTA Mayport turning basin as a result of impact pile driving.

The recapitalization of Wharf C-2 includes a maximum of 70 days of pile driving, distributed over a period of 12 months. Given the current level of anthropogenic activity in the basin and high noise levels from normal port operations, noise from pile driving associated with the proposed action is not expected to significantly affect the existing ambient acoustic environment in the NAVSTA Mayport turning basin during the 12 month in-water work window. The proposed action will not introduce any new long-term noise sources and will not significantly impact the long-term underwater ambient noise environment in the project area.

3.4 Marine Mammals

3.4.1 Regulatory Overview

The Endangered Species Act (ESA) of 1973 (16 United States Code [U.S.C.] Section [§] 1531 et seq.) established protection over and conservation of threatened and endangered species and the ecosystems upon which they depend. An "endangered" species is a species in danger of extinction throughout all or a significant portion of its range. A "threatened" species is one that is likely to become endangered within the near future throughout all or in a significant portion of its range. The United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) jointly administer the ESA and are also responsible for the listing of species (designating a species as either threatened or endangered). The ESA allows the designation of geographic areas as critical habitat for threatened or endangered species. Section 7(a) (2) requires each federal agency to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species.

When a federal agency's action “may affect” a listed species, that agency is required to consult with NMFS or USFWS, depending on the jurisdiction (50 CFR 402.14[a]).

The Marine Mammal Protection Act (MMPA) of 1972 (16 U.S.C. § 1361 et seq.) established, with limited exceptions, a moratorium on the “taking” of marine mammals in waters or on lands under United States (U.S.) jurisdiction. The act further regulates “takes” of marine mammals in the global commons (that is, the high seas) by vessels or persons under U.S. jurisdiction. The term “take,” as defined in Section 3 (16 U.S.C. § 1362 [13]) of the MMPA, means “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.” “Harassment” was further defined in the 1994 amendments to the MMPA, which provided two levels of harassment: Level A (potential injury) and Level B (potential behavioral disturbance).

The Marine Mammal Protection Act directs the Secretary of Commerce (Secretary) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if NMFS finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The authorization must set forth the permissible methods of taking, other means of affecting the least practicable adverse impact on the species or stock and its habitat, and requirements pertaining to the mitigation, monitoring and reporting of such taking.

3.4.2 Affected Environment

3.4.2.1 North Atlantic Right Whale

3.4.2.1.1 Status and Management

The North Atlantic right whale was listed as endangered in 1970 (35 Federal Register [FR] 18319) under the Endangered Species Conservation Act of 1969; its listing was revised in 2008 (73 FR 12024). A five year review was completed in August 2012 with a recommendation to maintain the species’ classification as endangered (NMFS 2012). North Atlantic right whales are designated as depleted under the MMPA.

3.4.2.1.2 Habitat and Geographic Range

North Atlantic right whales are most often seen as individuals or pairs (Jefferson et al. 1993). They migrate annually between the north and south Atlantic coasts of the United States. They can generally be found in calving grounds off Georgia and Florida from mid-November to mid-April; and then move to feeding grounds in the Gulf of Maine and Cape Cod in the summer (though sightings may occur year-round in this area) (National Marine Fisheries Service n.d.). North Atlantic right whale calves are born during December through March after 12 to 13 months of gestation (Kraus et al. 2001).

Based on annual surveys from conducted from December through March between 1985-2007, North Atlantic right whales are relatively common visitors to waters offshore from NAVSTA Mayport and the federal navigation channel (New England Aquarium 2013; Loop pers. comm. 2012). Incidental sightings of North Atlantic right whales are an infrequent, occurrence in the St. Johns River and NAVSTA Mayport turning basin, with the most recent sighting of two individuals occurring at the mouth of the St. Johns River in December 2012 (Gibbons 2011, Loop pers. comm. 2012).

3.4.2.1.3 Population and Abundance

The western North Atlantic minimum stock size is based on a census of individual whales identified using photo-identification techniques. A review of the photo-ID recapture database as it existed on 21 October 2011 indicated that 425 individually recognized whales in the catalog were known to be alive during 2009. Whales catalogued by this date included 20 of the 39 calves born during that year. Thus adding the 19 calves not yet catalogued brings the minimum number alive in 2009 to 444. This number represents a minimum population size assumed in the most recent stock assessment report. This count has no associated coefficient of variation (Waring et al. 2013).

3.4.2.1.4 Predator / Prey Interaction and Foraging

Dives of 5 to 15 min or longer have been reported (Cetacean and Turtle Assessment Program 1982; Baumgartner and Mate 2003), but can be much shorter when feeding (Winn et al. 1995). Longer surface intervals have been observed for reproductively-active females and their calves (Baumgartner and Mate 2003).

3.4.2.1.5 Critical Habitat

Three critical habitats areas - Cape Cod Bay/Massachusetts Bay/Stellwagen Bank, Great South Channel, and the coastal waters of Georgia and Florida in the southeastern United States—were designated by NMFS in 1994 (59 FR 28805). The southeastern U.S. critical habitat area covers waters from the coast to five miles offshore; the eastern portion of the federal navigation channel is within this critical habitat area. Two additional critical habitat areas in Canadian waters, Grand Manan Basin and Roseway Basin, were identified in Canada’s final recovery strategy for the North Atlantic right whale (Brown et al. 2009). A 12-month finding from NMFS on a 2002 petition to revise right whale critical habitat stated “a review of scientific information suggests that physical and biological features essential to the conservation of right whales may include, but are not necessarily limited to, the occurrence of copepods and the features that concentrate them in the water off of the northeast United States, as well as sea surface temperature and possibly bathymetry in the waters off of the southeast United States. In a more recent 12-month finding on a 2009 petition, NMFS stated they agree that revision of critical habitat is appropriate and that they would continue the ongoing rulemaking process (75 FR 61690). Therefore, determination of primary constituent elements for North Atlantic right whale critical habitat in the Atlantic Ocean is still pending.

3.4.2.2 Humpback Whale

3.4.2.2.1 Status and Management

As with the North Atlantic right whale, humpback whales were also listed as endangered in 1970 (35 FR 18319) under the Endangered Species Conservation Act of 1969. A status review was initiated in 2009 (74 FR 40568). Humpback whale abundance is increasing through much of the species’ range. Individuals that occur in the Wharf C-2 activity area are from the Gulf of Maine stock. Humpback whales are designated as depleted under the MMPA

3.4.2.2.2 Habitat and Geographic Range

During the winter, most of the North Atlantic population of humpback whales is believed to migrate south to calving grounds in the West Indies region (Whitehead and Moore 1982; Smith et al. 1999; Stevick et al. 2003), over shallow banks and along continental coasts, where calving occurs. Calving peaks from January through March, with some animals arriving as early as December and a few not leaving until June. The mean sighting dates in the West Indies for individuals from the United States and Canada are February 16 and 15, respectively (Stevick et al. 2003). Since humpback whales migrate south to calving grounds during the fall and make return migrations to the northern feeding grounds in spring, they are not expected off the coast of Florida during summer. There has been an increasing occurrence of humpbacks, which appear to be primarily juveniles, during the winter along the U.S. Atlantic coast from Florida north to Virginia (Clapham et al. 1993; Swingle et al. 1993; Wiley et al. 1995; Laerm et al. 1997).

The coastal region of Florida is not designated as an area of concentrated occurrence for humpback whales (DON 2002). Examination of whaling catches revealed that both northward and southward migrations are characterized by a staggering of sexual and maturational classes; lactating females are among the first to leave summer feeding grounds in the fall, followed by subadult males, mature males, non-pregnant females, and pregnant females (Clapham 1996). On the northward migration, this order is broadly reversed, with newly pregnant females among the first to begin the return migration to high latitudes.

Based on sightings, strandings, and life history, humpbacks would be expected to occur in waters off NAVSTA Mayport during fall, winter, and spring. The likelihood of occurrence is low, however, and even lower for the turning basin and Wharf C-2 activity area.

3.4.2.2.3 Population and Abundance

The most recent line-transect survey, which did not include the Scotian Shelf portion of the stock, produced an estimate of abundance for Gulf of Maine humpback whales of 331 animals (CV=0.48) with a resultant minimum population estimate for this stock of 228 animals. The line-transect based minimum estimate is unrealistic because at least 500 uniquely identifiable individual whales from the Gulf of Mexico stock were seen during the calendar year of that survey and the actual population would have been larger because re-sighting rates have historically been <1. Using the minimum count from at least 2 years prior to the year of a stock assessment report has allowed NMFS time to resight whales known to be alive prior to and after the focal year. Thus the minimum population estimate is set to the 2008 mark-recapture based count of 823. Current data suggest the Gulf of Maine stock is steadily increasing in numbers (Waring et al. 2013)

3.4.2.2.4 Predator / Prey Interaction and Foraging

Humpback whales feed on a variety of invertebrates and small schooling fishes. The most common invertebrate prey are krill; the most common fish prey are herring, mackerel, sand lance, sardines, anchovies, and capelin (Clapham and Mead 1999). Feeding occurs both at the surface and in deeper waters, wherever prey is abundant. The humpback whale is the only species of baleen whale that shows strong evidence of cooperation when feeding in large groups (D'Vincent et al. 1985).

3.4.2.2.5 Critical Habitat

Critical habitat has not been designated for humpback whales.

3.4.2.3 Atlantic Spotted Dolphin

3.4.2.3.1 Status and Management

Atlantic spotted dolphins occurring in the Wharf C-2 activity area belong to the Western North Atlantic Stock. The species is protected under the MMPA.

3.4.2.3.2 Habitat and Geographic Range

The Atlantic spotted dolphin is found in nearshore tropical to warm-temperate waters, predominantly over the continental shelf and upper slope. In the western Atlantic, this species is distributed from New England to Brazil and is found in the Gulf of Mexico as well as the Caribbean Sea (Perrin 2008).

3.4.2.3.3 Population and Abundance

Atlantic spotted dolphin sightings have been concentrated in the slope waters north of Cape Hatteras, but in the shelf waters south of Cape Hatteras sightings extend into the deeper slope and offshore waters of the mid-Atlantic. The best recent abundance estimate for Atlantic spotted dolphins is the result of a 2011 survey - 26,798 (CV= 0.66) individuals (Waring et al. 2013).

3.4.2.3.4 Predator / Prey Interaction and Foraging

Atlantic spotted dolphins feed on small cephalopods, fishes, and benthic invertebrates (Perrin et al. 1994). Atlantic spotted dolphins in the Gulf of Mexico were observed feeding cooperatively on clupeid fishes and are known to feed in association with shrimp trawlers (Fertl and Leatherwood 1997; Fertl and Wursig 1995). In the Bahamas, this species was observed to chase and catch flying fish (MacLeod et al. 2004). The diet of the Atlantic spotted dolphin varies depending on its location (Jefferson et al. 2008; Perrin et al. 1994).

3.4.2.3.5 Critical Habitat

This species is not listed under the ESA; as such, no critical habitat has been designated.

3.4.2.4 Bottlenose Dolphins

3.4.2.4.1 Status and Management

Bottlenose dolphins occurring in the Wharf C-2 activity area may be individuals belonging to any of the following stocks: the Western North Atlantic Offshore Stock, Jacksonville Estuarine System Stock; the Western North Atlantic Northern Florida Coastal Stock; and the Western North Atlantic Southern Migratory Coastal Stock. The species is protected under the MMPA.

3.4.2.4.2 Habitat and Geographic Range

Along the Atlantic coast of the United States, 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 III 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 III et al. 2000). There are no specific breeding locations for this species.

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). Based on incidental sightings in the turning basin as well as initial results from a current survey taking place there, bottlenose dolphins are expected to be frequent visitors to the Wharf C-2 activity area (DON *In prep*).

3.4.2.4.3 Population and Abundance

Table 3-8 details distribution, population and abundance information on bottlenose dolphins.

Table 3-8. Bottlenose Dolphin Stocks that May Occur in the Wharf C-2 Project Area

SPECIES and ESTIMATED DENSITY	STOCK	OCCURRENCE[1] and ABUNDANCE BEST (CV) / MIN	STATUS	
			MMPA	ESA
bottlenose dolphin 2.53 / km^2	Western North Atlantic Offshore	Rare 81,588 (0.17) / 70,775	n/a	n/a
	Western North Atlantic Northern Florida Coastal	Likely – year round 3,064 (0.24) / 2,511[2]		
	Jacksonville Estuarine System	Likely - year round, numbers may be slightly lower in winter 412 (0.06) / unknown[3]		
	Western North Atlantic Southern Migratory Coastal	Seasonal - January to March 12,482 (0.32) / 9,591[4]		

Sources: U. S. Department of the Navy 2012; U.S. Department of the Navy Turning Basin Bottlenose Dolphin Surveys (*in progress*); [1]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; [2]Waring et al. 2013; [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; [4]National Marine Fisheries Service 2010a

Based on preliminary results of surveys being conducted in the NAVSTA Mayport turning basin in 2012 / 2013, a density of 2.53 individuals per square kilometer has been estimated for the project area.

3.4.2.4.4 Predator / Prey Interaction and Foraging

Bottlenose dolphins are opportunistic feeders, taking a variety of fishes, cephalopods, and crustaceans (Wells and Scott 1999) and using a variety of feeding strategies (Shane et al. 1986). In addition to using echolocation, a process for locating prey by emitting sound waves that reflect back, bottlenose dolphins likely detect and orient to fish prey by listening for the sounds they produce, so-called passive listening (Barros and Myrberg 1987; Barros and Wells 1998). Nearshore bottlenose dolphins prey predominantly on coastal fishes and cephalopods, while offshore individuals prey on open ocean cephalopods and a large variety of near-surface and mid-water fishes (Mead and Potter 1995).

Dive durations as long as 15 minutes have been recorded for trained bottlenose dolphins (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)

3.4.2.4.5 Critical Habitat

This species is not listed under the ESA; therefore, no critical habitat has been designated.

3.4.2.5 West Indian Manatee

3.4.2.5.1 Status and Management

The West Indian manatee was listed as endangered in 1967 (32 FR 4001). West Indian manatees are classified as depleted under the MMPA. Only individuals from the Florida subspecies may occur in the project area (Deutsch et al. 2003). The Florida subspecies is closely monitored and managed by the USFWS and the Florida Fish and Wildlife Conservation Commission (FWC). The Florida manatee population is divided into four management units, one of which (the Atlantic Coast unit) overlaps the Wharf C-2 project area (FWC 2007). Data indicate that the Atlantic Coast management unit is stable.

3.4.2.5.2 Habitat and Geographic Range

West Indian manatees occur in warm, subtropical, and tropical waters of the western North Atlantic Ocean, from the southeastern U.S. to Central America, northern South America, and the West Indies (Lefebvre et al. 2001); they occur along both the Atlantic and gulf coasts of Florida. Florida manatees are found throughout the southeastern United States. Because manatees are a sub-tropical species with little tolerance for cold, they are generally restricted to the inland and coastal waters of peninsular Florida during the winter, when they shelter in or near warm-water springs, industrial effluents, and other warm water sites (Hartman 1979; Lefebvre et al. 2001; Stith et al. 2006). In warmer months, manatees leave these sites and can disperse great distances. Individuals have been sighted as far north as Massachusetts, as far west as Texas, and in all states in between (Fertl et al. 2005; Rathbun 1988; Schwartz 1995; USFWS Jacksonville Field Office 2008).

Two groups of manatees reside in the Jacksonville area. One group remains in the area all winter while the other group moves south during the winter (DON 2007a). Individual manatees are observed regularly in the vicinity of NAVSTA Mayport and inside the turning basin (Loop and Allen per. comm. 2013). They venture from the St. Johns River to the springs in November and reside there until March (USFWS 2001a, 2007a). As water temperatures rise in spring, West Indian manatees disperse from winter aggregation areas. West Indian manatees are frequently reported in coastal rivers of Georgia and South Carolina during warmer months (Lefebvre et al. 2001).

West Indian manatees are not gregarious and are most often observed alone (Hartman 1979). However, in Florida they occasionally aggregate in large, unorganized groups around warm-water sources during the cooler months (Hartman 1979). The only significant social bonds are between mother and calf during the first one to two years of the calf's life (Reeves et al. 1992). There is no defined breeding season; calves are born year-round after an 11-month gestation (O'Shea et al.1995). West Indian manatees do not reproduce in consecutive years, except in rare instances (Kendall et al. 2004).

3.4.2.5.3 Population and Abundance

The exact population for the West Indian manatee is unknown, but the minimum population of Florida manatees is estimated at 4,840, based on a January 2011 survey (USFWS 2010a).

3.4.2.5.4 Predator / Prey Interaction and Foraging

West Indian manatees are herbivorous and are known to consume more than 60 species of plants. They typically feed on bottom vegetation, plants in the water column, and shoreline vegetation, such as hyacinths and marine sea grasses (Reynolds et al. 2009). In some areas, they are known to feed on algae and parts of mangrove trees (Jefferson et al. 2008; Mignucci-Giannoni and Beck 1998).

3.4.2.5.5 Critical Habitat

Critical habitat was designated for the Florida manatee in 1976 (41 FR 41914) and reorganized in 1977. It encompasses multiple inland rivers and coastal waterways throughout Florida; however, the designation does not define any primary constituent elements. The St. Johns River and federal navigation channel to the northeast of the project area are included in this designation. A petition to revise manatee critical habitat was submitted in 2009, and a 12-month finding on that petition by U.S. Fish and Wildlife Service stated that revisions should be made including definition of primary constituent elements, but sufficient funding is not currently available (U.S. Department of the Interior 2010).

3.4.3 Environmental Consequences

3.4.3.1 No Action Alternative

Under the No Action Alternative the recapitalization of Wharf C-2 would not occur. Baseline conditions for marine mammals, as described above, would remain unchanged. Therefore, there would be no impacts to marine mammals from implementation of the No Action Alternative.

3.4.3.2 Proposed Action

The evaluation of impacts to marine mammals considers the importance of the resource (i.e., legal, recreational, ecological, or scientific); the proportion of the resource affected relative to its occurrence in the region; the particular sensitivity of the resource to project activities; and the duration of environmental impacts or disruption. Impacts to resources are critical if:

- Habitats of high concern are adversely affected over relatively large areas;
- Disturbances to small, essential habitats would lead to regional impacts to a protected species; or
- Disturbances harass or impact the ability of species to acquire resources and ultimately impact the abundance or distribution of federally listed threatened or endangered species.

It is estimated that a maximum of 1,421 m^2 of benthic habitat could be disturbed or displaced in the action area over the 18 month (1,322 m^2 by the potential maximum expansion of the wharf footprint, and 99 m^2 by the piles themselves).

In particular, underwater pile driving noise during the construction period has the potential to temporarily disrupt marine mammal foraging, resting, and transiting in the vicinity of Wharf C-2 and the NAVSTA Mayport turning basin during in-water work. The zone of influence due to pile driving noise is described in following sections. Other impacts to marine mammals such as changes in prey availability are anticipated to be highly localized to the construction area.

Any direct impacts to marine mammals resulting from the Wharf C-2 Recapitalization project primarily would arise from underwater noise generated by pile driving. This noise would exceed the threshold for behavioral disturbance to marine mammals and, if unmitigated (e.g., if the best management practices and minimization measures described in Chapter 4 were not adhered to), would also cause hearing-related injuries.

Table 3-9. Expected Seasonal Occurrence of Marine Mammals in the Vicinity of the Wharf C-2 Project

Species	Predicted Seasonal Occurrence
North Atlantic right whale	More likely during winter months
humpback whale	More likely during winter months
bottlenose dolphin	Year-round
West Indian manatee	More likely during summer months

The primary impacts to marine mammals from the Wharf C-2 Recapitalization project would be associated with water quality changes (turbidity) in nearshore habitat, noise associated with vibratory and (contingency) impact pile driving, other construction equipment/vessel traffic; and changes in prey availability. Seasonal occurrence of marine mammal species that may occur in the vicinity of the Wharf C-2 project is summarized in Table 3-9. Marine mammals are likely to avoid (indicating behavioral disturbance) the immediate vicinity of pile driving. The likelihood of adverse impacts to these species would be minimized through application of minimization measures described in Chapter 5.

The following sections describe how each of these factors may impact abundance and distribution of marine mammals present or potentially present in the vicinity of the Wharf C-2 Recapitalization project during in-water work.

3.4.3.2.1 Water Quality Impacts

Water quality would be impacted during vessel operations, installation of new piles, and contingency dredging because bottom sediments would be temporarily resuspended. Resuspended sediments would increase turbidity and reduce dissolved oxygen periodically during in-water construction activities, as discussed for water quality impacts in Section 3.1.3.2.2. The overall level of sediment disturbance associated with the Wharf C-2 Recapitalization project will be significantly lower than that of maintenance dredging in the turning basin, and resuspended sediments are expected to dissipate within a few hours (NMFS 2009). Thus marine mammals exposed to resuspended sediments are not likely to be impacted by contaminants. The activities that generate suspended sediments would be short-term and localized and suspended sediments are expected to disperse and/or settle rapidly. Moreover, marine mammals are expected to avoid the immediate construction area due to increased vessel traffic, noise and human activity, increased turbidity, and possible temporary disruptions in prey availability. Therefore, no direct impacts to marine mammals are expected due to changes in water quality during construction.

3.4.3.2.2 Vessel Traffic

Vessel movements have the potential to affect marine mammals directly by accidentally striking or disturbing individual animals. For example, several studies have linked vessels with behavioral changes in killer whales in Pacific Northwest inland waters (Kruse 1991; Williams et al. 2011; Bain et al. 2006), although it is not well understood whether the presence and activity of the vessel, the vessel noise, or a combination of these factors produces the changes. It seems likely that both noise and visual presence of vessels play a role in prompting reactions from these animals. The probability and significance of vessel and marine mammal interactions is dependent on several factors including numbers, types, and speeds of vessels; the regularity, duration, and spatial extent of activities; and the presence/absence and density of marine mammals.

Behavioral changes in response to vessel presence include avoidance reactions, alarm/startle responses, and other behavioral and stress-related changes (such as altered swimming speed, direction of travel, resting behavior, vocalizations, diving activity, and respiration rate) (Watkins 1986; Würsig et al 1998; Terhune and Verboom 1999; Ng and Leung 2003; Foote et al. 2004). Some dolphin species approach vessels and are observed bow riding or jumping in the wake of a vessel (Norris and Prescott 1961; Shane et al 1986; Würsig et al. 1998). In other cases neutral behavior (i.e., no obvious avoidance or attraction) has been reported (review in Nowacek et al. 2007). Little is known about the biological importance of changes in marine mammal behavior under prolonged or repeated exposure to high levels of vessel traffic, such as increased energetic expenditure or chronic stress, which can produce adverse hormonal or nervous system effects (Reeder and Kramer 2005).

Marine mammals in the NAVSTA Mayport turning basin and navigation channel encounter vessel traffic associated with daily operations, maintenance, and security monitoring along the waterfront, and it is assumed that individuals that frequent the waterfront have habituated to existing levels of vessel activity. Vessels will operate at low speeds within the relatively limited project area. Marine vessel traffic would potentially pass near marine mammals on an incidental basis, but short-term behavioral reactions to vessels are not expected to result in long-term impacts to individuals (such as chronic stress), or to marine mammal populations in waters surrounding the project area.

Collisions of vessels and marine mammals, primarily cetaceans, are not expected during construction because vessel speeds would be low. All of the species that may occur in the Wharf C-2 project area tend to surface at relatively short, regular intervals allowing for increased detectability and avoidance. Further, marine mammal observers will be deployed to observe the injury zone of influence and shutdown zones, and alert the contractor to shut down in-water work if an individual or group of marine mammals should be encountered.

3.4.3.2.3 Prey Availability

The greatest potential impacts to prey species during construction would result from benthic habitat displacement, resuspension of sediments, and behavioral disturbance due to pile driving noise. Injury and behavioral disturbance of fishes, should they occur due to underwater pile driving noise, would directly affect the prey base for marine mammals. Fish behavior would potentially be affected by pile driving noise resulting from concurrent operation of vibratory and impact rigs within 2,500 m (8,300 ft) of the source of pile driving noise (Section 3.7). Thus, prey availability within the injury and behavioral zones may be reduced during in-water pile driving activities. Minimization measures designed to reduce this effect are described in Chapter 4.

Anchoring of construction barges, propeller wash, and pile driving would locally displace or disturb benthic habitats and increase turbidity. All of these actions would indirectly affect marine mammals by degrading foraging and refuge habitat quality for prey species and reducing their invertebrate and forage fish prey base. However, due to regular disturbance resulting from dredging and high levels of vessel activity, the habitat in the turning basin is not considered high quality. As discussed in Section 3.5, project impacts may remove or disturb up to 1,322 m^2 of benthic habitat.

3.4.3.2.4 Acoustic Impacts

Underwater Noise

An introduction to acoustics and the decibel (dB) unit can be found in Section 3.3.1; for additional detail, see Appendix B. Noise level (dB) and frequency (Hz) can affect the susceptibility of marine mammals to noise impacts. Functional hearing ranges and peak sensitivity ranges vary by species, as described below. Peak sensitivity of most marine mammal species that may occur in the vicinity of the Wharf C-2 Recapitalization project is higher than the frequency range containing the greatest energy produced by impact pile driving. However, pile driving noise is well within the functional hearing ranges of these marine mammals, and all of these species would be susceptible to auditory effects of underwater pile driving noise.

The methods for estimating the number and types of exposure are described in the sections below beginning with presentation of the threshold criteria, 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 for marine mammals.

- The potential presence of each species and their estimated density in the zone of influence for the C-2 Wharf Recapitalization project.
- The area of impact for each pile driving sound source was 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.

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). Sound becomes noise in cases when it is produced incidental to a human activity (including during pile driving), or when it interferes with an animal’s natural behaviors or diminishes the quality of the environment (USACHPPM 2006).

Hearing and Acoustics for North Atlantic Right Whales

North Atlantic right whales produce a variety of sounds, including moans, screams, gunshots, blows, upcalls, downcalls, and warbles that are often linked to specific behaviors (Matthews et al. 2001; Laurinolli et al. 2003; Vanderlaan et al. 2003; Parks et al. 2005; Parks and Tyack 2005). Sounds can be divided into three main categories: (1) blow sounds; (2) broadband impulsive sounds; and (3) tonal call types (Parks and Clark 2007). Blow sounds are those coinciding with an exhalation; it is not known whether these are intentional communication signals or are just produced incidentally (Parks and Clark 2007). Broadband sounds include non-vocal slaps (when the whale strikes the surface of the water with parts of its body) and the “gunshot” sound; data suggests that the latter serves a communicative purpose (Parks and Clark 2007; Parks & Hotchkin et al. 2012). Tonal calls can be divided into simple, low-frequency, stereo-typed calls and more complex, frequency-modulated, higher frequency calls (Parks and Clark 2007). Most of these sounds range in frequency from 0.02 to 15 kHz (dominant frequency range from 0.02 to less than 2 kHz; durations typically range from 0.01 to multiple seconds) with some sounds having multiple harmonics (Parks and Tyack 2005). Source levels for some of these sounds have been measured as ranging from 137 to 192 dB root-mean-square (rms) re: 1 μPa-m (decibels at the reference level of one micro Pascal at one meter) (Parks et al. 2005; Parks and Tyack 2005). In certain regions (i.e., northeast Atlantic), preliminary results indicate that right whales vocalize more from dusk to dawn than during the daytime (Leaper and Gillespie 2006; Mussoline et al. 2012; Parks & Warren et al. 2012). Vocalization rates of North Atlantic right whales are also highly variable, and individuals have been known to remain silent for hours (Gillespie and Leaper 2001). Baumgartner et al. (2005) noted that downsweep calls by North Atlantic right whales in the 16 to 160 Hz frequency band exhibited a diel pattern (fewer calls at night) that corresponded strongly to the diel vertical migration of zooplankton.

Recent morphometric analyses of North Atlantic right whale inner ears estimates a hearing range of approximately 0.01 to 22 kHz based on established marine mammal models (Parks et al. 2004; Parks and Tyack 2005; Parks et al. 2007).

Hearing and Acoustics for Humpback Whales

Humpback whales are known to produce three classes of vocalizations: (1) “songs” in the late fall, winter, and spring by solitary males; (2) sounds made within groups on the wintering (calving) grounds; and (3) social sounds made on the feeding grounds (Richardson et al. 1995).The best-known types of sounds produced by humpback whales are songs, which are thought to be breeding displays used only by adult males (Helweg et al. 1992). Singing is most common on breeding grounds during the winter and spring months but is occasionally heard outside breeding areas and out of season (Mattila et al. 1987; Gabriele et al. 2001; Gabriele and Frankel 2002; Clark and Clapham 2004). Humpback song is an elaborate series of patterned vocalizations which are hierarchical in nature (Payne and McVay 1971). There is geographical variation in humpback whale song, with different populations singing different songs and all members of a population using the same basic song. However, the song evolves over the course of a breeding season but remains nearly unchanged from the end of one season to the start of the next (Payne et al. 1983). Components of the song range from under 20 Hz to 4 kHz and occasionally 8 kHz, with source levels measured between 151 and 189 dB re 1 μPa-m and high-frequency harmonics extending beyond 24 kHz (Au et al. 2001; Au et al. 2006).

Social calls range in frequency from 50 Hz to over 10 kHz, with dominant frequencies below 3 kHz (Silber 1986). Female vocalizations appear to be simple; Simão and Moreira (2005) noted little complexity. “Feeding” calls, unlike song and social sounds, are highly stereotyped series of narrow-band trumpeting calls. They are 20 Hz to 2 kHz, less than 1 sec in duration, and have source levels of 162 to 192 dB re 1 μPa-m. The fundamental frequency of feeding calls is approximately 500 Hz (D'Vincent et al. 1985; Thompson et al. 1986).

While no measured data on hearing ability is available for this species, Ketten (1997) hypothesized that mysticetes have acute infrasonic hearing. Houser et al. (2001) produced the first humpback whale audiogram (using a mathematical model), which was u-shaped and conformed to the typical mammalian presentation. The area of best hearing, or sensitivity, was estimate to lie between 700 Hz and 10 kHz but the maximum range of hearing was identified between 200 Hz to 14 kHz. Au et al. (2006) noted that if the popular notion that animals generally hear the totality of the sounds they produce is applied to humpback whales, this suggests that its upper frequency limit of hearing is as high as 24 kHz.

Hearing and Acoustics for Atlantic Spotted Dolphin

A variety of sounds including whistles, echolocation clicks, squawks, barks, growls, and chirps have been recorded for the Atlantic spotted dolphin (Thomson and Richardson 1995). Whistles have dominant frequencies below 20 kHz (range: 7.1 to 14.5 kHz) but multiple harmonics extend above 100 kHz, while burst pulses consist of frequencies above 20 kHz (dominant frequency of approximately 40 kHz) (Lammers et al. 2003). Other sounds, such as squawks, barks, growls, and chirps, typically range in frequency from 100 Hz to 8 kHz

(Thomson and Richardson 1995). Recently recorded echolocation clicks have two dominant frequency ranges at 40 to 50 kHz and 110 to 130 kHz, depending on source level (i.e., lower source levels typically correspond to lower frequencies and higher frequencies to higher source levels (Au and Herzing 2003).

Echolocation click source levels as high as 210 dB re 1 μPa-m peak-to-peak have been recorded (Au and Herzing 2003). Spotted dolphins in The Bahamas were frequently recorded during agonistic / aggressive interactions with bottlenose dolphins (and their own species) to produce squawks (200 Hz to 12 kHz broad band burst pulses; males and females), screams (5.8 to 9.4 kHz whistles; males only), barks (200 Hz to 20 kHz burst pulses; males only), and synchronized squawks (100 Hz - 15 kHz burst pulses; males only in a coordinated group) (Herzing 1996).

There have been no data collected on Atlantic spotted dolphin hearing abilities. However, odontocetes are generally adapted to hear high-frequencies (Ketten 1997) and it can be assumed that vocalization frequencies are generally within the hearing range of a species.

Hearing and Acoustics for Bottlenose Dolphins

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 1998a). 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 that 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).

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 that 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 that 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).

Hearing and Acoustics for West Indian Manatees

West Indian manatees produce a variety of squeak-like sounds that have a typical frequency range of 0.6 to 12 kHz (dominant frequency range from 2 to 5 kHz), and last 0.25 to 0.5 s (Steel and Morris 1982; Thomson and Richardson 1995; Niezrecki et al. 2003). Recently, vocalizations below 0.1 kHz have also been recorded (Frisch and Frisch 2003; Frisch 2006). Overall, West Indian manatee vocalizations are considered relatively stereotypic, with little variation between isolated populations examined (i.e., Florida and Belize; Nowacek et al. 2003). However, vocalizations have been newly shown to possess nonlinear dynamic characteristics (e.g., subharmonics or abrupt, unpredictable transitions between frequencies), which could aid in individual recognition and mother/calf communication (Mann et al. 2006). Average source levels for vocalizations have been calculated to range from 90 to 138 dB re: 1 μPa (average: 100 to 112 dB re: 1 μPa) (Nowacek et al. 2003; Phillips et al. 2004). Behavioral data on two animals indicate an underwater hearing range of approximately 0.4 to 46 kHz, with best sensitivity between 16 and 18 kHz (Gerstein et al. 1999), while earlier electrophysiological studies indicated best sensitivity from 1 to 1.5 kHz (Bullock et al. 1982).

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 noise exposure thresholds to determine when an activity in the ocean that produces sound might result in impacts to a marine mammal such that a take by harassment might occur (70 FR 1871). Current NMFS practice regarding exposure of marine mammals to pile driving noise is that cetaceans exposed to impulsive sounds at or above180 re 1 μPa rms are considered to have been taken by Level A (i.e., injurious) harassment. Level A injury thresholds have not been established for non-impulsive sounds such as noise produced by vibratory pile driving, but to conservatively estimate injurious takes as a result of exposure to non-impulsive noise, the Navy has applied the threshold values for impulsive sounds to vibratory pile driving noise in this analysis (Table 3-10).

Behavioral harassment (Level B) is considered to have occurred when marine mammals are exposed to impulsive noise from impact pile driving at or above 160 dB re 1 μPa rms for and non-impulsive noise from vibratory pile driving at or above120 dB re 1 μPa rms but below injurious thresholds.

Table 3-10. Injury and disturbance thresholds for cetaceans

Marine Mammals	Vibratory driving criteria (dB re 1 µPA rms)		Impact driving criteria (dB re 1 µPA rms)	
	Level A injury threshold	Level B disturbance threshold	Level A injury threshold	Level B disturbance threshold
Cetaceans	180	120	180	160

Limitations of Existing Noise Criteria

The application of the 120 dB rms re 1µPa threshold can sometimes be problematic because this threshold level can be either at or below the ambient noise level of certain locations (Washington State Department of Transportation 2008). As a result, this threshold level is subject to ongoing discussion (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 (Southall et al. 2007). 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. Note: The 120 dB re 1 µPa rms *non-impulsive* sound threshold should not be confused with the 120 dB re 1 µPa rms *impulsive* sound criterion established for migrating bowhead whales in the Arctic as a result of research in the Beaufort Sea (Richardson et al. 1995; Miller et al. 1999). 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.

Ambient Noise

Underwater 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 both 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 nearshore 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 and the bottom of the St. Johns River is likely to be 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. 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 3-11). During the proposed action, normal port operations, including transits, docking, and maintenance by multiple tugboats and ships would continue and noise contributions from these sources would remain at current levels.

Dredging may be necessary as part of the proposed action. If so, a clamshell dredge would be used to remove up to 4,000 cubic yards of sediment from the increased footprint area of Wharf C-2. , but since dredging would only be used as a contingency any increases in noise level will be short-term and temporary.

The existing sources of anthropogenic noise in the Mayport turning basin are generally non-impulsive (see Appendix B), intermittent sources such as vessel engines. Impact pile driving noise differs from these sources in that it is impulsive, with a fast rise time and multiple short-duration (50–100 millisecond; Illingworth and Rodkin 2001) events. The use of impact driving during the proposed project is limited to instances when vibratory driving fails, and will include a maximum of 20 strikes per day. Because of the very limited use of impact pile driving during the proposed action, the Navy expects no change in the average ambient noise environment in the Mayport during basin as a result of impact pile driving.

Table 3-11. 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 pipe pile[4]	50–1,500	159 dB rms at 10 m
Impact driving of 24-inch steel pipe pile[5]	50–1,500	186 dB rms at 10 m
m=meter		

Sources: 1 Lesage et al. 1999; 2 Richardson et al. 1995; 3 Blackwell and Greene 2002;; 4 Illingworth & Rodkin 2012; 5 WSDOT 2010b

Airborne ambient noise in industrial areas such as the Mayport Turning Basin is comprised of sounds from trucks, cranes, compressors, generators, pumps, ship engines, and other equipment. While there are no current measurements of airborne ambient noise in the basin or wharf areas, expected noise levels range from a daytime minimum of 55 dBA to a maximum of 99 dBA, assuming that multiple sources will be operating simultaneously (WSDOT 2007).

Underwater Noise from Pile Driving

Noise levels produced by pile driving are greatly 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 and vibratory driving of steel pipe piles, concrete piles, and some timber piles. Data for vibratory pile driving is concentrated on steel pipe piles of a range of diameters, and on single 24-inch wide sheet piles at a project in California (CALTRANS 2009). There have been no measurements of sound pressure levels produced by the types of piles (paired steel sheet piles and king piles) that will be installed in the Mayport turning basin, or in the soft sediments found in the basin, and it was therefore necessary to extrapolate from available data to estimate reasonable source levels for this project.

Because of the differences between the proposed action (driving of steel king piles, paired 27-inch wide steel sheet piles, and 12-inch diameter polymeric piles) and available measured sound pressure levels, the Navy evaluated potential source levels for modeling of steel piles based on two methods. The first method examined measured sound pressure levels for single 24-inch wide sheet piles; the second was a comparison of the linear length of piles with the circumference of steel pipe piles for which source levels have been measured. Linear length was calculated as the sum of the lengths of all sides of each pile type (Table 2-1). Both the king and paired sheet pile linear lengths were comparable to the circumference of a 24-inch diameter pipe pile.

Source levels for polymeric piles were estimated based on a comparison of the material properties of timber, concrete, and steel piles. Data from timber piles were selected to model driving of HDPE polymer piles; there will be no impact driving of polymeric piles.

Measured sound pressure levels for 24 in. diameter steel sheet piles and 24-inch diameter steel pipe piles are available for both vibratory and impact driving methods. To determine the most appropriate sound pressure levels for this project, data from studies which met the following parameters were considered:

- Pile size and type: steel pipe piles (24” diameter), steel sheet piles (24 in. wide), and/or timber piles
- Installation method: vibratory and/or impact hammer
- Physical environment: water depth 15 ft (4.5 m) or greater, sediment similar to sandy bottom in NAVSTA Mayport turning basin.

The tables below detail representative pile driving sound pressure levels measured from 24” steel pipe piles, 24 in. wide steel sheet piles and 12” timber piles. Comparison of measured sound pressure levels from the 24-inch steel pipe piles and 24-inch steel sheet piles revealed that levels from sheet pile driving were higher than those from pipe pile driving; the Navy has therefore used the more conservative sound pressure levels from 24-inch steel sheet piles to model both king and sheet pile pairs for the proposed action. The selected sound pressure levels used for modeling the effects of noise on marine mammals were 163 dB re 1 µPa rms for vibratory driving and 189 dB re 1µPa rms for impact driving; sources are indicated by footnotes in the relevant tables.

Table 3-12. Underwater Sound Pressure Levels Expected During Vibratory Installation Based on Similar In-situ Monitored Construction Activities

Project and Location	Pile Size and Type	Water Depth	Range to Pile	RMS	Peak	Sediment
Portage Bay, WA[b]	24 inch steel pipe	3 – 7 m	10 m	157	170	Unknown
Berth 23 Port of Oakland, CA[c, 1]	24 inch steel sheet pile	6.1 m	10 m	163	177	Unknown
Berth 30 Port of Oakland, CA[c]	24 inch steel sheet pile	4.9 m	10 m	162	175	Unknown
Berth 35/37 Port of Oakland, CA[c]	24 inch steel sheet pile	6.1 m	10 m	163	177	Unknown
Port Townsend Ferry, WA[c]	12 inch timber pile	10 m	10 m	153[2]	167	Unknown

m=meter

Sound levels expressed as dB re 1 µPa rms and dB re 1 µPa peak for RMS and Peak SPL measurements, respectively. Average and Max values for Test Pile Program data are based on 10-second rms measurements over the 10 minute driving time for the pile. 1- This data point was selected for use in acoustic modeling based on similarity to physical environment at NAVSTA Mayport and measurement location in mid-water column; 2- Data selected for use in modeling polymeric fender piles based on similarity of material properties between timber and polymeric piles; there are no existing measurements for polymeric piles of any size and shape.

Sources: a – Illingworth & Rodkin 2012; b- Washington Department of Transportation 2010; c- California Department of Transportation 2009 ; d – Washington Department of Transportation 2011

Table 3-13. Underwater Sound Pressure Levels Expected During Impact Installation Based on Similar In-situ Monitored Construction Activities

Project and Location	Pile Size and Type	Water Depth	RMS	Peak	SEL	Sediment
Friday Harbor Ferry Terminal, WA[a]	24-inch steel sheet pile	12.8 m	170	183	180	Sandy silt / clay
		13.4 m	186	205	179	
		14.3 m	186	204	179	
		10 m	194	210	185	Sandy silt / rock
		10 m	195	215	187	
		10 m	193	212	184	
Typical values, CALTRANS compendium summary table[b]	24-inch steel sheet pile	15 m	194	207	178	unknown
Berth 23 Port of Oakland[b,1]	24-inch steel sheet pile	12 to 14 m	189	205	179	unknown
Sound levels expressed as dB re 1 µPa rms and dB re 1 µPa peak for RMS and Peak SPL measurements, respectively; 1- Data point was selected for use in acoustic modeling based on similarity to physical environment at NAVSTA Mayport and measurement location in mid-water column; 2- Data selected for use in modeling polymeric fender piles based on similarity of material properties between timber and polymeric piles						

Sources: [a]WSDOT 2005; [b]CALTRANS 2009

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:

$$TL = 15\log_{10}\frac{R_1}{10}$$

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 NAVSTA Mayport turning basin. A total of 70 days of pile driving were modeled; 50 days of vibratory driving (45 days for steel piles, 5 days for polymeric fender piles), and 20 days of contingency impact driving (steel piles only). No sound mitigation methods (bubble curtains, cofferdams, etc.) are proposed and therefore no attenuation was included in the acoustic model.

For vibratory driving, the acoustic analysis used the assumption that a maximum of three templates (each consisting of five king piles and four sheet pile pairs) would be driven each day, for a maximum total length of approximately 75 ft. Modeling therefore estimated that noise would be produced at each point of a 75 ft length of wall in a given day.

For impact driving, modeling assumed a maximum of 20 strikes of the impact hammer per day, which is expected to take no more than 45 seconds to complete. This assumption was used to calculate cumulative SEL values for all relevant species.

The calculations presented in Table 3-14 assume a field free of obstruction, which is unrealistic, because the NAVSTA 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 cannot actually be attained at the project area.

The actual distances to the behavioral disturbance thresholds for impact and vibratory pile driving will generally be shorter than those calculated due to the irregular contour of the waterfront and the maximum fetch (furthest distance sound waves travel without obstruction [i.e. line of sight]) at the project area. Table 3-14 depicts the actual areas encompassed by the marine mammal thresholds during the project. Figures 3-2, 3-3, and 3-4 depict the areas of each marine mammal sound threshold exceedance that may to occur in the project area due to pile driving.

Table 3-14. Calculated Distance(s) To and the Area(s) Encompassed By the Underwater Marine Mammal Noise Thresholds During Installation of Steel Piles

Pile type	Driving method	Threshold (dB re 1µPa rms)	Distance (m)[1]	Area in (km^2)
Steel (sheet and king piles)	Vibratory	Level A (injury): 180	0.74	0
		Level B (behavioral): 120	7,356	2.9
	Impact (contingency)	Level A (injury): 180	39.8	0.004
		Level B (behavioral): 160	858	0.67
Polymeric Fender Piles	Vibratory	Level A (injury): 180	0.16	0
		Level B (behavioral): 120	1,585	0.88

All sound levels expressed in dB re 1 µPa rms. dB=decibel; rms=root-mean-square; µPa=microPascal
Practical spreading loss (15 log, or 4.5 dB per doubling of distance) used for calculations.
[1]Sound pressure levels used for calculations are given in Table 3-12

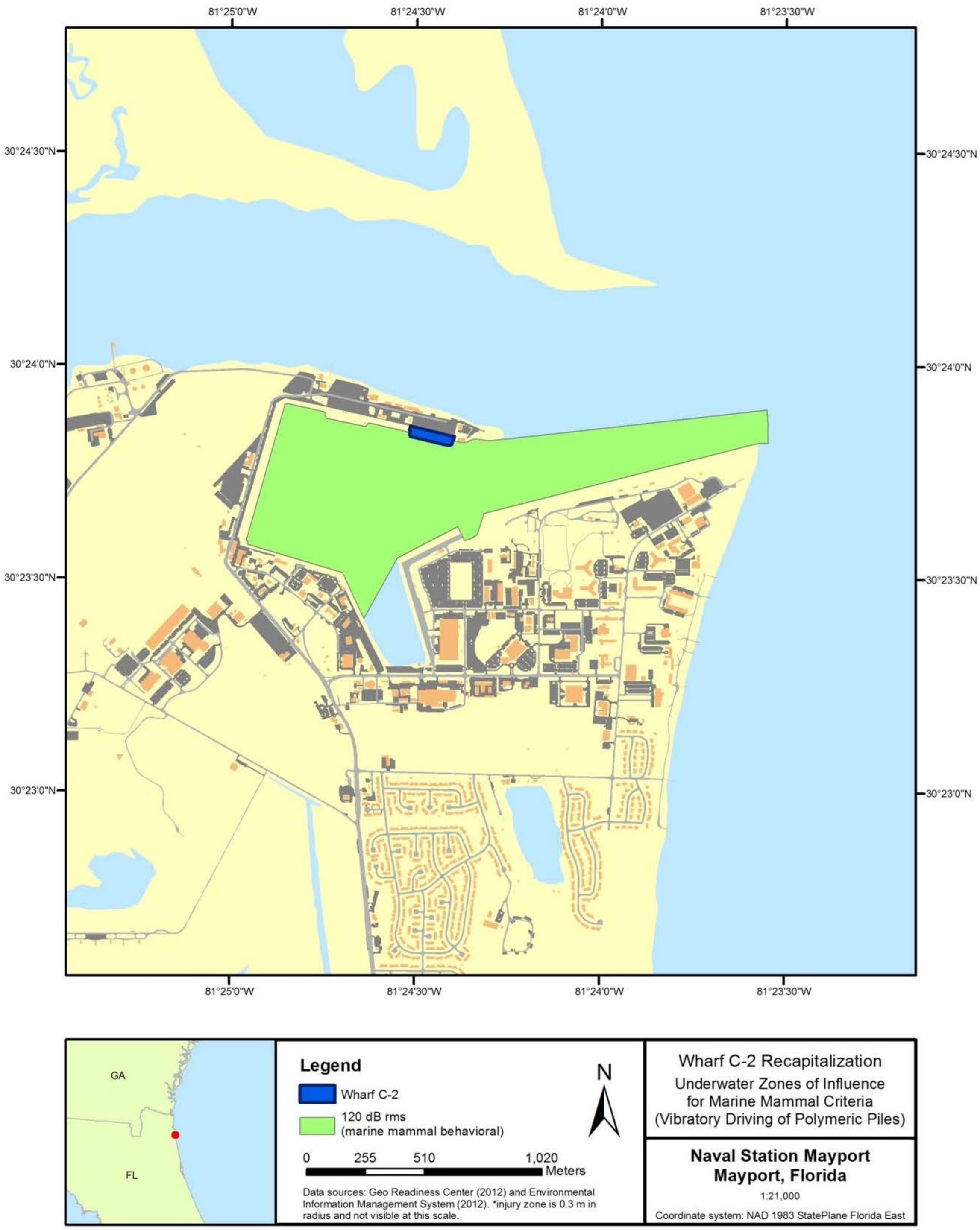


Figure 3-2. Underwater Zones of Influence for Marine Mammal[4] Criteria for Vibratory Pile Driving of Polymeric Piles

[4] Official criteria have not been established for West Indian manatees

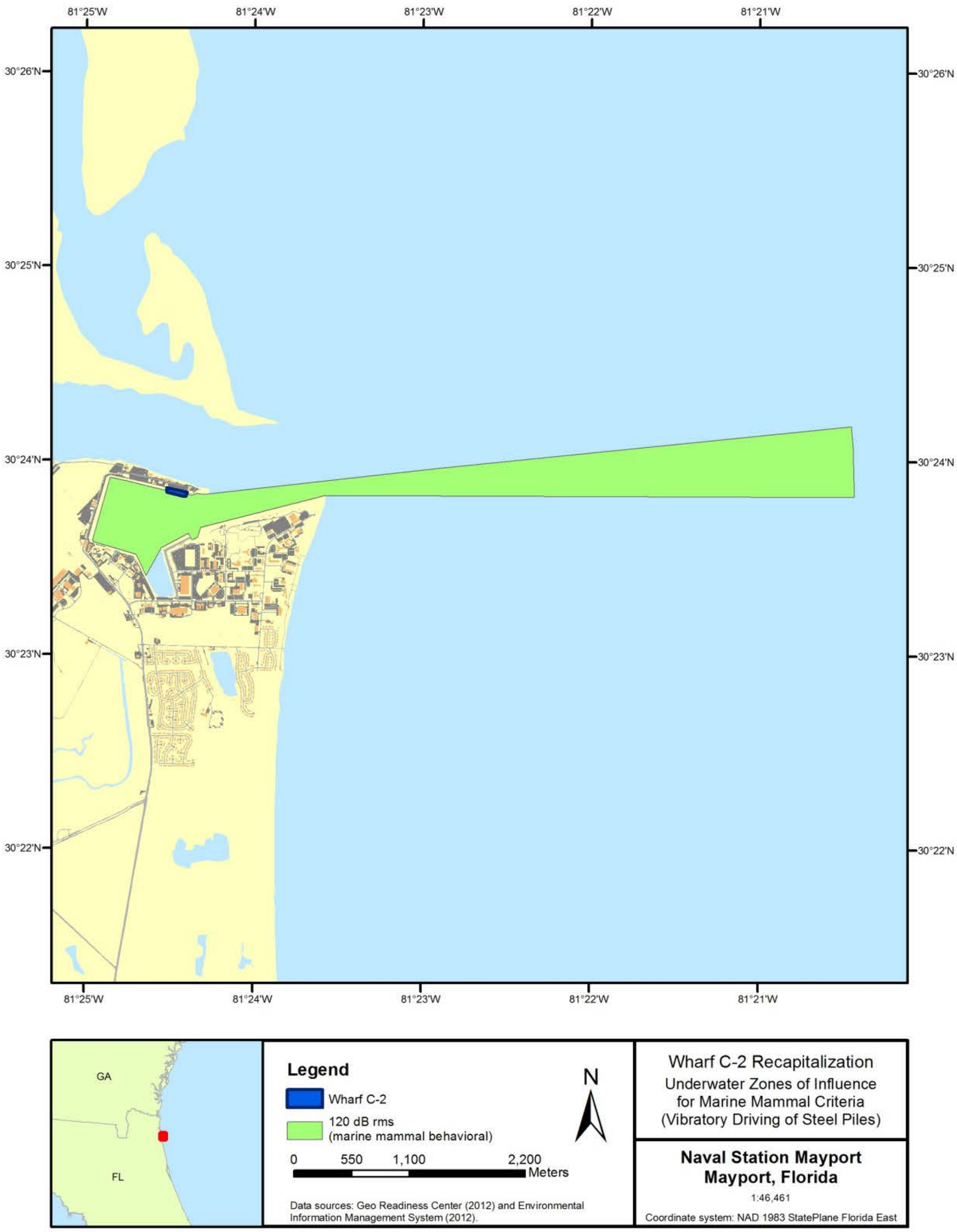


Figure 3-3. Underwater Zones of Influence for Marine Mammal[5] Criteria for Vibratory Pile Driving of Steel Piles

[5] Official criteria have not been established for West Indian manatees

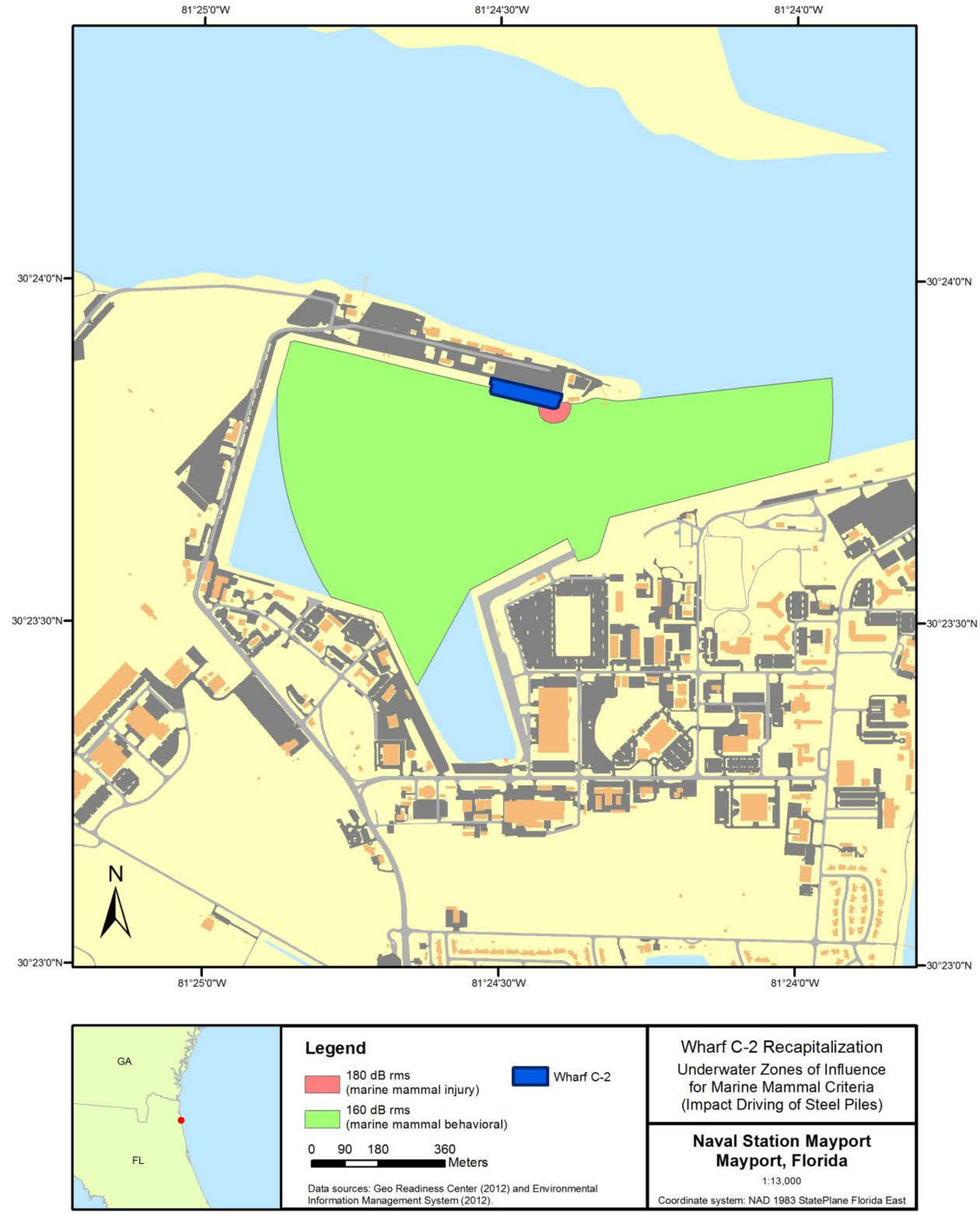


Figure 3-4. Underwater Zones of Influence for Marine Mammal[6] Criteria for Contingency Impact Driving of Steel Piles

[6] Official criteria have not been established for West Indian manatees.

The effects of pile driving on marine mammals are dependent on several factors, including the species, size of the animal, and proximity to the source; the depth, intensity, and duration of the pile driving noise; the depth of the water column; the substrate of the habitat; the distance between the pile and the animal; and the propagation properties of the environment. Impacts to marine mammals from pile driving activities, if any, are expected to result primarily from acoustic pathways. As such, the degree of effect would be intrinsically related to the received level and duration of the noise exposure, which would be influenced by the distance between the animal and the source. The farther away from the source, the less intense the exposure should be. The substrate and depth of the habitat affect the sound propagation properties of the environment. Shallow environments are typically more structurally complex, which leads to rapid sound attenuation. In addition, soft substrates in the basin (i.e., sand) will absorb or attenuate the noise more rapidly than suggested by the practical spreading model. Soft substrates will also require less time to drive the pile, and possibly less forceful equipment, which would ultimately decrease the source level of the noise.

Impacts to marine species are expected to be the result of physiological responses to both the type and strength of the acoustic signature (Viada et al. 2008). Only behavioral impacts would be expected, but the type and severity of these effects are difficult to define due to limited number of studies addressing the behavioral effects of impulsive sounds on marine mammals. Potential effects from impulsive sound sources can include behavioral disturbance, and slight injury of the auditory system (DON 2001).

Physiological Responses

Pursuant to the MMPA, no Level A exposures are expected because of the standard operating procedures and minimization measures outlined in Chapter 4 and the conservative modeling assumptions discussed earlier in this section.

Behavioral Responses

Behavioral responses to sound can be highly variable. For each potential behavioral change, the magnitude of the 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. Habituation occurs when an animal’s response to a stimulus such as pile driving noise 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 swimming speed, increased surfacing time, and cessation of foraging in the affected area would indicate disturbance or discomfort.

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 pulsed sound sources (typically seismic guns or acoustic harassment devices and including pile driving) have been varied, but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002; also see reviews in Gordon et al. 2004; Wartzok et al. 2003; and Nowacek et al. 2007). Some studies of acoustic harassment and acoustic deterrence devices have found habituation in resident populations of seals and harbor porpoises (see review in Southall et al. 2007). Blackwell et al. (2004) found that ringed seals exposed to underwater pile driving sounds in the 153–160 dB rms range tolerated this noise level and did not seem unwilling to dive. One individual was as close as 63 meters from the pile driving. Responses of two pinniped species to impact pile driving at the San Francisco-Oakland Bay Bridge East Span Seismic Safety Project were mixed (Caltrans 2001; Thorson & Reyff 2006; Thorson 2010). Harbor seals were observed in the water at distances of approximately 400–500 meters from the pile driving activity and exhibited no alarm responses, although several showed alert reactions, and none of the seals appeared to remain in the area. One of these harbor seals was even seen to swim to within 150 meters of the pile driving barge during pile driving. Several sea lions, however, were observed at distances of 500–1,000 meters swimming rapidly and porpoising away from pile driving activities. The reasons for these differences are not known, although Kastak and Schusterman (1998) reported that sea lions are more sensitive than harbor seals to underwater noise at low frequencies.

Studies of marine mammal responses to non-impulsive noise, such as vibratory pile installation, are limited. Marine mammal monitoring at the Port of Anchorage marine terminal redevelopment project found no response by marine mammals swimming within the threshold distances to noise impacts from construction activities including pile driving (both impact hammer and vibratory driving) (Integrated Concepts & Research Corporation 2009). Most marine mammals observed during the two lengthy construction seasons—beluga whales, harbor seals, harbor porpoises, and Steller sea lions—were observed in smaller numbers. Background noise levels at this port are typically at 125 dB.

A comprehensive review of acoustic and behavioral responses to noise exposure by Nowacek et al. (2007) concluded that one of the most common behavioral 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 that they return to the pre-disturbance area. Short-term displacement may not be of great concern unless the disturbance happens repeatedly. Similarly, long-term displacement may not be of concern if adequate replacement habitat is available.

Marine mammals encountering pile driving operations over the Wharf C-2 in-water work period may avoid affected areas in which they experience noise-related discomfort, limiting their ability to forage or rest there. As described in the section above, individual responses to pile driving noise are expected to be variable. Some individuals may occupy the activity area during pile driving without apparent discomfort, but others may be displaced with undetermined long-term effects. Avoidance of the affected area during pile driving operations would reduce the likelihood of injury impacts, but would also reduce access to foraging areas. Noise-related disturbance may also inhibit some marine mammals from transiting the area. 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, habituation may occur resulting in a decrease in the severity of response. Since pile driving will only occur during daylight hours, marine mammals transiting the activity area, foraging or resting in the project area at night will not be affected. 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.

3.4.3.2.5 Conclusions

Individual marine mammals may be exposed to high sound pressure levels during pile removal and installation, which may result in Level B behavioral harassment. Any marine mammals that are exposed may change their normal behavior patterns (e.g. foraging). 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. While some exposures are unavoidable, minimization measures are expected to reduce or avoid most potential adverse underwater impacts to marine mammals from pile driving. Therefore, no significant impacts to marine mammals are anticipated as a result of the Wharf C-2 Recapitalization project.

3.4.3.2.5.1 Marine Mammal Protection Act Compliance

Pursuant to the MMPA, the proposed action is not anticipated to have any adverse impact to North Atlantic right whales’, humpback whales’, Atlantic spotted dolphins’, bottlenose dolphins’, or West Indian manatees’ population recruitment, survival, or recovery.

The Navy applied for an Incidental Harassment Authorization for the first year of in-water work associated with the Wharf C-2 Recapitalization project in April 2013. Should work need to continue after the initial 12-month period, a second IHA may be developed. See Appendix A for agency correspondence.

3.4.3.2.5.2 Endangered Species Act Compliance

Pursuant to the ESA, a may affect, not likely to adversely affect determination was made for North Atlantic right whales, humpback whales, and West Indian manatees because effects from temporary water quality depletion, resuspended sediments, and noise are expected to be highly localized and discountable. A no effect determination was made for North Atlantic right whale critical habitat and West Indian manatee critical habitat because of the highly localized, temporary nature of potential water quality depletion and sediment resuspension; any effects are expected to be discountable.

The Navy submitted a biological evaluation for the Wharf C-2 Recapitalization project in May 2013. See Appendix A for agency correspondence.

3.5 Marine Vegetation

This section analyzes potential impacts of the proposed action on marine vegetation found in the project area. The taxonomic groups that may occur in local estuaries include phytoplankton (e.g., microalgae), benthic microalgae (e.g., diatoms), floating macroalgae (e.g., seaweed), attached macroalgae, submerged rooted plants (e.g., seagrass), and rooted emergent plants (e.g., saltmarsh cordgrass). The regulatory requirements for considering impacts to marine vegetation are covered in Section 3.5.1. The affected environment section

(3.5.2) describes the occurrence of taxonomic groups for population-level impacts and regulated species (if they occur) for individual impacts.

3.5.1 Regulatory Overview

Marine vegetation species may receive protection via the ESA, Clean Water Act (Section 404 permits), or Magnuson-Stevens Fishery Conservation and Management Act (MSA) status. There are few species of endangered marine vegetation, and none that occur in the project area. There are also no wetlands in or near the construction area to consider requiring a Section 404 permit. The only regulated species that may occur in the project area are *Sargassum fluitans* and *Sargassum natans* (brown algae) which are federally managed by the South Atlantic Fishery Management Council (SAFMC) (NMFS 2003). However, designated Essential Fish Habitat (EFH) for *Sargassum* is defined as the top 33 ft (10 m) of the water column in the South Atlantic Exclusive Economic Zone bounded by the Gulf Stream (50 CFR 622), which does not include estuarine waters of the project area. Given the absence of regulated plant species, the affected environment and environmental consequences sections will focus on taxonomic groups and population-level impacts.

3.5.2 Affected Environment

Features that influence the distribution and abundance of marine vegetation in the project area are the availability of light, water quality, water clarity, salinity level, seafloor type (important for rooted or attached vegetation), currents, tidal schedule, and temperature (Green and Short 2003). Marine ecosystems depend almost entirely on the energy produced by marine vegetation through photosynthesis (Castro and Huber 2000). In the lighted surface waters of coastal waters, marine algae and flowering plants provide oxygen and habitat for many organisms in addition to forming the base of the marine food web (Dawes 1998). The project area habitats include hardened shorelines grading steeply to depths of over 12 m (40 ft) (NOAA 2011a) in sheltered, high salinity estuarine waters (NOAA 2012). Substrate on the bottom is dredged, unconsolidated material (USGS 2000).

As a general rule, algae can grow down to bottom areas receiving one percent or more of surface light intensity (Wetzel 2001). Microalgae, including phytoplankton, are widespread and abundant in the estuarine water column where light is sufficient for growth. The dominant genus of floating macroalgae, *Sargassum,* is widely distributed in offshore waters of the North Atlantic Ocean (Gower and King 2008; South Atlantic Fishery Management Council 2002), but may find its way to nearshore water and estuaries on the winds and tides. Attached macroalgae (i.e., kelp, seaweed) form “meadows” or “beds” where they dominate intertidal shores or subtidal bottoms. Whereas kelp do not occur in the project area (Mathieson et al. 2009; Steneck et al. 2002), other species of seaweeds grow attached to hard bottom substrate (Nybakken 1993) in the project area. Green seaweed species (e.g., *Enteramorpha, Ulva*, *Codium*) may also grow on mudflats in sheltered estuarine waters (Gosner 1978). Attached macroalgae inhabit the hardened shoreline and shallower depths of the project area.

There are no seagrass beds mapped in this area of Florida, despite comprehensive mapping efforts (FWC–Fish and Wildlife Research Institute 2011).

3.5.3 Environmental Consequences

3.5.3.1 No Action Alternative

Under the No Action Alternative the recapitalization of Wharf C-2 would not occur. Baseline conditions for marine vegetation, as described above, would remain unchanged. Therefore, there would be no impacts to marine vegetation from implementation of the No Action Alternative.

3.5.3.2 Proposed Action

3.5.3.2.1 Physical impacts

Among the taxonomic groups of marine vegetation that could occur in the project area, only phytoplankton, benthic microalgae, and attached macroalgae are likely to occur (refer to Affected Environment section for more information). The proposed action is not expected to impact phytoplankton or benthic microalgae populations in the local ecosystem; demolition and reconstruction activities would have no lasting impact on these prolific and resilient plant species.

Algae species, in general, are more able to colonize disturbed environments than seagrass due to higher growth rates and lower light requirements (Levinton 2009). Attached macroalgae are also resilient to high levels of wave action (Mach et al. 2007), which aid in their ability to withstand disturbances that occur near them. As long as suitable substrate is maintained, any impacts on attached macroalgae should be considered temporary due to rapid regrowth of plants. The demolition and reconstruction activities of the proposed action would result in no net loss of suitable habitat for attached macroalgae.

3.5.3.2.2 Water quality impacts

Water quality would be impacted during vessel operations, installation of new piles, and contingency dredging because bottom sediments would be temporarily resuspended. Resuspended sediments would increase turbidity and reduce dissolved oxygen periodically during in-water construction activities, as discussed for water quality impacts in Section 3.1.3.2.2. The overall level of sediment disturbance associated with the Wharf C-2 Recapitalization project will be significantly lower than that of maintenance dredging in the turning basin, and resuspended sediments are expected to dissipate within a few hours (NMFS 2009). Thus marine vegetation exposed to resuspended sediments are not likely to be impacted by contaminants or chronic reduction in light availability needed for growth. Frequent tidal flushing will also dilute the concentration of contaminants in the basin water column. The activities that generate suspended sediments would be short-term and localized and suspended sediments are expected to disperse and/or settle rapidly. Therefore, no direct impacts to marine vegetation are expected due to changes in water quality during construction.

3.5.3.2.3 Acoustic impacts

Two studies have suggested that noise may affect growth rates in terrestrial plants, but the results of these studies were contradictory and there are no studies of the effects of noise on marine vegetation (Collins & Foreman, 2001; Woodlief, Royster, & Huang, 1969).

3.5.3.2.4 Conclusion

Pursuant to NEPA, the proposed action is expected to have no significant impact on unregulated marine vegetation in the project area.

3.6 Marine Invertebrates

This section analyzes potential impacts of the proposed action on marine invertebrates found in the project area. The taxonomic groups that may occur in local estuaries include bed or reef-forming (e.g., sponges, barnacles, oysters, corals), drifting (e.g., zooplankton, jellyfish), slow-moving (e.g., worms, sea urchins, clams, snails), and highly mobile (e.g., crabs, shrimp, squid). The regulatory requirements for considering impacts to marine invertebrates are covered in Section 3.6.1. The affected environment section (3.6.2) describes the occurrence of taxonomic groups for population-level impacts and regulated species (if they occur) for individual impacts.

Sedentary invertebrate beds are characterized by aggregations of unattached oysters, clams, mussels, soft corals, and other stationary invertebrates inhabiting soft or hard bottom substrate. Such aggregations do not form ridge-like or mound-like structures on hard bottom substrate; they form “meadows” or “beds” where they dominate shore or bottom areas. Reefs are ridge-like or mound-like structures formed by the colonization and layered growth of sedentary invertebrates (Cowardin et al. 1979). Reefs are characterized by their three-dimensional structure, elevation above the surrounding substrate, and interference with normal wave flow; they are primarily subtidal, but parts of some reefs may be intertidal as well.

3.6.1 Regulatory Overview

Marine invertebrate species may receive protection via the ESA, or MSA status. There are few species of endangered marine invertebrates, and none that occur in the project area. The only regulated species that could occur in the project area are commercial shrimps (brown, pink, and white), which are all federally managed by the South Atlantic Fishery Management Council (refer to subsequent sections on Essential Fish Habitat for background and supporting details). Spiny lobsters and coral species on live hard bottoms are not expected to occur in shallow waters north of southern Florida (SAFMC 1998). The affected environment and environmental consequences sections will focus on taxonomic groups and population-level impacts and adverse impacts on commercial shrimps.

3.6.1.1 Essential Fish Habitat

In 1996, the MSA was reauthorized and amended by the Sustainable Fisheries Act (Public Law 104-267). The reauthorized MSA mandated numerous changes to the existing legislation designed to prevent overfishing, rebuild depleted fish stocks, minimize bycatch, enhance research, improve monitoring, and protect fish habitat. One of the most significant mandates in the MSA that came out of the reauthorization was the EFH provision, which provides the means to conserve fish habitat.

The EFH mandate requires that the regional Fishery Management Councils, through federal fishery management plans, describe and identify EFH for each federally managed species; minimize, to the extent practicable, adverse effects on such habitat caused by fishing; and identify other actions to encourage the conservation and enhancement of such habitats.

Congress defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (16 U.S.C. § 1802(10)). The term “fish” is defined in the MSA as “finfish, mollusks, crustaceans, and all other forms of marine animals and plant life other than marine mammals and birds” (16 U.S.C. § 1802(12)). The regulations for implementing EFH provide the following: "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities (50 CFR § 600.10). Habitats used at any time during a species’ life cycle (i.e., during at least one of its life stages) must be accounted for when describing and identifying EFH (NMFS 2002).

Authority to implement the MSA is given to the Secretary of Commerce and has been delegated to NMFS. The MSA requires that EFH be identified and described for each federally managed species. The MSA also requires federal agencies to consult with the NMFS on activities that may adversely affect EFH or when the NMFS independently learns of a federal activity that may adversely affect EFH. The MSA’s implementing regulations define an adverse effect as “any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions” (50 CFR 600.810).

In addition to EFH designations, areas called Habitat Areas of Particular Concern (HAPC) are also designated by the regional Fishery Management Councils. Designated HAPC are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation (50 CFR 600.805-600.815). Regional Fishery Management Councils may designate a specific habitat area as a HAPC based on one or more of the following reasons (NMFS 2002):

- Importance of the ecological function provided by the habitat
- The extent to which the habitat is sensitive to human-induced environmental degradation
- Whether, and to what extent, development activities are, or will be, stressing the habitat type
- Rarity of the habitat type.

Categorization of an area as a HAPC does not confer additional protection or restriction to the designated area.

The area encompassed by the proposed action (project area) extends through the jurisdiction of the South Atlantic Fishery Management Council (SAFMC). In addition, the project area also extends through areas where the NMFS has designated EFH for highly migratory species (e.g., tuna, billfish, swordfish, and sharks). As a result, the proposed action may occur within areas designated as EFH by SAFMC and the NMFS and will be analyzed for potential adverse effects.

3.6.2 Affected Environment

The project area habitats include hardened shorelines grading steeply to depths of over 40 ft (12 m) (NOAA 2011a) in sheltered, high salinity estuarine waters (NOAA 2012). Substrate on the bottom is dredged, unconsolidated material (USGS 2000).

The hardened structures along the shoreline provide habitat for sedentary invertebrate beds and associated mobile invertebrates. There may also be slow-moving invertebrates inhabiting the sediment around the base of the pier footprint, and highly-mobile species in overlying water column. An extensive list of species that may occur from these taxonomic groups can be assembled from Gosner (1978). National Oceanic Administration Association's Estuarine Living Marine Resources Program has developed a consistent database on the distribution, relative abundance, and life history characteristics of ecologically and economically important fishes and invertebrates in the Nation's estuaries (NOAA 2011b). This database includes the St. Johns River estuary and >25 parts per thousand salinity zone where the project area resides. This database documents the seasonal occurrence of blue crabs, commercial shrimps (brown, pink, and white), grass shrimp, quahog clams, and eastern oysters in the high salinity portion of the estuary (Table 3-15).

Eastern oysters grow attached to hard substrate, including pier structures, whereas quahogs clams inhabit the sediment around the base of the pier footprint. The shrimp species occupy the estuary as juveniles and larvae in the water column surrounding the pier, with seasonal peaks in abundance during the warmer months.

Table 3-15. Estuarine Living Marine Resources Database records for invertebrates in the>25 parts per thousand salinity zone of the St. Johns River

Common Name	Life Stage	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
BED or REEF FORMING													
EASTERN OYSTER	ADULTS	4	4	4	4	4	4	4	4	4	4	4	4
	JUVENILES	4	4	4	4	4	4	4	4	4	4	4	4
	SPAWNING	0	0	0	4	4	4	4	4	4	4	4	0
DRIFTING													
BLUE CRAB	EGGS	0	3	4	4	4	4	4	4	4	3	0	0
	LARVAE	0	0	0	3	4	4	4	4	4	3	0	0
BROWN SHRIMP	LARVAE	0	3	4	4	4	4	4	3	3	0	0	0
EASTERN OYSTER	EGGS	0	0	0	4	4	4	4	4	4	4	4	0
	LARVAE	0	0	0	4	4	4	4	4	4	4	4	0
PINK SHRIMP	LARVAE	2	2	3	3	3	3	3	3	3	3	3	2
GRASS SHRIMP	LARVAE	0	0	3	3	3	3	3	3	3	3	0	0
	EGGS	0	0	3	3	3	3	3	3	3	3	0	0
QUAHOG CLAM	EGGS	0	0	3	3	3	2	2	2	3	3	3	0
	LARVAE	0	0	3	3	3	2	2	2	3	3	3	0

Common Name	Life Stage	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
WHITE SHRIMP	LARVAE	0	0	0	0	4	5	5	5	4	4	4	0
SLOW-MOVING													
QUAHOG CLAM	ADULTS	3	3	3	3	3	3	3	3	3	3	3	3
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
	SPAWNING	0	0	3	3	3	2	2	2	3	3	3	0
HIGHLY MOBILE													
BLUE CRAB	ADULTS	5	5	5	5	5	5	5	5	5	5	5	5
	JUVENILES	4	4	4	4	4	4	4	4	4	4	4	4
	MATING	2	2	3	3	3	3	3	3	3	3	3	3
BROWN SHRIMP	JUVENILES	0	0	3	3	4	4	4	4	4	3	3	3
GRASS SHRIMP	ADULT	5	5	5	5	5	5	5	5	5	5	5	5
	JUVENILE	3	3	3	3	3	3	3	3	3	3	3	3
PINK SHRIMP	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
WHITE SHRIMP	JUVENILES	4	4	4	3	3	3	5	5	5	4	4	4
Note: 0=absent, 2=rare; 3=common; 4=abundant; 5=high abundant													

Source: NOAA 2011b

3.6.2.1 Essential Fish Habitat

The SAFMC established a panel of experts to identify physical habitats, both inshore (estuarine) and offshore (marine), present within the South Atlantic region that are essential to the various federally managed fish (including invertebrate) species and to determine the availability of information to adequately determine the distribution and spatial extent of the habitats identified (SAFMC 1998). While maps depicting the EFH for each species or management unit were not provided along with the original EFH designations, the SAFMC has since developed a website to graphically depict the distribution and geographic extent of habitats designated as EFH by species or management unit. While not all of the EFH designations have a spatial coverage at this time, the website is continually updated as more information becomes available and all data are also available for download for use in geographic information system software applications.

The EFH for brown, pink, and white shrimp is defined as:

> "Inshore estuarine nursery areas, offshore marine habitats used for spawning and growth to maturity, and all interconnecting water bodies as described in the Habitat Plan. Inshore nursery areas include tidal freshwater (palustrine), estuarine, and marine emergent wetlands (e.g., intertidal marshes); tidal palustrine forested areas; mangroves; tidal freshwater, estuarine, and marine submerged aquatic vegetation (e.g., seagrass); and subtidal and intertidal non-vegetated flats. This applies from North Carolina through the Florida Keys." Shrimp HAPCs include: "…all coastal inlets, all state-designated nursery habitats of particular importance to shrimp (for example, in North Carolina this

> would include all Primary Nursery Areas and all Secondary Nursery Areas), and state identified overwintering areas." (SAFMC 1998)

The project area includes EFH for brown, pink, or white shrimp in the form of subtidal flats. The project area is also included in the HAPC designation for these commercial shrimp species. Wetlands and seagrass are not expected to occur in the project area (refer to Section 3.5 Marine Vegetation for supporting details).

3.6.3 Environmental Consequences

In addition to NEPA and ESA evaluation criteria, this section evaluates how and to what degree the activities described in Chapter 2 (Discussion of Alternatives) could impact EFH and HAPC in the project area. A stressor is evaluated for impacts on a designated habitat if it has the potential to alter the quality or quantity of that habitat (e.g., water column, seagrass beds, shallow coral reefs). The stressors applicable to one or more descriptors of EFH and HAPC in the project area include demolition of wharf structures and associated sound propagation.

If there is a reasonable likelihood of co-occurrence between the proposed stressors and sensitive EFH or HAPC, then a conclusion of adverse impact is made. The conclusion is further described in terms of intensity and duration of effects. Intensity is described in terms of type (e.g., minimal, substantial) and area of impact. The duration of effects is based on either duration of stressor or recovery of the habitat (NOAA 2004), whichever is greater:

- Temporary – stressor duration or recovery in hours, days, or weeks
- Short Term – stressor duration or recovery in less than 3 years
- Long Term – stressor duration or recovery in more than 3 years but less than 20 years
- Permanent – stressor duration or recovery in more than 20 years

3.6.3.1 No Action Alternative

Under the No Action Alternative the recapitalization of Wharf C-2 would not occur. Baseline conditions for marine invertebrates, as described above, would remain unchanged. Therefore, there would be no impacts to marine invertebrates from implementation of the No Action Alternative.

3.6.3.2 Proposed Action

3.6.3.2.1 Physical impacts

The proposed action includes some demolition and reconstruction of the old wharf structures and associated disturbance of the water column and bottom substrate (e.g., clamshell dredging). Eastern oysters and other sedentary invertebrates inhabiting the replaced structures will definitely be harmed, and slow-moving species may be killed in the demolition process. Highly mobile species (e.g., blue crabs, shrimps) should be able to move quickly away from the disturbance. However, no population-level impacts are anticipated given the relatively small area of impacts; resident invertebrates will recolonize the renovated structures. The small area of subtidal flat EFH in the affected area will be minimally disturbed in the replacement of the wharf structures, but highly disturbed by the dredging. However, the dredging impact on subtidal bottom would be very temporary in duration (e.g., altering depth of sand bottom).

3.6.3.2.2 Water quality impacts

Water quality would be impacted during vessel operations, installation of new piles, and contingency dredging because bottom sediments would be temporarily resuspended. Resuspended sediments would increase turbidity and reduce dissolved oxygen periodically during in-water construction activities, as discussed for water quality impacts in Section 3.1.3.2.2. The overall level of sediment disturbance associated with the Wharf C-2 Recapitalization project will be significantly lower than that of maintenance dredging in the turning basin, and resuspended sediments are expected to dissipate within a few hours (NMFS 2009). Frequent tidal flushing will also dilute the concentration of contaminants in the basin water column. Thus marine invertebrates exposed to resuspended sediments are not likely to be impacted by contaminants. The activities that generate suspended sediments would be short-term and localized and suspended sediments are expected to disperse and/or settle rapidly. Therefore, no direct impacts to marine invertebrates are expected due to changes in water quality during construction.

3.6.3.2.3 Acoustic impacts

Invertebrate species near the piling replacement work may also experience sound intensities that could affect their behavior or damage their hearing ability. There is an in-depth discussion of underwater noise from pile driving and the modeling methodology in the marine mammals section. However, very little is known about sound detection and use of sound by aquatic invertebrates (Budelmann 1992a, b; Montgomery et al. 2006; Popper et al. 2001) and there are no established criteria for behavioral disturbance or injury from intense sounds (FHWG 2008). Whereas invertebrates lacking a swim bladder are more resilient to impulsive stressors than fish, the thresholds for fish suggest very limited mortality and only very close to the pilings (refer to Section 3.7.3.2 for supporting details). There are no population-level impacts on unregulated invertebrates anticipated from sound intensities modeled and only minimum and temporary impacts on the EFH and HAPC for commercial shrimp species.

3.6.3.2.4 Conclusions

Pursuant to NEPA, the proposed action is expected to have no significant impacts on unregulated marine invertebrates. Pursuant to the Essential Fish Habitat requirements of the MSA and implementing regulations, the proposed action will have minimum and temporary adverse impacts on the EFH and HAPC for commercial shrimp species. The Navy submitted an EFH assessment for the Wharf C-2 Recapitalization project in May 2013. See Appendix A for agency correspondence.

3.7 Fish

This section analyzes potential impacts of the proposed action on fish inhabiting the project area. The life history strategies of fish that may occur in local estuaries include:

- Anadromous – spawn in freshwater and mature downstream to reach adult habitat in nearshore ocean waters;
- Estuarine spawning and nursery;

- Catadromous – spawn in ocean waters and mature upstream to reach adult habitat in coastal rivers;
- Ocean spawning/estuarine nursery; and
- Ocean spawning/high salinity nursery – includes both nearshore ocean and high salinity zone of estuaries.

The regulatory requirements for considering impacts to fish are covered in Section 3.7.1. The affected environment section (3.7.2) describes the occurrence of species groups for population-level impacts and regulated species (if they occur) for individual impacts. The groups are based on life history strategies and life stages to capture spatial and temporal occurrence patterns in the project area.

3.7.1 Regulatory Overview

Fish species may receive protection via the ESA or MSA status. There are numerous species of endangered fish, and three that may occur in the project area: Atlantic sturgeon, shortnose sturgeon, and smalltooth sawfish (refer to subsequent sections on ESA species for supporting details). Candidate species (e.g., American eel, river herring) are included for information purposes only. Other regulated species groups that could occur in the project area include highly migratory, coastal migratory pelagics, and snapper-grouper, which are managed by the SAFMC; and juvenile summer flounder managed by the Mid-Atlantic Fishery Management Council (refer to subsequent section on Essential Fish Habitat for supporting details). Background on EFH regulations is provided in Section 3.6.1.1. The affected environment and environmental consequences sections will focus on life history groups and population-level impacts, individual impacts on endangered species, and adverse impacts on EFH.

3.7.2 Affected Environment

The project area habitats include hardened shorelines grading steeply to depths of over 12 m (40 ft) (NOAA 2011a) in sheltered, high salinity estuarine waters (NOAA 2012). Substrate on the bottom is dredged, unconsolidated material (USGS 2000).

Most juvenile estuarine fish managed by the SAFMC accumulate and thrive in shallow tidal creeks and flats (Ross 2003), which would suggest a lack of juvenile habitat in the steep-sided basin of the project area. The seasonal abundance patterns of selected fish species in high salinity portions of the St. Johns River estuary are included in Table 3-16, including but not limited to SAFMC managed species. Adults of the selected species are more likely to occur in the project area; abundant species (adult life stage) in the lower St. Johns River estuary include bay anchovies, silversides, sheepshead, striped mullet, weakfish, Atlantic croaker, southern flounder, and pinfish; all except pinfish have either estuarine spawning/estuarine nursery or ocean spawning/estuarine nursery life histories. The ocean spawning adults are generally less abundant in January and February (Table 3-16). Estuarine spawning adults may be abundant year-round. The anadromous Atlantic sturgeon, an ESA species, was considered rare in the project area (refer to subsequent ESA sections for supporting details). Sharks and other highly migratory fish occurring in coastal waters were not included in the Estuarine Living Marine Resources database (refer to subsequent EFH section for supporting details).

Table 3-16. Estuarine Living Marine Resources present in high salinity portion of the St. Johns River, including but not limited to SAFMC managed species

Common Name	Life Stage	January	February	March	April	May	June	July	August	September	October	November	December
ANADROMOUS FISH													
AMERICAN SHAD	ADULTS	3	3	3	3	3	0	0	0	0	0	3	3
	JUVENILES	3	0	0	0	0	0	0	0	0	3	3	3
ATLANTIC STURGEON	ADULTS	0	0	2	2	2	0	0	0	2	2	2	0
	JUVENILES	0	0	0	0	0	0	0	0	2	2	2	0
BLUEBACK HERRING	ADULTS	3	3	3	3	0	0	0	0	0	0	0	3
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
ESTUARINE SPAWNING AND NURSERY													
BAY ANCHOVY	ADULTS	5	5	5	5	5	5	5	5	5	5	5	5
	JUVENILES	5	5	5	5	5	5	5	5	5	5	5	5
	SPAWNING	0	0	0	4	5	5	5	5	4	0	0	0
	EGGS	0	0	0	4	5	5	5	5	4	0	0	0
	LARVAE	0	0	0	4	4	5	5	5	5	4	0	0
BLACK DRUM	ADULTS	3	3	3	3	3	3	3	3	3	3	3	3
	JUVENILES	4	4	4	4	4	4	4	4	4	4	4	4
	SPAWNING	3	3	3	3	3	0	0	0	0	0	0	0
	EGGS	3	3	3	3	3	0	0	0	0	0	0	0
	LARVAE	4	4	4	4	4	4	0	0	0	0	0	0
COBIA	ADULTS	3	3	3	3	3	3	3	3	3	3	3	3
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
MUMMICHOG	ADULTS	4	4	4	4	4	4	4	4	4	4	4	4
	JUVENILES	4	4	4	4	4	4	4	4	4	4	4	4
	SPAWNING	0	0	0	4	4	4	4	4	0	0	0	0
	EGGS	0	0	0	4	4	4	4	4	0	0	0	0
	LARVAE	0	0	0	4	4	4	4	4	4	0	0	0
RED DRUM	ADULTS	3	3	3	3	3	3	3	3	3	3	3	3
	JUVENILES	4	4	4	4	4	4	4	4	4	4	4	4
	SPAWNING	4	0	0	0	0	0	0	0	4	4	4	4
	EGGS	4	0	0	0	0	0	0	0	4	4	4	4
	LARVAE	4	4	0	0	0	0	0	0	4	4	4	4

Common Name	Life Stage	January	February	March	April	May	June	July	August	September	October	November	December
	ADULTS	4	4	4	4	4	4	4	4	4	4	4	4
	JUVENILES	4	4	4	4	4	4	4	4	4	4	4	4
SHEEPSHEAD	SPAWNING	0	3	3	3	3	0	0	0	0	0	0	0
	EGGS	0	3	3	3	3	0	0	0	0	0	0	0
	LARVAE	0	3	3	3	3	0	0	0	0	0	0	0
	ADULTS	3	3	3	3	3	3	3	3	3	3	3	3
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
SHEEPSHEAD MINNOW	SPAWNING	0	3	3	3	3	3	0	0	0	0	0	0
	EGGS	0	3	3	3	3	3	0	0	0	0	0	0
	LARVAE	0	3	3	3	3	3	3	0	0	0	0	0
	ADULTS	4	4	5	5	5	5	5	5	5	5	4	4
	JUVENILES	4	4	4	4	4	4	4	4	4	4	4	4
SILVERSIDES	SPAWNING	2	3	5	5	5	5	5	5	5	5	3	2
	EGGS	2	3	4	4	4	4	4	4	4	4	3	2
	LARVAE	2	3	4	4	4	4	4	4	4	4	3	2
	ADULTS	3	3	3	3	3	3	3	3	3	3	3	3
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
SPOTTED SEATROUT	SPAWNING	0	0	0	3	3	3	3	0	0	0	0	0
	EGGS	0	0	0	3	3	3	3	0	0	0	0	0
	LARVAE	0	0	0	3	3	3	3	3	0	0	0	0
	ADULTS	4	4	4	4	4	4	4	4	4	4	4	4
	JUVENILES	4	4	4	4	4	4	4	4	4	4	4	4
WEAKFISH	SPAWNING	0	0	4	4	4	4	4	4	0	0	0	0
	EGGS	0	0	4	4	4	4	4	4	0	0	0	0
	LARVAE	0	0	4	4	4	4	4	4	4	0	0	0
CATADROMOUS													
	ADULTS	3	3	3	0	0	0	0	0	0	0	3	3
AMERICAN EEL	JUVENILES	4	4	4	4	4	4	4	4	4	4	4	4
	LARVAE	4	5	5	5	4	0	0	0	0	0	0	0
OCEAN SPAWNING/ESTUARINE NURSERY													
ATLANTIC CROAKER	ADULTS	3	3	3	3	3	4	4	4	4	4	4	4
	JUVENILES	4	4	4	4	4	4	4	4	4	4	4	4

Common Name	Life Stage	January	February	March	April	May	June	July	August	September	October	November	December
	LARVAE	4	4	4	4	0	0	0	0	0	0	0	4
ATLANTIC MENHADEN	ADULTS	2	2	2	2	2	4	4	4	4	4	3	2
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
	LARVAE	3	3	3	3	3	0	0	0	0	0	0	0
SOUTHERN FLOUNDER	ADULTS	0	0	3	4	4	4	4	4	4	3	3	3
	JUVENILES	3	3	4	4	4	4	4	4	4	4	3	3
	LARVAE	4	4	3	3	3	0	0	0	0	3	4	4
SPOT	ADULTS	0	0	0	0	3	3	3	3	3	0	0	0
	JUVENILES	3	3	3	4	4	4	4	4	4	4	3	3
	LARVAE	3	3	3	3	0	0	0	0	0	0	0	0
STRIPED MULLET	ADULTS	3	3	3	5	5	5	5	5	5	3	3	3
	JUVENILES	4	4	4	5	5	5	5	5	5	5	5	5
	LARVAE	5	5	4	4	0	0	0	0	0	4	5	5
OCEAN SPAWNING/HIGH SALINITY NURSERY													
BLUEFISH	ADULTS	3	3	3	3	3	0	0	0	0	3	3	3
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
GRAY SNAPPER	ADULTS	3	3	3	3	3	3	3	3	3	3	3	3
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
	LARVAE	0	0	0	3	3	3	3	3	0	0	0	0
GULF FLOUNDER	ADULTS	0	0	3	3	3	3	3	3	3	3	0	0
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
	LARVAE	3	3	3	3	0	0	0	0	0	0	3	3
LADYFISH	ADULTS	3	3	3	3	3	3	3	3	3	3	3	3
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
	LARVAE	3	3	3	3	0	0	0	0	0	0	0	0
PINFISH	ADULTS	3	3	3	4	4	4	4	4	4	3	3	3
	JUVENILES	4	4	4	4	4	4	4	4	4	4	4	4
	LARVAE	4	4	4	3	0	0	0	0	0	0	0	3
SOUTHERN KINGFISH	ADULTS	3	3	3	3	3	3	3	3	3	3	3	3
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
	LARVAE	0	0	0	3	3	3	3	3	0	0	0	0

Common Name	Life Stage	January	February	March	April	May	June	July	August	September	October	November	December
SPANISH MACKEREL	ADULTS	3	3	3	0	0	0	0	0	0	3	3	3
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
	LARVAE	0	0	0	0	0	0	3	3	3	0	0	0
SUMMER FLOUNDER	ADULTS	0	0	3	3	3	3	3	3	3	0	0	0
	JUVENILES	3	3	3	3	3	3	3	3	3	3	3	3
	LARVAE	3	3	3	0	0	0	0	0	0	0	0	3

Documentation for the occurrence of ESA and EFH species in the project area are provided in the following sections.

3.7.2.1 Atlantic Sturgeon

3.7.2.1.1 Status and Management

In January 2010, NMFS found a petition to list presented substantial scientific and commercial information indicating that listing may be warranted (NMFS 2010c). After completing an ESA status review of the species, NMFS issued two final rules in February 2012 – one for the southeast region, listing the Carolina and South Atlantic distinct population segments (DPS) as endangered (77 FR 5914); the other for the northeast region, listing the Gulf of Maine population segment as threatened and the Chesapeake Bay and New York Bight distinct population segments as endangered (77 FR 5880).

3.7.2.1.2 Habitat and Geographic Range

Spawning adults migrate upriver in spring, beginning in February in the south, April in Mid-Atlantic, and May in Canadian waters (Dadswell 2006). After spawning in freshwater, the adults migrate back into estuarine and marine waters. Tagging data indicate that juvenile Atlantic sturgeons disperse widely once they move into coastal waters (Secor et al. 2000). Dispersal is extensive: north and south along the Atlantic coast and seaward to the edge of the continental shelf (Bain 1997; NMFS 2010c). During non-spawning years, adults remain in marine waters either year-round or seasonally (Bain 1997). Although the species occurs as far south as St. Johns River, it is strongly associated with specific coastal areas, including the mouth of Chesapeake Bay in a narrow range of depths (30-160 ft [10-50 m] over gravel and sand, and to a lesser extent, silt and clay (Stein et al. 2004). There is no Critical Habitat designated for Atlantic sturgeon.

3.7.2.1.3 Population and Abundance

The status of the Atlantic sturgeon populations varies widely, from the large but possibly declining population in the Hudson River, to small groups of survivors of a once robust population that has undergone considerable decline (Delaware River), to apparently locally extent (Maryland tributaries of Chesapeake Bay and St. Johns River, Florida) (National Marine Fisheries Service 2007, Waldman and Wirgin 1998). However, the Estuarine Living

Marine Resources database indicates a rare occurrence of Atlantic sturgeon in the St. Johns River estuary (refer to Section 3.7.2 for supporting details).

3.7.2.1.4 Predator / Prey Interaction and Foraging

Like all sturgeon, the Atlantic sturgeon feeds along the bottom on invertebrates such as isopods, crustaceans, worms, and mollusks (NMFS 2010f). It has also been documented to feed on fish (Bain 1997). Evidence of predation on sturgeon is scarce, but some researchers believe they are taken by the American alligator (*Alligator mississippiensis*), alligator gar (*Atractosteus spatula*), and striped bass (*Morone saxatilis*) (Dadswell 2006). Sharks likely prey on all species of sturgeon in the marine environment (National Marine Fisheries Service 1998).

3.7.2.1.5 Critical Habitat

No critical habitat has been designated for this species.

3.7.2.2 Shortnose Sturgeon

3.7.2.2.1 Status and Management

In 1967, the species was listed as endangered under the Endangered Species Preservation Action of 1966, which predated the ESA; this species remains on the list as endangered throughout its range along the Atlantic coast (NMFS 1998). NMFS manages 19 distinct population segments on the anadromous shortnose sturgeon; the St. Johns River population is included in the DPS.

3.7.2.2.2 Habitat and Geographic Range

The species primarily occurs in freshwater rivers and coastal estuaries of the northeastern and southeastern United States and into the nearshore coastal waters NMFS 1998). Adults are found in deep water (35-100 ft [10-30 m]) in winter and shallow water (7-35 ft) in summer (Welsh et al. 2002). There is no Critical Habitat designated for shortnose sturgeon.

3.7.2.2.3 Population and Abundance

Although a DPS has been designated for shortnose sturgeon in the St. Johns River, there is no evidence suggesting their abundance in the estuary. The Estuarine Living Marine Resources database does not include shortnose sturgeon in the list of species for the St. Johns River.

3.7.2.2.4 Predator / Prey Interaction and Foraging

In southern rivers, feeding has been observed during winter at or just downstream of where saltwater and freshwater meet (Kynard 1997). Shortnose sturgeon in the southeastern United States Continental Shelf Large Marine Ecosystem reduce their feeding activity during summer months (NMFS 1998; Sulak and Randall 2002).

The shortnose sturgeon feeds by suctioning polychaetes (marine worms), crustaceans, mollusks, and small fish from the bottom (NMFS 1998; Stein et al. 2004). Young-of-the-year sturgeon (individuals less than a year old) have been found in the stomachs of yellow perch (NMFS 1998); predation on older sturgeon is not well-documented, although sharks likely prey on them in the marine environment (NMFS 1998).

3.7.2.3 Smalltooth Sawfish

3.7.2.3.1 Status and Management

The DPS of smalltooth sawfish, a species of shark (elasmobranch), between Florida and Cape Hatteras, North Carolina, was listed as endangered under the ESA by NMFS in 2003 and by USFWS in 2005; it is co-managed by both agencies (NMFS 2010d).

3.7.2.3.2 Habitat and Geographic Range

The species was once common in the Gulf of Mexico and along the east coast of the United States in shallow estuarine and marine waters. Today, the severely depleted population is restricted mostly to southern Florida (Poulakis and Seitz 2004; Simpfendorfer 2002; Simpfendorfer and Wiley 2005, 2006). In 2009, NMFS designated critical habitat for smalltooth sawfish at two locations; the Charlotte Harbor estuary and the Ten Thousand Islands portion of the Everglades (50 CFR 226.218—Critical habitat for the U.S. DPS of smalltooth sawfish). Both critical habitat areas are on the Gulf of Mexico coast, far from the project area.

3.7.2.3.3 Population and Abundance

The species is not expected to occur in the study area, though the area resides in the historic range of the smalltooth sawfish.

3.7.2.3.4 Predator / Prey Interaction and Foraging

The smalltooth sawfish feeds primarily at night (NMFS 2009e) and uses its saw while feeding to stir the substrate to expose crustaceans or to stun and slash schooling fish (NMFS 2009c). Smalltooth sawfish, particularly juveniles, are preyed upon by bull sharks and other sharks occurring in shallow coastal waters.

3.7.2.3.5 Critical Habitat

There is no smalltooth sawfish critical habitat in the vicinity of the Project.

3.7.2.4 American Eel

3.7.2.4.1 Status and Management

American eel are currently under petition as a candidate for listing under the ESA by the U.S. Fish and Wildlife Service because they have undergone substantial declines throughout their range (76 FR 60431).

3.7.2.4.2 Habitat and Geographic Range

The American eel ranges from Greenland south along the Atlantic Coast and into the Caribbean (U.S. Fish and Wildlife Service 2011). The American eel is catadromous, meaning it is born in saltwater and migrates into freshwater to mature (Jessop et al. 2002). Spawning of the U.S. population of American eel is believed to occur in the Sargasso Sea of the Atlantic Ocean. As juveniles, or “glass eels,” they enter coastal waters where they further mature into ‘‘elvers’’ and then a late juvenile stage known as ‘‘yellow eels” (U.S. Fish and Wildlife Service 2011). Older juveniles and adults occupy estuarine and freshwater habitats, often swimming far upriver into lakes, ponds, and headwater streams, where they may spend up to 30 years as adults. Mature adults, or “silver eels,” migrate to the Sargasso Sea to spawn and die (U.S. Fish and Wildlife Service 2011). Peak migration in the St. Johns River takes place between January and February (Florida Fish and Wildlife Conservation Commission n.d.[A]).

3.7.2.4.3 Population and Abundance

The American eel exists as a single population that disperses widely from its spawning grounds in the Sargasso Sea, making abundance difficult to determine (Haro et al. 2000). Demographic structure is difficult to determine because nonbreeding individuals are spread over an extremely large geographic range (U.S. Fish and Wildlife Service 2011). There is a small commercial fishery for American eels in Florida, which operates almost exclusively in the St. Johns River system. Annual landings of American eels have been reported since the early 1980s. However, commercial eel harvest has been declining since the early 1990s (Florida Fish and Wildlife Conservation Commission n.d.[A]).

3.7.2.4.4 Predator / Prey Interaction and Foraging

The American eel feeds on a wide variety of prey items including benthic invertebrates, insects, crustaceans, mollusks, worms, and finfish. It is preyed upon by a wide variety of species including fish, seabirds, sharks, and rays (Dalton et al. 2009; U.S. Fish and Wildlife Service 2011).

3.7.2.4.5 Critical Habitat

This species is not listed under the ESA; as such, no critical habitat has been designated.

3.7.2.5 Blueback Herring

3.7.2.5.1 Status and Management

The blueback herring was classified as a candidate species under the ESA in 2011 (76 FR 67652). Blueback herring and alewife are evaluated jointly as “river herring” by NMFS. Coastal ranges of the two species overlap with blueback herring found in a greater and more southerly distribution ranging from Nova Scotia down to the St. Johns River (76 FR 67652). Therefore, only blueback herring is addressed in this document.

3.7.2.5.2 Habitat and Geographic Range

The blueback herring ranges from Nova Scotia to the St. Johns River (McBride et al. 2010). Blueback herring and alewife exhibit very similar life histories, and herring are often harvested and managed together because of the difficulty in distinguishing between the two species; they are currently managed by the Atlantic States Marine Fisheries Commission. Several states north of Florida have enacted harvest moratoria and management plans for this species.

3.7.2.5.3 Population and Abundance

River herring have undergone substantial declines throughout most of their range. Smaller sizes being harvested in the St. Johns River suggests that the population is experiencing higher mortality than in the past (McBride et al. 2010).

3.7.2.5.4 Predator / Prey Interaction and Foraging

All life stages of river herring feed primarily on phytoplankton and zooplankton, but adults also eat mysids, small finfish, and benthic crustaceans (National Marine Fisheries Service

2009). River herring are preyed on by a number of marine species, including striped bass, bluefish, tunas, cod, haddock, halibut, American eel, seabirds, and marine mammals.

3.7.2.5.5 Critical Habitat

This species is not listed under the ESA; as such, no critical habitat has been designated.

3.7.2.6 Dwarf Seahorse

3.7.2.6.1 Status and Management

In April 2011, NMFS received a petition to list the dwarf seahorse as threatened or endangered under the ESA and to designate critical habitat concurrently with the listing (77 FR 26478). In its 90-day review, NMFS concluded that the species may warrant listing under the ESA, resulting in the initiation of a formal status review (77 FR 26478).

Dwarf seahorses are harvested in Florida's commercial seahorse fishery, primarily in the southeast portion of the state through diving, seining, or dredging (Bruckner 2005; 77 FR 26478). The state imposes a commercial bag limit of 400 dwarf seahorses per person or per vessel per day, whichever is less; and a recreational bag limit of five dwarf seahorses per person, per day. There are no seasonal restrictions or closures for this fishery (77 FR 26478).

3.7.2.6.2 Habitat and Geographic Range

The dwarf seahorse inhabits tropical and subtropical / warm-temperate waters of Florida, the Gulf of Mexico, and the Caribbean (Masonjones and Lewis 1996). The species primarily occurs in south Florida estuaries and in the Florida Keys, preferring protected bays/lagoons with low water flow, high organic content, mid- to high-salinities and depths less than 6 ft (2 m) (Bruckner 2005; Foster and Vincent 2004). Dwarf seahorses are almost exclusively associated with seagrass beds, particularly eelgrass (Zostera spp.) (Bruckner 2005). Other habitats used by the dwarf seahorse include mangrove areas, unattached algae, and inshore drifting vegetation (Center for Biological Diversity 2011; Hoese and Moore 1998; Tabb and Manning 1961).

While most seahorse species exhibit strong site-fidelity, in terms of home ranges and spawning habitat (Curtis and Vincent 2006; Masonjones and Lewis 1996), Masonjones et al. (2010) suggests that further seahorse dispersal outside of home ranges may occur. Dispersal may be enhanced by clinging to drifting Sargassum or floating debris within inshore habitats (Foster and Vincent 2004; Masonjones and Lewis 1996). Dwarf seahorse spawning occurs between February and November (Foster and Vincent 2004). Based on habitat requirements (particularly seagrass and subtropical water temperatures, dwarf seahorses are not expected to occur in the action area.

3.7.2.6.3 Population and Abundance

There are no published data on current global population trends or total numbers of mature dwarf seahorses; however, some population data exist in Florida based on numbers derived from the commercial seahorse fishery. The NMFS reported a five-fold increase in seahorse landings between 1991 and 1992 (from 14,000 harvested in 1991 to 83,700 harvested in 1992) (77 FR 26478), with the increased landings primarily attributed to dwarf seahorses. Over a longer period, the number of dwarf seahorses landed during 1990–2003 ranged from 2,142 to

98,779 individuals per year (Bruckner 2005). Additional density data are from ichthyoplankton tows conducted in portions of southern Florida and range from 0 to 6 seahorses per 100 cubic meters in subtidal pools, seagrass beds, in channels, and along restored marsh edges (Masonjones et al. 2010; Powell et al. 2002; Thayer et al. 1999).

3.7.2.6.4 Predator/Prey Interaction and Foraging

Seahorses are ambush predators, consuming primarily live, mobile nekton, such as small amphipods and other invertebrates (Bruckner 2005).

3.7.2.6.5 Critical Habitat

This species is not listed under the ESA; as such, no critical habitat has been designated.

3.7.2.7 Essential Fish Habitat

Refer to Section 3.6.2.2 for background on the designation process for the SAFMC.

3.7.2.7.1 Coastal Migratory Pelagics

The fish species in this management unit include Spanish mackerel, king mackerel, and cobia. Of these species, Spanish mackerel and cobia are considered common in the lower St. Johns River estuary (Table 3-16). The EFH for coastal migratory pelagic species is defined as:

> "Sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf stream shoreward, including Sargassum. In addition, all coastal inlets, all state-designated nursery habitats of particular importance to coastal migratory pelagics (for example, in North Carolina this would include all Primary Nursery Areas and all Secondary Nursery Areas). In addition, the Gulf Stream is an essential fish habitat because it provides a mechanism to disperse coastal migratory pelagic larvae. For king and Spanish mackerel and cobia essential fish habitat occurs in the South Atlantic and Mid-Atlantic Bights. For Cobia essential fish habitat also includes high salinity bays, estuaries, and seagrass habitat." (SAFMC 1998)

The project area includes EFH for coastal migratory pelagics in the form of open estuarine waters in close proximity to an inlet and within a high salinity bay. There are no state-designated nursery areas and no documented seagrass beds occurring in the project area (refer to Section 3.5 Marine Vegetation for supporting details).

3.7.2.7.2 Snapper-grouper

There are numerous fish species in this management unit, with gray snapper the only common representative in the project area (Table 3-16). The EFH for snapper-grouper species is defined as:

> "Coral reefs, live/hard bottom, submerged aquatic vegetation, artificial reefs and medium to high profile outcroppings on and around the shelf break zone from shore to at least 600 ft (but to at least 2,000 ft for wreckfish) where the annual water temperature range is sufficiently warm to maintain adult populations of members of this largely tropical complex. EFH includes the

> spawning area in the water column above the adult habitat and the additional pelagic environment, including Sargassum, required for larval survival and growth up to and including settlement. In addition the Gulf Stream is an essential fish habitat because it provides a mechanism to disperse snapper grouper larvae. For specific life stages of estuarine dependent and nearshore snapper-grouper species, essential fish habitat includes areas inshore of the 100-foot contour, such as attached macroalgae; submerged rooted vascular plants (seagrasses); estuarine emergent vegetated wetlands (saltmarshes, brackish marsh); tidal creeks; estuarine scrub/shrub (mangrove fringe); oyster reefs and shell banks; unconsolidated bottom (soft sediments); artificial reefs; and coral reefs and live/hard bottom." (SAFMC 1998)

The project area includes EFH for snapper-grouper in the form of attached macroalgae, oyster reefs and unconsolidated bottom. The artificial structures along the shoreline do not qualify as EFH because they were not designed as fish habitats. Estuarine emergent wetlands, mangrove fringes, tidal creeks, coral reefs, and live hard bottom (with coral species) are not expected to occur in the project area (refer to Section 3.5 Marine Vegetation and 3.6 Marine Invertebrates for supporting details).

3.7.2.7.3 Highly Migratory Species

The NMFS has assumed the responsibility of designating EFH and HAPC for federally managed highly migratory species (e.g., tunas, billfish, swordfish, and sharks) in the U.S. waters of the Atlantic Ocean and the Gulf of Mexico, as these species are not restricted to the waters under the jurisdiction of any single Fishery Management Council. The NMFS adopted amendments to the fishery management plans of each of the six primary fisheries that they manage as a means of designating EFH and HAPC for each of the species (NMFS 2009b). Of the primary fisheries, only coastal sharks (large and small) are expected to occur in the project area (Table 3-17). No HAPCs designated for these species intersect the project area.

Table 3-17. Highly Migratory Species inhabiting coastal waters of the South Atlantic Fishery Management Council region

Species	Scientific name
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*
Blacknose shark	*Carcharhinus acronotus*
Blacktip shark	*Carcharhinus limbatus*
Bonnethead shark	*Sphyrna tiburo*
Bull shark	*Carcharhinus leucas*
Finetooth shark	*Carcharhinus isodon*
Great hammerhead	*Sphyrna mokarran*
Lemon shark	*Negaprion brevirostris*
Nurse shark	*Ginglymostoma cirratum*
Sandbar shark	*Carcharhinus plumbeus*
Scalloped hammerhead	*Sphyrna lewini*
Spinner shark	*Carcharhinus brevipinna*

3.7.2.7.4 Summer flounder

The MAFMC has designated all submerged aquatic vegetation and macroalgae beds from Maine to Indian River (Florida) as HAPC for summer flounder (Mid-Atlantic Fishery Management Council and Atlantic States Marine Fisheries Commission 1998). The Project Area includes both macroalgae habitat (Section 3.5) and an abundance of juvenile summer flounder (Table 3.16).

3.7.3 Environmental Consequences

Refer to Section 3.6.3 for EFH evaluation criteria.

3.7.3.1 No Action Alternative

Under the No Action Alternative the recapitalization of Wharf C-2 would not occur. Baseline conditions for fish, as described above, would remain unchanged. Therefore, there would be no impacts to fish from implementation of the No Action Alternative.

3.7.3.2 Proposed Action

3.7.3.2.1 Physical Impacts

The proposed action includes some demolition and reconstruction of the old wharf structures and associated disturbance of the water column and bottom substrate (e.g., clamshell dredging). Highly mobile juvenile or adult fish would be able to move quickly away from the disturbance. However, fish associated with attached macroalgae and sedentary invertebrate beds on the demolished pier structures may be displaced until the community is re-established on the new structures; attached macroalgae EFH will quickly recolonize the wharf structures (<1 year), while the oyster reef EFH will take several years to fully mature (Bahr and Lanier 1981, Coen et al. 1999). The small area of unconsolidated substrate EFH (e.g., subtidal flats) in the affected area will be minimally disturbed in the replacement of the vertical structures, but highly disturbed by the dredging. However, the dredging impact on subtidal bottom would be very temporary in duration (e.g., altering depth of sand bottom).

The estimated area of vertical oyster reefs impacted depends on the surface area of subtidal structures removed and the density-at-depth distribution of oysters. The perimeter of the concrete curtain is 280m x approximately 1m (visible width of oyster reefs; Figure 3-5), which equals an area of 280 m^2 (0.07 acres). This area assumes equal width of oyster reef along the entire length, and no growth on the support pilings and submerged debris removed from the area (approximately 30 pilings). It would be difficult to determine an entire surface area impacted without a comprehensive survey of the submerged structures. However, regrowth of oysters on the new structures is anticipated to compensate for the long term impact on oysters.

Figure 3-5. Vertical oyster reefs visible on photograph of the Wharf C-2 curtain

3.7.3.2.2 Water quality impacts

Water quality would be impacted during vessel operations, installation of new piles, and contingency dredging because bottom sediments would be temporarily resuspended. Resuspended sediments would increase turbidity and reduce dissolved oxygen periodically during in-water construction activities, as discussed for water quality impacts in Section 3.1.3.2.2. The overall level of sediment disturbance associated with the Wharf C-2 Recapitalization project will be significantly lower than that of maintenance dredging in the turning basin, and resuspended sediments are expected to dissipate within a few hours (NMFS 2009). Frequent tidal flushing will also dilute the concentration of contaminants in the basin water column. Thus fish exposed to resuspended sediments are not likely to be impacted by contaminants. The activities that generate suspended sediments would be short-term and localized and suspended sediments are expected to disperse and/or settle rapidly. Therefore, no direct impacts to fish are expected due to changes in water quality during construction.

3.7.3.2.3 Acoustic impacts

Individual fish near the piling replacement work may also experience sound intensities that could affect their behavior or damage their hearing ability. There is an in-depth discussion of underwater noise from pile driving and the modeling methodology in the marine mammals section (Section 3.4.3.2.13). Since many fish use their swim bladders for buoyancy, they are susceptible to rapid expansion/decompression due to peak pressure waves from underwater noises (Hastings and Popper 2005). The onset of injury threshold resulting from this rapid expansion/decompression is supported by data presented on selected species in FHWG (2008). Whereas behavioral disturbance criteria for fish are not supported with data, the NMFS and USFWS generally use 150 dB rms as the threshold for ESA-listed species. Criteria for behavioral impacts and onset of injury are provided in Table 3-18.

The criteria and resulting areas (Figure 3-6) suggest only the most limited mortality of fish, and only when they are very close to an intense sound source (FHWG 2008). There is no population-level impact on unregulated fish anticipated from the sound intensities modeled and only minimum and temporary adverse impacts on water column EFH for all managed species inhabiting the water column. The ESA listed sturgeon species and smalltooth sawfish may be affected by the sound intensities, but are not likely to be adversely impacted by them.

Table 3-18. Criteria for fish behavioral disturbance and onset of injury from the sound produced by vibratory and impact hammers

Pile Type	Driving Method	Threshold	Distance (m)[1]	Area (km^2)
Steel (sheet and king piles)	Vibratory	Behavioral (all):150 dB re 1 µPa rms	73.6	0.011
	Impact (contingency)	Injury (all): 206 dB re 1 µPa rms	8.6	0.00058
		Injury (≥ 2g): 187 dB re 1 μPa^2sec SEL	21.6	0.0019
		Injury (< 2g): 183 dB re 1 μPa^2sec SEL	39.9	0.0045
		Behavioral (all):150 dB re 1 µPa rms	3,981	1.37
Polymeric fender piles	Vibratory	Behavioral (all): 150 dB re 1 µPa rms	15.8	0.001

Note: no injury criteria for fish for vibratory driving; all sound levels expressed in dB re 1 µPa rms. dB=decibel; rms=root-mean-square; µPa=microPascal; Practical spreading loss (15 log, or 4.5 dB per doubling of distance) used for calculations; [1]Sound pressure levels used for calculations are given in Tables 3-12 and 3-13.

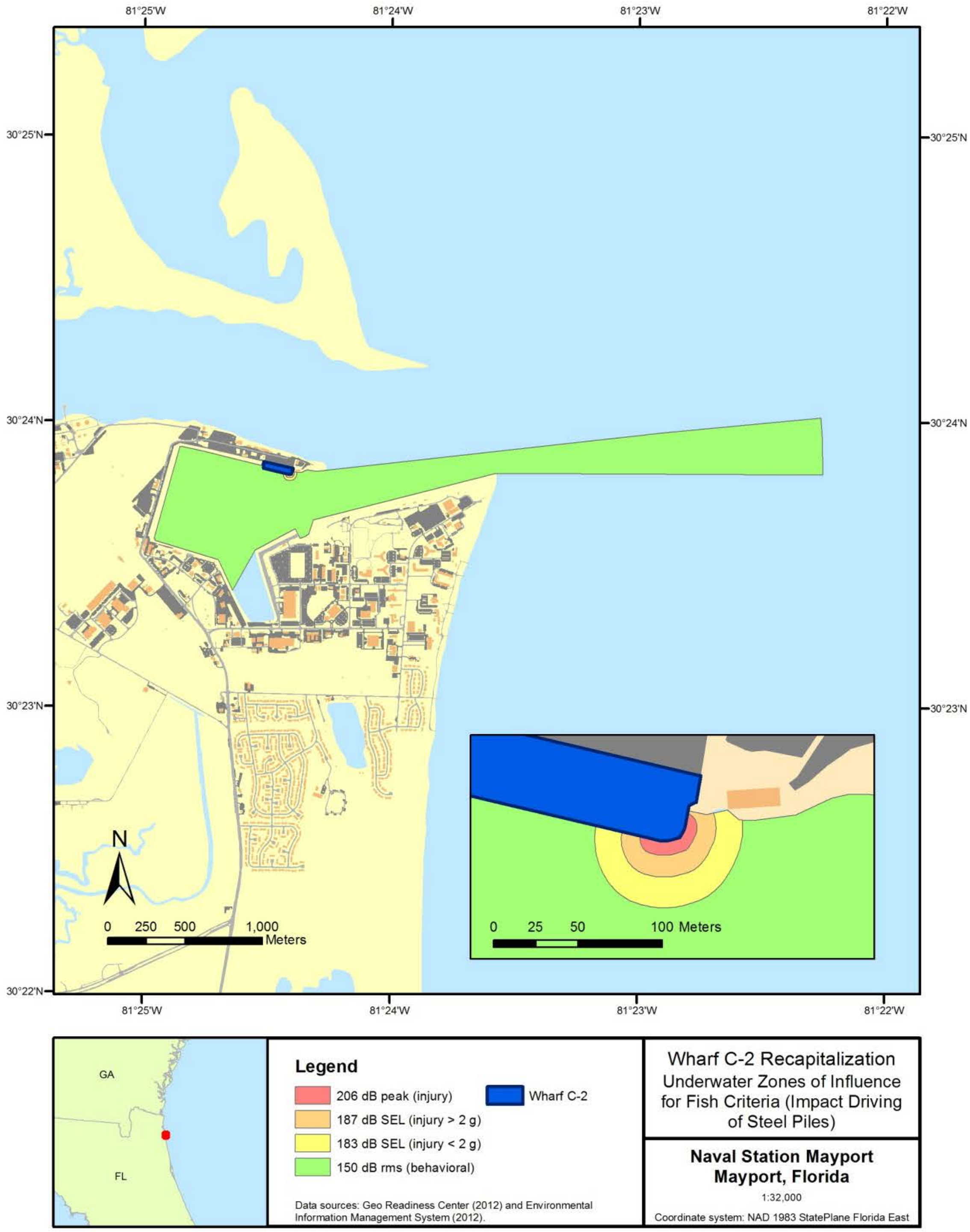


Figure 3-6. Underwater Zones of Influence for Fish Criteria Impact Pile Driving

3.7.3.2.4 Conclusions

Pursuant to NEPA, the proposed action is not expected to have any significant impacts on unregulated fish species. Pursuant to EFH requirements of the MSA and implementing regulations, the attached macroalgae (summer flounder EFH) will experience a temporary adverse impact, whereas oyster reefs (snapper-grouper EFH) will experience long-term adverse impact before regrowth of oysters on the new structures is established. Water column habitats (EFH for all managed species inhabiting the water column) will experience only temporary impacts of minimum intensity. Pursuant to the ESA, the proposed action may affect, but is not likely to adversely affect ESA-listed sturgeon and smalltooth sawfish species. The Navy submitted a biological evaluation for the Wharf C-2 Recapitalization project in May 2013. See Appendix A for agency correspondence.

3.8 Sea Turtles

This section provides a brief introduction to sea turtles that occur within the boundaries of the project area and whose distribution may overlap with stressors associated with the proposed action. There are five species of sea turtles which may occur within the project area: the green turtle (*Chelonia mydas*), the hawksbill turtle (*Eretmochelys imbricata*), the Kemp's ridley turtle (*Lepidochelys kempii*), the loggerhead turtle (*Caretta caretta*), and the leatherback turtle (*Dermochelys coriacea*). Each of these species is discussed below in Section 3.8.2 (Affected Environment).

The olive ridley sea turtle (*Lepidochelys olivacea*) was considered for inclusion in this document, but because its occurrence in the project area is extralimital (outside the species' normal range), the species will not be analyzed. Currently, there are no olive ridley nesting beaches in the eastern United States, and there are no known feeding, breeding, or migration areas within the vicinity of the project area.

No other marine reptiles (e.g. the American alligator, *Alligator mississippiensis*) occur in the project area, and are not considered here.

3.8.1 Regulatory Overview

As shown in Table 3-19, all sea turtle species that occur in the project area are listed under the ESA as either threatened or endangered. The NMFS and the USFWS share jurisdictional responsibility for sea turtles under the ESA. The USFWS has responsibility in the terrestrial environment (e.g., nesting beaches), while the NMFS has responsibility in the marine environment. Two species, the green turtle and loggerhead turtle are listed by population and DPS respectively. For more background on the ESA, see Section 3.4.1 Marine Mammal Regulatory Overview.

Table 3-19. Regulatory Status of ESA-Listed Sea turtles in the Project Area

Species	Relevant Population/DPS	ESA Status
Green turtle (*Chelonia mydas*)	Florida nesting population[1]	Endangered
Hawksbill turtle (*Eretmochelys imbricata*)	Entire population	Endangered
Kemp's ridley turtle (*Lepidochelys kempii*)	Entire population	Endangered
Loggerhead turtle (*Caretta caretta*)	Northwest Atlantic Ocean	Threatened
Leatherback turtle (*Dermochelys coriacea*)	Entire population	Endangered

[1] As a species, the green turtle is listed as threatened, but the Florida and Mexican Pacific coast nesting populations are listed as endangered. Note that green turtles found in the project area might not all be from the Florida population.

DPS: Distinct Population Segment; ESA: Endangered Species Act

3.8.2 Affected Environment

Sea turtles are highly migratory, long-lived reptiles that occur throughout the open ocean and coastal regions of the world, generally within tropical to subtropical latitudes. Habitat and distribution vary depending on species and life stages and are discussed further in the species profiles.

Sea turtles begin their life on land, and crawl into the ocean after hatching. Little information is available regarding a sea turtle's life after hatching. Open-ocean juveniles spend an estimated 2 to 14 years drifting, foraging, and developing. Due to the general lack of knowledge of this period, it has been described as "the lost years." After this period, juvenile hawksbill (*Eretmochelys imbricata*), Kemp's ridley (*Lepidochelys kempii*), loggerhead (*Caretta caretta*), and green (*Chelonia mydas*) turtles settle into coastal habitat (Bjorndal and Bolten 1988; NMFS and USFWS 1991). Leatherback turtles remain primarily in the open ocean throughout their lives, except for mating in coastal waters and nesting on beaches.

In general, only adult females come ashore, and then only for the purpose of nesting, returning to the ocean once their eggs have been laid. All species have the ability to migrate long distances across large expanses of the open ocean, primarily between nesting and feeding grounds (NMFS and USFWS 2009).

Foraging habitats for several species occur in the project area and nesting habitat for loggerhead turtles, green turtles, and leatherback turtles occur adjacent to the project area. Additionally, because the project area extends into open water, migratory pathways for non-nesting species or individuals may be impacted.

Because acoustic impacts are one of the possible effects of the proposed action, a brief discussion of sea turtle hearing is merited. Investigations suggest that sea turtle hearing is limited to low-frequency sounds, such as the sounds of waves breaking on a beach and the lower range of the broad band sounds produced by pile driving. For more detail on sounds produced by the proposed action, see Section 3.4.3 Marine Mammal Environmental Consequences.

The role of underwater low-frequency hearing in sea turtles is unclear. Sea turtles may use acoustic signals from their environment as guideposts during migration and as cues to identify their natal beaches (Lenhardt et al. 1983). Sea turtles are low-frequency hearing specialists, typically hearing frequencies from 30 to 2,000 Hertz (Hz), with a range of maximum sensitivity between 100 and 800 Hz (Bartol and Ketten 2006; Bartol et al. 1999; Lenhardt 2002; Lenhardt 1994; Ridgway et al. 1969).

The sections that follow contain specific details on the five species of sea turtles and their occurrence in the project area. General threats to sea turtles populations are covered in Chapter 5 (Cumulative Impacts).

3.8.2.1 Green Sea Turtle

3.8.2.1.1 Status and Management

Green sea turtle populations are listed separately under the ESA: the Florida and Mexico Pacific coast breeding colonies, and sea turtles from all other populations. The Florida and Mexico Pacific coast breeding colonies are designated as endangered and all other colonies are designated as threatened (NMFS 1978). Individuals from both threatened and endangered populations may be present in the project area. As of the 2007 status report, NMFS and the USFWS determined that the current population listing remains valid (NMFS and USFWS 2007a). Critical habitat for the green turtle has been designated, but does not occur in or near the project area.

3.8.2.1.2 Habitat and Geographic Range

The green sea turtle is distributed worldwide across tropical and subtropical coastal waters between 45° N and 40° S (The State of the World's Sea Turtles Team 2011). After emerging from the nest, green turtle hatchlings swim to offshore areas where they float passively in major current systems. At the juvenile stage (estimated at 5 to 6 years) they leave the open-ocean habitat and retreat to protected lagoons and open coastal areas that are rich in seagrass or marine algae (Bresette et al. 2006), where they will spend most of their lives (Bjorndal and Bolten 1988).

Along Florida's Atlantic coast, juvenile green turtles occur in high-wave-energy, nearshore reef environments less than 2 m deep that support an abundance of macroalgae and submerged aquatic vegetation (Holloway-Adkins 2006). Adult green turtles can also utilize these habitats in between migrations for mating and nesting.

Occasional green turtle nesting occurs in Duval County, on beaches adjacent to the project area. Nesting season varies with locality; in the project area, the season is roughly June to September (NMFS and USFWS 2007a).

3.8.2.1.3 Population and Abundance

An annual average of 8,927 green sea turtles nested in Florida from 2006 to 2010, making this the second largest green sea turtle nesting population in the wider Caribbean FWC Fish and Wildlife Research Institute 2011b; Meylan et al. 2006). In 2012, only one green turtle nest was laid in Duval County. This is comparable to the past five years of nesting data available

(FWC Fish and Wildlife Research Institute 2012). The nest was not on a NAVSTA Mayport beach, however green turtles have nested there as recently as 2011.

Generally, nesting trends in the Western Atlantic Ocean are stable to increasing and are increasing in Florida (NMFS and USFWS 2007a). Green turtles have been recorded in the turning basin (USACE 2001), though in-water abundance for the region and along the Atlantic coast remains unavailable (NMFS and USFWS 2007a). In addition to individuals from the Florida nesting population, adult and juvenile males and females from nesting colonies in the wider Caribbean could occur in the waters of the project area.

3.8.2.1.4 Predator / Prey Interaction and Foraging

The green sea turtle is the only species of sea turtle that, as a subadult and adult, primarily consumes plants and other types of vegetation (Mortimer 1995). Very young green sea turtles are omnivorous (Bjorndal 1997). Salmon et al. (2004) reported that post-hatchling green sea turtles were found to feed near the surface on seagrasses or at shallow depths on small jellyfish and fish eggs. Pelagic juveniles eat worms, young crustaceans, aquatic insects, grasses, and algae (Bjorndal 1997).

The loss of eggs to land-based predators such as mammals, snakes, crabs, and ants occurs on some nesting beaches globally, though this is less of an issue in Florida due to intense nest protection efforts. As with other sea turtles, hatchlings may be preyed on by birds and fish. Sharks are the primary nonhuman predators of juvenile and adult green sea turtles at sea (NMFS and USFWS 1991).

3.8.2.1.5 Critical Habitat

Critical habitat for the green turtle was designated in 1998 (63 FR 46693), but does not occur in or near the action area.

3.8.2.2 Hawksbill Sea Turtle

3.8.2.2.1 Status and Management

The hawksbill turtle is listed as endangered under the ESA (Bureau of Sport Fisheries and Wildlife 1970). While the current listing as a single global population remains valid, data may support separating populations at least by ocean basin under the distinct population segment policy (NMFS and USFWS 2007b). Critical habitat has been designated for hawksbill turtles, but does not occur in or adjacent to the project area.

3.8.2.2.2 Habitat and Geographic Range

The hawksbill is the most tropical of the world’s sea turtles, rarely occurring above 35° N or below 30° S (The State of the World's Sea Turtles Team 2008; Witzell 1983). Hatchlings are believed to occupy open-ocean waters, associating themselves with surface algal mats in the Atlantic Ocean (Parker 1995; Witherington and Hirama 2006; Witzell 1983). Juveniles leave the open-ocean habitat after 3 to 4 years and settle in coastal foraging areas, typically coral reefs (Mortimer and Donnelly 2008). Juveniles and adults share the same foraging areas, including tropical nearshore waters associated with coral reefs, hardbottoms, or estuaries with mangroves (Musick and Limpus 1997).

Hawksbill turtles occur regularly in the nearshore waters of southern Florida NMFS and USFWS 2007b). Sightings north of Florida are rare, and Texas is the only other state where hawksbills are sighted with any regularity (Keinath et al. 1991; Lee and Palmer 1981; Parker 1995; Plotkin 1995). Extremely rare nesting may occur in Duval County where the project area is located but has not been documented.

3.8.2.2.3 Population and Abundance

The 2007 five-year review (NMFS and USFWS 2007b) assessed nesting abundance and nesting trends in all regions inhabited by hawksbill turtles. An analysis of 25 index sites around the world indicated that hawksbill nesting has declined globally by at least 80 percent over the last three hawksbill generations (Meylan and Donnelly 1999). In the wider Caribbean, population trends vary, and trends are not known for many locations (NMFS and USFWS 2007b).

Nesting data for Duval County or Florida are not available, as hawksbill turtles nest rarely or not at all in Florida. Hawksbill turtles are cryptic nesters (Bjorndal et al. 1985), and the rare hawksbill nest could be missed in areas with high number of other species nesting, or where beach coverage is incomplete. Because of its location north of the species' normal nesting range, and its lack of suitable juvenile and adult habitat, it is very unlikely that any hawksbill turtles will occur in the project area.

3.8.2.2.4 Predator / Prey Interaction and Foraging

Older juvenile and adult hawksbill turtles fill a unique ecological niche in marine and coastal ecosystems, feeding on sponges helps to control populations of sponges that may otherwise compete for space with reef-building corals (Hill 1998; Leon and Bjorndal 2002). Post-hatchling hawksbills feed on floating *Sargassum* in the open ocean (Plotkin and Amos 1998). During the juvenile stage, hawksbills are considered omnivorous, feeding on sponges, sea squirts, algae, molluscs, crustaceans, jellyfish, and other aquatic invertebrates (Bjorndal 1997).

As with other sea turtles, hatchlings may be preyed on by terrestrial predators upon emergence from the nest, and birds and fish at sea. Sharks are the primary nonhuman predators of juvenile and adult hawksbills at sea (Witzell 1983).

3.8.2.2.5 Critical Habitat

Critical habitat was designated for hawksbill terrestrial nesting areas in Puerto Rico in 1982 (47 FR 27295), but it does not occur in or near the action area.

3.8.2.3 Kemp's Ridley Sea Turtle

3.8.2.3.1 Status and Management

The Kemp's ridley sea turtle is listed as a single population and is classified as endangered under the ESA (Bureau of Sport Fisheries and Wildlife 1970). The NMFS and the USFWS are currently reviewing a petition to designate critical habitat for Kemp's ridley sea turtles for nesting beaches along the Texas coast and marine habitats in the Gulf of Mexico and Atlantic Ocean (WildEarth Guardians 2010); however, there is no critical habitat currently designated for this species.

3.8.2.3.2 Habitat and Geographic Range

The Kemp's ridley sea turtle is found only in the Gulf of Mexico and North Atlantic Ocean, north of the Caribbean Sea. Habitats frequently used by juvenile and adult Kemp's ridley sea turtles are warm-temperate to subtropical sounds, bays, estuaries, tidal passes, shipping channels, and beachfront waters, where their preferred food, the blue crab, is abundant (Lutcavage and Musick 1985; Seney and Musick 2005). Juveniles migrate to habitats along the U.S. Atlantic continental shelf from Florida to New England (Morreale and Standora 1998; Peña 2006) at around 2 years of age.

Adult female Kemp's ridley sea turtles take part in mass synchronized nesting emergences known as "arribadas" on only a few nesting beaches; this nesting strategy is unique to *Lepidochelys* spp. Kemp's ridley turtles may also be solitary nesters, but this is less common and generally occurs outside of the main nesting areas in Mexico. Only rare nesting is known to occur on the east coast of Florida, and has not been documented in Duval County in the last 25 years (FWRI 2012). Nesting is not expected to occur near the project area.

3.8.2.3.3 Population and Abundance

An estimated 5,500 females nest each season in the Gulf of Mexico (NMFS and USFWS 2011a). Given the current population growth rate, the population could increase to 10,000 nesting females by 2015 (Heppell et al. 2005). In 2009, a record 127 nests were recorded in Texas, 73 of which were documented at Padre Island National Seashore (National Park Service 2011).

Kemp's ridley turtles have been recorded in nearby Kings Bay, Georgia and therefore may be present in the NAVSTA Mayport turning basin (USACE 2006). Occurrences within the turning basin are expected to be seasonal, uncommon, rare, and correlated with presence of preferred prey species.

3.8.2.3.4 Predator / Prey Interaction and Foraging

Kemp's ridley sea turtles feed primarily on crabs but are also known to prey on molluscs, shrimp, fish, jellyfish, and plant material (Frick et al. 1999; Marquez-M. 1994). Blue crabs and spider crabs are important prey species for the Kemp's ridley (Keinath et al. 1987; Lutcavage and Musick 1985; Seney and Musick 2005).

Major predators of Kemp's ridley sea turtle eggs and hatchlings on nesting beaches include raccoons, dogs, pigs, skunks, badgers, and fire ants. Predatory fishes such as jackfish and redfish may feed on hatchlings at sea. Sharks are the primary predator of juvenile and adult Kemp's ridley sea turtles (NMFS and USFWS 2011a).

3.8.2.3.5 Critical Habitat

In 2010, NOAA Fisheries and USFWS were jointly petitioned to designate critical habitat for Kemp's ridley sea turtles in nesting beaches along the Texas coast and marine habitats in the Gulf of Mexico and Atlantic Ocean (WildEarth Guardians 2010). Consideration of this petition is currently in progress.

3.8.2.4 Loggerhead Sea Turtle

3.8.2.4.1 Status and Management

In 2009, a status review conducted for the loggerhead identified nine distinct population segments within the global population (Conant et al. 2009). In a September 2011 rulemaking, the NMFS and USFWS listed five of these distinct population segments as endangered and kept four as threatened under the ESA (NMFS 2011b). The Northwest Atlantic Ocean distinct population segment, listed as threatened, is the only one that occurs within the project area. No critical habitat is currently listed for the loggerhead, but the petitions that were submitted to NMFS requesting to list the distinct population segments also requested that critical habitat be designated after any listing revision (NOAA 2010).

3.8.2.4.2 Habitat and Geographic Range

Loggerhead sea turtles occur in U.S. waters in habitats ranging from coastal estuaries to waters far beyond the continental shelf (Dodd 1988). At emergence, hatchlings swim to offshore currents and remain in the open ocean, often associating with floating mats of *Sargassum* (Carr 1986, 1987; Witherington and Hirama 2006). Migration between oceanic and nearshore habitats occurs during the juvenile stage as turtles move seasonally from open-ocean current systems to nearshore foraging areas where they will settle as adults (Bolten 2003; Mansfield 2006).

In the southeastern United States, nesting season for loggerheads takes place from May to October (FWC 2007a). Large nesting colonies exist in Florida, with more limited nesting along the Gulf Coast and north through Virginia. Duval County hosts a moderate amount of nesting on beaches throughout the county. NAVSTA Mayport itself has several suitable nesting beaches that see regular, small amounts of nesting each season (Allen and Loop pers. comm. 2013).

Limited foraging habitat for juveniles and adults exists in the project area. In the turning basin and navigation channel, the muddy bottom provides habitat for invertebrates which are a major food source for loggerhead turtles.

3.8.2.4.3 Population and Abundance

Annual nesting totals of loggerheads on the U.S. Atlantic and gulf coasts fluctuated between 47,000 and 90,000 nests, with an average of 70,880 nests from 1989 to 2007 (NMFS and USFWS 2009). Annual totals for the Peninsular Florida Recovery Unit averaged 64,513 nests from 1989-2007. Analysis of index nesting beach survey data has shown a decline in nesting. Results indicated that there has been a decrease of 26 percent over the 20-year period from 1989 - 2008 and a 41 percent decline since 1998. The mean annual rate of decline for the 20-year period was 1.6 percent.

Surveys conducted in 2012 identified 187 loggerhead nests along Duval County beaches, a six year maximum (FWC 2013). Loggerheads have historically nested on NAVSTA Mayport beaches and continue to do so each year. In 2012, 11 nests were documented at the installation (Allen and Loop pers. comm. 2013). In-water abundances of loggerhead turtles in the action area are unknown. However, given presence of nesting and foraging habitat nearby, loggerhead turtles can be expected to occur regularly in the action area.

3.8.2.4.4 Predator / Prey Interaction and Foraging

Juvenile and subadult loggerhead turtles are omnivorous, foraging on crabs, molluscs, jellyfish, and vegetation captured at or near the surface (Dodd 1988). Adult loggerhead sea turtles are generalized carnivores that forage on nearshore bottom-dwelling invertebrates (molluscs, crustaceans, and anemones) and sometimes fish (Dodd 1988).

Globally, common predators of eggs and hatchlings on nesting beaches are ghost crabs, raccoons, feral pigs, foxes, coyotes, armadillos, and fire ants (Dodd 1988), though this is less of an issue in Florida due to intense nest protection efforts. In the water, hatchlings are susceptible to predation by birds and fish. Sharks are the primary predator of juvenile and adult loggerhead sea turtles (Fergusson et al. 2000; Simpfendorfer et al. 2001).

3.8.2.4.5 Critical Habitat

No critical habitat is listed for the loggerhead, but the petitions that were submitted to NMFS requesting to list the distinct population segments also requested that critical habitat be designated after any listing revision (National Oceanic and Atmospheric Administration 2010).

3.8.2.5 Leatherback Sea Turtle

3.8.2.5.1 Status and Management

The leatherback sea turtle is listed as a single population and is classified as endangered under the ESA (Bureau of Sport Fisheries and Wildlife 1970). Although the USFWS and NMFS believe the current listing is valid, preliminary information indicates an analysis and review of the species should be conducted under the distinct population segment policy (NMFS and USFWS 2007d). Critical habitat has been designated for this species, but does not occur in or near the vicinity of the project area.

3.8.2.5.2 Habitat and Geographic Range

Upwelling areas serve as nursery grounds for post-hatchling and early juvenile leatherback sea turtles because these areas provide a high level of prey (Musick and Limpus 1997). Late juvenile and adult leatherback sea turtles are known to range from mid-ocean to the continental shelf and nearshore waters (Grant and Ferrell 1993; Schroeder and Thompson 1987; Shoop and Kenney 1992). Juvenile and adult foraging habitats include both coastal and offshore feeding areas (Frazier 2001).

In Florida, nesting begins around March and continues through July or August. Suitable nesting habitat occurs throughout Duval County and on the beaches of NAVSTA Mayport. The waters of the project area exterior to the turning basin may serve as nearshore foraging habitat when their preferred prey is nearby. Leatherback turtles may also occur in the project area while migrating between nesting habitat south of the project area on their way to more productive foraging habitat in the North Atlantic.

3.8.2.5.3 Population and Abundance

Since 1989, there has been a substantial increase in the nesting population along the east coast of Florida (Turtle Expert Working Group 2007). This increase has coincided with an upsurge in the wider Caribbean population.

Nesting peaked for the Florida stock in the year 2001 with 935 nests. Leatherbacks typically nest along the beaches from Brevard County south to Broward County, south of the project area. However, they do nest in low numbers along the beaches of Duval County; six leatherback nests were documented in Duval County in 2012, a typical amount over the last five years (FWC, 2012). Single leatherback nests occurred at NAVSTA Mayport in 2009, 2011, and 2012 (Allen and Loop pers. comm. 2013).

In-water abundances for the project area are unknown. Leatherbacks from the Florida stock may occur in the nearshore waters of the project area during the nesting season. Migrating individuals from other stocks may pass through or forage in project area waters, though it is unlikely that individuals from any stock would utilize the turning basin for foraging habitat.

3.8.2.5.4 Predator / Prey Interaction and Foraging

Leatherbacks have pointed tooth-like cusps and sharp-edged jaws that are adapted for a diet of soft-bodied open-ocean prey such as jellyfish, which are their main food source (Aki et al. 1994; Bjorndal 1997; James and Herman 2001; Salmon et al. 2004). Leatherback sea turtles feed throughout the water column (Davenport 1988; Eckert et al. 1989; Eisenberg and Frazier 1983; Grant and Ferrell 1993; James et al. 2005; Salmon et al. 2004).

Globally, predators of leatherback sea turtles eggs and hatchlings include feral pigs, dogs, raccoons, ghost crabs, and fire ants, though this is less of an issue in Florida due to intense nest protection efforts. As with other sea turtle species, leatherback hatchlings are preyed on by birds and large fish such as tarpon and snapper. Sharks and killer whales are predators of adult leatherbacks (NMFS and USFWS 2007d).

3.8.2.5.5 Critical Habitat

Critical habitat was designated for the leatherback's terrestrial environment on St. Croix in 1978. Revision to the critical habitat designation is currently underway. There is no critical habitat in the vicinity of the Wharf C-2 project.

3.8.3 Environmental Consequences

This section evaluates how and to what degree the activities described in Chapter 2 (Discussion of Alternatives) could potentially impact sea turtles known or suspected to occur within the project area. Refer to Section 2.1.2 Action Alternative for a general description of the proposed action, including duration, location, and construction practices.

Impacts to sea turtles can be broadly classified into two categories: direct and indirect. Direct impacts affect individuals in the form of behavioral disturbances, physical injury, or even death, and occur at the time of the action. Indirect impacts affect through pathways such as habitat destruction and loss of prey and only affect individuals after the action has occurred.

Direct impacts to sea turtles associated with the Proposed Action are possible behavioral disturbances or physical injuries caused by pile driving noise and physical strikes during dredging activities. Possible indirect impacts may include loss or degradation of benthic and migratory habitat, decreased water quality, lighting, and reduced prey availability. No loss of nesting substrate is anticipated. Because acoustic effects are anticipated it is important to understand how sea turtles react to sounds in the water.

3.8.3.1 Sea Turtle Acoustic Threshold Criteria

The Navy considers two primary categories of sound sources in its analyses of sound impacts on sea turtles: impulsive sources (e.g., impact pile driving) and non-impulsive sources (e.g., vibratory pile driving). For a general description of underwater sound, the sound produced by the proposed action, and the assumptions used to generate source levels, see Section 3.4.3 Marine Mammal Environmental Consequences. Possible effects of sound from pile driving range from behavioral effects such as startle reactions and behavioral changes (e.g. ceasing foraging) to injurious effects such as temporary or permanent loss of hearing and damage to internal organs.

Acoustic impacts criteria and thresholds were developed in cooperation with NMFS for sea turtle exposures to various sound sources. Only one criteria applicable to sound produced by pile driving exists for sea turtles. The NMFS threshold value for onset of injury to sea turtles due to both impact pile driving and vibratory pile driving is 190 dB re 1 μPa sound pressure level root mean square. This criteria was developed in cooperation with the NMFS and is not based on experimental evidence of injuries caused to sea turtles by pile driving sound but was adopted from pinniped thresholds as a precautionary measure when addressing impacts from pile driving to sea turtles. In the absence of reliable in-water density data for sea turtles, this criteria is useful for qualitatively assessing activities that impart sound to water.

Sound levels from pile driving will not reach the 190 dB re 1 μPa sound pressure level root mean square threshold (Section 3.4.3 Marine Mammal Environmental Consequences); therefore no injuries to sea turtles from sound associated with pile driving are anticipated.

There is limited data available on sea turtle behavioral reactions to sound. As such, no behavioral criterion has been adopted by the NMFS for sea turtles for pile driving sound and as such behavioral effects must be assessed qualitatively. Startle responses to anthropogenic sound have been documented in sea turtles (O’Hara and Wilcox 1990; Moein Bartol et al.1995; and McCauley et al. 2000). As such it can be conservatively assumed that pile driving has the potential to cause startle responses, and behavioral impacts to sea turtles will be assessed qualitatively. Note that all sea turtle species regularly encounter natural events that can cause startle reactions, such as the appearance of predators or changing weather conditions.

3.8.3.2 No Action Alternative

Under the No Action Alternative the recapitalization of Wharf C-2 would not occur. Baseline conditions for marine turtles, as described above, would remain unchanged. Therefore, there would be no impacts to marine turtles from implementation of the No Action Alternative.

3.8.3.3 Proposed Action

Under the proposed action, pile driving and construction activities associated with the recapitalization of Wharf C-2 will commence. Direct and indirect impacts to sea turtles from the proposed action are discussed below, and NEPA, ESA and critical habitat conclusions are given. A detailed description of the activities associated with the proposed action is presented in Chapter2 (Discussion of Alternatives).

3.8.3.3.1 Acoustic Impacts

Anticipated sound source levels relevant to sea turtles are presented in Table 3-20. These source levels were developed using the assumptions presented in Section 3.4. Note that impact pile driving, and its associated higher source levels, will only be used when necessary. It is anticipated that impact pile driving will be used rarely, if at all. If used, no more than 20 strikes per day will occur. The overall use and duration of impact pile driving will be extremely limited.

Table 3-20. Source Levels from Pile Driving

Hammer	Pile type	RMS [dB re 1µPa at 10m]	SEL [dB re 1µPa^{2}s at 10m]
Vibratory	24" steel pipe	163	-
	12" timber	153	-
Impact	24" steel pipe	189	179
	12" timber	170	160

None of the anticipated pile driving scenarios result in the production of sound above the 190 dB re 1 µPa sound pressure level root mean square sea turtle injury criteria. Because of this, no injuries associated with sound produced by pile driving are anticipated for any species of sea turtle. However this does not preclude behavioral effects. As a precautionary measure against possible behavioral effects, a sea turtle and manatee shutdown zone of 50 ft (15 m) will be observed. If a sea turtle approaches or enters the shutdown zone, pile driving will cease and will not resume until the animal has moved out of the area. See Chapter 4 Minimization and Monitoring for more detail on best management practices and mitigation measures.

No behavior criteria for sea turtles exist but it is understood that behavioral impacts could still occur over the course of the project. In general, the distances over which behavioral disturbances can occur from sound are substantially larger than the distances at which injury can occur. See Section 3.4.3 Marine Mammal Environmental Consequences for an example of how these distances vary. In the absence of established criteria and quantitative density data, impacts can only be assessed qualitatively, based on the relative abundance of a given species and the knowledge that turtles can react to underwater sound.

Hawksbill turtles are expected to be in the project area only rarely, if at all, due to the lack of nesting, reef, and hardbottom foraging habitat. Because of this, and the limited duration of construction, no acoustic effects to hawksbill turtles are anticipated.

Green and leatherback turtles may occasionally occur in the project area while migrating to nest on nearby beaches. No waters directly off of nesting beaches will be impacted by the sound produced during the project. Green, Kemp's ridley and leatherback turtles may pass through the project area while migrating to foraging habitats. Kemp's ridley turtles may forage in the turning basin and navigation channel when their preferred prey, blue crabs and invertebrates, are present. Leatherback turtles may forage in the offshore portions of the project area. Presence of these species in the project area is possible, though at limited times of the year and in low numbers. Because of this, and the limited duration of construction, behavioral effects from sound produced by the proposed action are possible, but not likely.

Loggerhead turtles nest regularly in Duval County and have been found nesting on NAVSTA Mayport beaches. No waters directly off of nesting beaches will be impacted by the sound produced during the project. The turning basin and offshore portions of the project area contain their preferred prey of benthic invertebrates. They are expected to be in the project area regularly during the nesting season, and could be found foraging during other seasons. Despite the limited duration of construction activities, the number of loggerhead turtles found in the area makes it likely that some behavioral reactions, such as startle responses, from sound produced by the proposed action may occur. Given the limited duration of pile driving activities and the fact the loggerhead turtles regularly experience stimuli that cause startle responses in their natural environment, these induced behavioral reactions should not significantly disrupt an individual turtle's normal behavioral patterns or constitute harassment.

3.8.3.3.2 Physical Strikes

Dredging

Contingency clamshell dredging may occur during the preconstruction phase of the proposed action. When the clamshell is dropped, there is small chance a foraging turtle may be struck, possibly resulting in injury or death.

Previous assessments concur that clamshell dredges are the least likely to adversely affect sea turtles because they are stationary and impact very small areas at a given time. Any sea turtle injured or killed by a clamshell dredge would have to be directly beneath the bucket when it is dropped. The chances of such an occurrence are extremely low because of the limited area to be dredged and the short interval in which an impact could occur, despite the regular presence of turtles in the basin. Because this dredge type is relatively stationary and sea turtles are mobile, NMFS believes that sea turtles are capable of avoiding interactions with the aforementioned types of dredge equipment. NMFS is not aware of any information that contradicts these judgments (NMFS 2009).

Vessel Strikes

Vessel movements have the potential to affect sea turtles directly by accidentally striking or disturbing individual animals. Precise data are lacking for sea turtle mortalities directly caused by ship strikes; however, live and dead turtles are often found with deep cuts and fractures indicative of collision with a boat hull or propeller (Hazel et al. 2007; Lutcavage et al. 1997). Behavioral changes in response to vessel presence include avoidance reactions, alarm/startle responses, and other behavioral and stress-related changes (such as altered swimming speed, direction of travel, resting behavior, diving activity, and respiration rate). It is not well understood whether the presence and activity of the vessel, the vessel noise, or a combination of these factors produces behavioral reactions. It seems likely that both noise and visual presence of vessels play a role in prompting reactions from these animals. The probability and significance of vessel and sea turtle interactions is dependent on several factors including numbers, types, and speeds of vessels; the regularity, duration, and spatial extent of activities; and the presence/absence and density of sea turtles.

Sea turtles in the NAVSTA Mayport turning basin and navigation channel encounter vessel traffic associated with daily operations, maintenance, and security monitoring along the waterfront, and it is assumed that individuals that frequent the waterfront have habituated to existing levels of vessel activity. Vessels operate at low speeds within the relatively limited project area. Marine vessel traffic would potentially pass near sea turtles on an incidental basis, but short-term behavioral reactions to vessels are not expected to result in long-term impacts to individuals in the area (such as chronic stress), or to sea turtle populations in waters surrounding the project area.

Collisions of vessels and sea turtles are not expected during construction because vessel speeds would be low. All of the species that may occur in the Wharf C-2 project area tend to surface at regular intervals allowing for increased detectability and avoidance. Further, marine species observers will be deployed to observe sea turtle shutdown zones, and alert the contractor to shut down in-water work if sea turtles are sighted in the shutdown zone.

3.8.3.3.3 Impacts to Sea Turtle Habitat

No nesting habitat for any species will be lost due to construction activities associated with the proposed action. Wharf C-2 will have an expanded profile, however the wharf exists along an already armored shoreline and no beaches will be affected. Construction will occur during daytime hours, and no additional lighting will occur at night during the construction period.

Hatchling sea turtles use lighting cues to navigate from the beach to the ocean upon emergence from the nest. As part of the recapitalization of the wharf, new lighting fixtures will be installed. Four 50 ft tall (15 m) concrete posts each with two 1,000 watt metal halide luminaires are currently planned. Luminaires will be of the full cut off type to minimize stray light. This lighting profile may slightly increase the total amount of light over current conditions on Wharf C-2, but will be comparable to other areas surrounding the basin. Though these lights do not meet FWC turtle safe recommendations (low wattage, height less than 12 ft [4 m], and long wavelengths [red/orange]), to do so would compromise Occupational Safety and Health Administration and Antiterrorism Force Protection requirements, and as such cannot be accommodated. The Mayport basin is already a highly industrialized area and the new lights will not appreciably change the overall lighting at the installation. The nearest nesting beach is in Huguenot Memorial Park across the St. Johns River 3,000 ft (1,000 m) away. If possible, lights will be directed away from the river. It is not anticipated that this minor change in the overall lighting profile will adversely affect any nearby emerging hatchlings.

Foraging habitat in the water column for the Kemp’s ridley, loggerhead, and leatherback turtle may be temporarily degraded by the presence of increased sound in the water (three hours per day maximum). The effects of sound in the water will be minimal and temporary, and will not permanently degrade nearby foraging habitat for sea turtles. Dredging activities as well as the increased wharf profile (approximately 15 ft [5 m]) will result in some loss of benthic foraging habitat for loggerhead turtles. However, this habitat is not of high quality, and is extremely small in proportion to the total amount of habitat available in the project area and the wider region.

Turbidity from dredging and pile driving may temporarily decrease water quality and the foraging efficacy of sea turtles, which are visual predators. The increased turbidity is expected to dissipate over a matter of hours and will not permanently degrade water quality or sea turtles’ ability to forage.

NAVSTA Mayport has an approved spill prevention and control plan. As such, runoff or pollution in the water column is not expected. Pile driving activities will cause increased sediment in the water column, however this sediment will quickly settle back to the bottom of the turning basin and no more than minor, temporary effects are anticipated. For a more detailed description of effects to water quality, see Section 3.1 Sediments and Water Quality.

Because effects from the proposed action will be temporary and minor, no permanent effect to sea turtle habitat is anticipated. No designated critical habitat for any sea turtle species occurs in or near the project area and will not be affected.

3.8.3.3.4 Impacts to Sea Turtle Prey

No suitable prey for hawksbill turtles occurs in the project area and will not be affected by the proposed action.

Benthic invertebrates and blue crabs, the favored prey of loggerheads and Kemp’s ridley turtles respectively, occur in the turning basin and navigation channel. Jellyfish, the favored prey of leatherback turtles may occur in the water column when conditions favor their growth. Some benthic invertebrates that live in the substrate directly adjacent to pile driving activities may be injured or killed by the physical act of piles being placed into the substrate of the turning basin or removed during dredging activities. Sound produced by pile driving may affect invertebrates both on the bottom and in the water column. However, effects of sound on invertebrates are not clearly understood. See Section 3.6 Marine Invertebrates for more detail on the effects of the proposed action to invertebrates. In general, effects to and removals of invertebrate prey species will not appreciably alter the amount of prey available in the area for loggerhead, Kemp’s ridley and leatherback sea turtles.

Seagrasses, which are consumed by green turtles, are not present in or near the project area. Macroalgae, which are sometimes consumed by green turtles, could be present on the piles and armored shoreline of the project area. Macroalgae on old piles which are being removed will not be available for sea turtles to graze on. It is anticipated that macroalgae will quickly recolonize new piles and no overall loss of prey for green turtles will occur. See 3.5 Marine Vegetation for more detail on the effects to marine vegetation.

3.8.3.3.5 Conclusions

No significant amount of nesting, foraging, or migratory habitat for sea turtles will be lost or degraded from the proposed action. Additionally, few individuals will be behaviorally impacted by the proposed action and no injuries are anticipated. As such, pursuant to NEPA, no significant impacts to sea turtles will occur as a result of the proposed action.

Pursuant to the ESA, no effects to individual ESA-listed hawksbill turtles, their habitat, or their prey from the proposed action are anticipated. A no effect determination was made for hawksbill turtles.

No significant effects from pile driving activities to ESA-listed green, Kemp’s ridley, or leatherback turtle habitat or prey are anticipated. No significant impacts are anticipated from dredging because of these species’ limited occurrence in the turning basin. However, there is a small chance that individuals of these species may be present during in-water construction and exposed to levels of sound that could cause behavioral disturbances. As such, a may affect, not likely to adversely affect determination was made for green turtles, Kemp’s ridley turtles, and leatherback turtles.

No significant effects to ESA-listed loggerhead turtle habitat or prey are anticipated. Despite the regular occurrence of loggerheads in the basin, direct impacts from dredging are not anticipated because of the very small likelihood of a loggerhead turtle and the dropping of the dredge bucket co-occurring in space and time, with the animal unable to avoid a strike. Due to the number of loggerhead turtles nesting near and foraging in the project area, it is likely that some individuals of this species may become behaviorally disturbed by sound produced by the proposed action. These behavioral disturbances are not expected to significantly change the turtle's normal behavior and rise to the level of harassment. As such, a may affect, not likely to adversely affect, determination was made for the loggerhead turtle.

No critical habitat for any ESA-listed turtle species is present in or near the project area so the proposed action will have no effect on sea turtle critical habitat.

The Navy submitted biological evaluations to the USFWS and NMFS for the Wharf C-2 Recapitalization project in May 2013. See Appendix A for agency correspondence.

3.9 Birds

3.9.1 Regulatory Overview

3.9.1.1 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 U.S.C. 703-712), as amended, makes it a prohibited act, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention…for the protection of migratory birds…or any part, nest, or egg of any such bird" (16 U.S.C. 703). Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, requires that all federal agencies avoid or minimize the effects of their actions on migratory birds and take active steps to protect birds and their habitat. While the proposed action is not expected to affect migratory birds, should the Navy's environmental analysis indicate a potential for the proposed action to affect migratory birds, the Navy will consult with the USFWS under the Migratory Bird Treaty Act.

3.9.1.2 Endangered Species Act

The ESA of 1973, as amended, requires that an action authorized by a federal agency shall not jeopardize the continued existence of an endangered or threatened species or result in the destruction or adverse modification of designated critical habitat of such species.

3.9.2 Affected Environment

A variety of bird species could occur in the vicinity of the Wharf C-2 Recapitalization project area (Table 3-21); most are protected under the Migratory Bird Treaty Act (USFWS 2010a). The Migratory Bird Treaty Act established federal responsibilities for protecting nearly all migratory species of birds, eggs, and nests. Bird migration is defined as the periodic seasonal movement of birds from one geographic region to another, typically coinciding with available food supplies or breeding seasons.

Of the species listed in Table 3-21, two ESA-listed birds, and one ESA-candidate bird, are known to occur in and around NAVSTA Mayport: piping plovers and wood storks, and red knots, respectively.

Table 3-21. Potential Bird Species Occurring in the Wharf C-2 Recapitalization Project Area

Common Name	Taxonomic Group	Description
Geese, swans, dabbling and diving ducks	Anseriformes	Diverse group of geese, swans, and ducks that inhabit shallow waters, coastal areas, and deeper waters. Feed at the surface by dabbling or by diving in deeper water. Often occur in large flocks.
Loons	Gaviiformes	Superficially duck-like, fish-eating birds that capture prey by diving and underwater pursuit.
Grebes	Podicipediformes	Small diving birds, superficially duck-like. May occur in small groups.
Albatrosses, fulmars, petrels, shearwaters, and storm-petrels	Procellariiformes	Group of largely pelagic seabirds. Fly nearly continuously when at sea. Soar low over the water surface to find prey. Some species dive below the surface.
Tropicbirds, boobies, gannets, pelicans, cormorants, and frigatebirds	Pelecaniformes	Diverse group of large, fish-eating seabirds with four toes joined by webbing. Often occur in large flocks near high concentrations of bait fish.
Herons, egrets, ibis, spoonbill	Ciconiiformes	Small to medium-sized wading birds with dagger-like, down-curved, or spoon-shaped bills used to capture prey in water or mud.
Osprey, bald eagles, peregrine falcons	Accipitriformes, and Falconiformes	Large raptors that inhabit habitats with open water, including coastal areas. Feed on fish, waterfowl, or other mammals. Migrate and forage over open water.
Shorebirds, phalaropes, gulls, noddies, terns, skimmer, skuas, jaegers, and alcids	Charadriiformes	Diverse group of small- to medium-sized shorebirds, seabirds, and allies inhabiting coastal, nearshore, and open-ocean waters.
Neotropical migrant songbirds, warblers, thrushes, and allies	Passeriformes Cuculiformes, Strigiformes, and Apodiformes	Largest and most diverse group of birds in North America, primarily occur in coastal, and inland areas, but often occur in large numbers over the open ocean (particularly over the Gulf of Mexico) during annual spring and fall migration periods.

3.9.2.1 Piping Plover

3.9.2.1.1 Status and Management

The piping plover (*Charadrius melodus*) is divided into two subspecies of plovers. Those that breed on the Atlantic coast of the United States and Canada belong to the Atlantic subspecies *Charadrius melodus melodus* (USFWS 2009a). The USFWS listed the Atlantic Coast piping plover population as threatened in 1985 (50 FR 50726) and has instituted a recovery plan for this shorebird species (USFWS 1996).

3.9.2.1.2 Habitat and Geographic Range

The Atlantic breeding population of piping plovers nest and breed on coastal beaches from southern Maine to North Carolina and are primarily an inhabitant of sandy shorelines in the northeastern and southeastern United States (Haig and Elliott-Smith 2004; O'Brien et al. 2006). Piping plovers nest above the high tide line on coastal beaches, sand flats at the ends of sandpits and barrier islands, gently sloping foredunes (dunes parallel to the shoreline), blowout areas behind primary dunes, and washover areas cut into or between dunes (USFWS 1996).

Individuals migrate through and winter in coastal areas of the United States from North Carolina to Texas and portions of Yucatan in Mexico and the Caribbean (USFWS 2009b). In winter, the species is only found in coastal areas using a wide variety of habitats, including mudflats and dredge spoil areas and, most commonly, sandflats (O'Brien et al. 2006). Plovers appear to prefer sandflats adjacent to inlets or passes, sandy mudflats along spits (beaches formed by currents), and overwash areas as foraging habitats. Piping plover migration routes and habitats overlap breeding and wintering habitats.

3.9.2.1.3 Population and Abundance

The 1991 international census documented 5,482 total piping plover (Haig and Elliott-Smith 2004). The 2001 total population estimate was 5,945 total birds (Haig and Elliott-Smith 2004). Coastal Atlantic United States populations have trended upward since listing, though some areas’ breeding populations are remaining at depressed levels and showing little or no increase in size. Since its 1985 listing, the Atlantic Coast population estimate has increased from 790 pairs to an estimated 1,849 pairs in 2008, and the United States portion of the population has almost tripled, from approximately 550 pairs to an estimated 1,596 pairs (USFWS 2009b). Results of the 2006 international piping plover winter census showed a total of 3,355 piping plovers in the United States, with the highest counts occurring in Texas. Though the increased abundance of the Atlantic Coast plovers has reduced near-term extinction threats, geographic variation in population growth and sensitivity to survival and productivity are cause for continuing conservation concern (USFWS 2009a).

Although piping plovers do not breed in Florida, individuals from the three breeding populations winter there (USFWS 1999). The Atlantic Coast birds use Florida’s Atlantic and Gulf of Mexico coastlines in the winter, including beaches in Duval County (Stevenson and Anderson 1994, Nicholls 1996). A previous winter census stated that approximately 20-30 piping plovers occur along the Atlantic coast from Duval County south to Brevard, St. Lucie, and Miami-Dade counties (Florida Natural Areas Inventory 2001). Piping plovers are infrequent visitors to NAVSTA Mayport and Duval County beaches, but were observed at NAVSTA Mayport as recently as 2007. Otherwise, they are not expected to occur routinely in the vicinity of the Wharf C-2 Recapitalization project (Labella pers. comm. 2007).

3.9.2.1.4 Predator / Prey Interaction and Foraging

Feeding habitats of breeding piping plovers include intertidal portions of ocean beaches, washover areas, mudflats, sandflats, wrack lines (line of deposited seaweed on the beach), shorelines of coastal ponds, lagoons, and salt marshes (USFWS 1996). They hunt visually using a start-and-stop running method, gleaning and probing prey from the substrate for a variety of small invertebrates (marine worms, crustaceans, mollusks, insects, and the eggs and larvae of many marine invertebrates) (USFWS 1996). Foraging occurs throughout the day and at night.

Piping plovers are preyed upon by various species. These predators, such as raccoons, foxes, skunks, and domestic and feral cats, are often associated with developed beaches and have been identified as a significant source of mortality for piping plover eggs and chicks (USFWS 2009a; Winter and Wallace 2006).

3.9.2.1.5 Critical Habitat

In 2000 and 2001, critical habitat was designated for the Great Lakes breeding population, Northern Great Plains breeding population, and wintering population of piping plovers. Designated critical habitat for wintering piping plovers is found to the north of NAVSTA Mayport, and includes a portion of the St. Johns River on Fort George Island within Huguenot Memorial Park (USFWS 2001a). The project area overlaps a small portion of piping plover critical habitat over the St. Johns River. The primary constituent elements of wintering piping plover habitats are those essential to foraging, sheltering, and roosting and are found in coastal areas containing intertidal beaches and flats and dunes above the annual high tide (66 FR 36038).

3.9.2.2 Wood Stork

3.9.2.2.1 Status and Management

Wood storks were classified as endangered by the USFWS in 1984 (49 FR 7332). A five year review was conducted in 2007 resulting in a recommendation to reclassify the species from endangered to threatened and expand their range. A DPS evaluation of the species was also recommended during this review.

3.9.2.2.2 Habitat and Geographic Range

Wood storks nest in tall trees in swamps and islands; sites protected from land-based predators are characterized as those surrounded by large expanses of open water or where the nest trees are inundated at the onset of nesting and remain inundated throughout most of the breeding cycle (USACE 2008). The breeding range for wood storks includes peninsular Florida, the coastal plain and large river systems of Georgia and South Carolina, extending north into southern North Carolina and west to south central Georgia and the panhandle of Florida to the Ochlockonee River system. There are approximately 50 documented wood stork nesting colonies in north Florida. They are typically seen in North Florida during the nesting season from March through August. Wood storks have been observed along the entrance channel, east of the turning basin (DON 2007a). The closest wood stork nesting colony to the project site is at Cedar Point Road, approximately 4.8 miles (7.7 km) to the northwest (USFWS 2010c).

3.9.2.2.3 Population and Abundance

Surveys conducted in 2006 documented 11,279 pairs of wood storks (USFWS 2007d).

3.9.2.2.4 Predator / Prey Interaction and Foraging

Wood storks are generalists in the selection of foraging habitat and may adjust locations based on seasonal factors such as hydroperiod (Rodgers et al. 2012). Typical forage areas include freshwater marshes, narrow tidal creeks, shallow tidal pools, agricultural or roadside drainage ditches, and managed impoundments. Most foraging occurs within 13 miles from nesting colonies, although wood storks have been observed to travel up to 60 miles from nest sites to forage (USFWS 1997).Wood storks are tactile feeders, hunting by feeling for fish, crustaceans, and other prey. This strategy requires high concentrations of prey in water that is shallow enough for storks to wade (South Carolina Department of Natural Resources 2012).

3.9.2.2.5 Critical Habitat

No critical habitat has been designated for this species.

3.9.2.3 Red Knot

3.9.2.3.1 Status and Management

Red knots (*Calidris canutus*) found on the Atlantic coast of the United States and Canada belong to the subspecies *C. canutus rufa* (Harrington 2001). This subspecies of red knot was designated as a candidate species for listing under the ESA in 2006 (Niles et al. 2008).

Four petitions to emergency list the red knot have been submitted since 2004; however, the species currently remains listed as a candidate for protection under the ESA (USFWS 2010d). Candidates for listing are species that the USFWS understands to be threatened, but listing of the species is precluded by other, higher-priority listing activities. The five year goal highlighted in the species action plan is to stabilize and improve the conservation status of the species through increasing habitat protection, reducing disturbance, and protecting key resources at migration and wintering sites (Harrington 2001; USFWS 2010d). The Western Hemisphere Shorebird Reserve Network has established an international network of wetlands in an effort to protect important sites used by shorebirds, including the red knot (Tsipoura and Burger 1999).

3.9.2.3.2 Habitat and Geographic Range

The species breeds on the central Canadian arctic tundra but migrates down and winters along the Atlantic and Gulf coasts from southern New England to Florida, and as far south as South America (Harrington 2001). They would be more likely to occur in the vicinity of the Wharf C-2 project during the late summer and fall.

3.9.2.3.3 Population and Abundance

The red knot population was previously estimated at 100,000 to 150,000 individuals (Niles et al. 2008). However, population surveys during the stopover period in the spring of 1998 at Delaware Bay estimated 50,000 red knots. In 2004, the same survey was repeated and the estimated population was substantially lower at 18,000 (Niles et al. 2008). Surveys of red knots at both migration stopover sites and wintering grounds continually show substantial population declines in recent decades (USFWS 2006). Surveys of wintering red knot populations in Florida during the 2005-2006 season revealed a statewide abundance of approximately 4,000 individuals. Studies from 1994 to 2002 also show decreased annual adult survival rates related to these population declines (Niles et al. 2008). No dedicated surveys have been conducted for this species aboard NAVSTA Mayport to date; no incidental sightings have been reported.

3.9.2.3.4 Predator / Prey Interaction and Foraging

Red knots forage by surface pecking and probing for intertidal invertebrates and various species of mussels and other mollusks (Harrington 2001). During spring migration, a major food source for red knots are horseshoe crab eggs; millions of which can be found in the Delaware Bay during the second half of May (Botton et al. 1994). Red knot migration coincides with the horseshoe crabs laying their eggs, allowing birds to restore their fat reserves to continue their northward migration to their breeding grounds in the arctic (Harrington 2001; Tsipoura and Burger 1999).

3.9.2.3.5 Critical Habitat

This species is currently a candidate for listing under the ESA; as such, no critical habitat is designated.

3.9.3 Environmental Consequences

3.9.3.1 No Action Alternative

Under the No Action Alternative the recapitalization of Wharf C-2 would not occur. Baseline conditions for birds, as described above, would remain unchanged. Therefore, there would be no impacts to birds from implementation of the No Action Alternative.

3.9.3.2 Proposed Action

Effects to birds would result primarily from airborne pile driving noise, as described below. Airborne noise from pile driving will vary depending on the installation method, but is expected to attenuate to 65 dBA within 0.34 miles (550 m) or 0.4 miles (650 m) of the incident pile for vibratory and impact driving methods, respectively. Additional construction-related noise would result from use of heavy equipment and vehicle traffic, but these noise levels would be lower than pile driving noise levels (see Section 3.3 for noise level details). There are no established thresholds for airborne pile driving noise-related injury or disturbance impacts to terrestrial wildlife species with the exception of marbled murrelets in the Pacific Northwest.

3.9.3.2.1 Bird Acoustics and Hearing

The majority of the published literature on bird hearing focuses on terrestrial birds and their ability to hear in air. A review of 32 terrestrial and marine species reveals that birds generally have greatest hearing sensitivity between 1 and 4 kHz (Beason 2004; Dooling 2002). Very few can hear below 20 Hz, most have an upper frequency hearing limit of 10 kHz, and none exhibit hearing at frequencies higher than 15 kHz (Dooling 2002; Dooling et al. 2000). In comparison to humans, birds typically hear less well over a narrower frequency bandwidth (Dooling and Popper 2007).

Behavioral responses of birds to pile driving are not well known. Temporary threshold shift (hearing loss) (TTS) resulting from exposure to elevated sound pressure levels is typically not considered an injury effect (Popper et al. 2006), but can result in behavioral disorientation (USFWS 2008). Results of disorientation may include increased vulnerability to predators, inability to communicate with mates, or inability to identify potential prey. Other adverse behavioral effects could include flushing, aborted feeding attempts, cessation of feeding, interrupted resting attempts, and avoidance of the zone of disturbance. These behavioral changes may impair birds' ability to forage, provision chicks in the nest, create and maintain pair bonds, or rest. Energy expenditures due to avoidance of elevated sound pressure levels may increase. However, observations of seabirds suggest that if fish are killed or injured as a result of pile driving, foraging birds may be attracted to the work area to feed on the fish in spite of the noise levels (Cooper 1982).

Even without the attractant of stunned or killed fish, birds could continue to forage close to the Wharf C-2 project area and be exposed to noise-related injuries or disturbance. For example, monitoring work at the Hood Canal Bridge in Washington demonstrated that marbled murrelets would continue to dive and forage within 984 ft of active pile driving operations (Entranco and Hamer Environmental 2005), well within the zone of potential behavioral disturbance anticipated by USFWS (2006), indicating that foraging birds may habituate to pile driving.

Expected airborne noise levels from the proposed action are not expected to be injurious to birds within the project area. The source levels for airborne noise from pile driving (vibratory: 96 dBA at 15m; impact: 100 dBA at 11m) are well below those known to cause injury to birds in laboratory situations. Studies of TTS in captive birds indicate that long-term exposure to high levels (≥ 93 dBA) of non-impulsive noise (i.e. vibratory pile driving) or to multiple impulses over 125 dBA can cause TTS (Dooling and Popper 2007). Behavioral reactions could occur at levels below 93 dBA out to the range at which noise from the proposed action falls below ambient noise levels (Dooling and Popper 2007). Airborne ambient noise in the project area is discussed in Section 3.3.2.1, and daytime ambient noise at the Mayport waterfront is expected to average around 65 dBA. While there are no available data on noise levels in nearby natural areas (i.e. Huguenot Park), the Navy expects that these areas will have lower ambient noise levels than the industrialized waterfront at the NAVSTA Mayport turning basin.

Within the project area, birds will not be exposed to injurious noise levels, and are unlikely to experience TTS due to a lack of foraging habitat or other attractants of Wharf C-2. Based on analysis of the propagation of airborne noise from pile driving (Section 3.3.3.2.1.1) the Navy expects that noise levels from the proposed action will attenuate to ≤ 65 dBA within 0.4 miles (650 m) of Wharf C-2. Birds exposed to pile driving noise that exceeds ambient sound levels may exhibit startle responses, avoidance, or other behavioral reactions.

Modeling for sensitive noise receptors (Section 3.3.3.2.1.1) indicated that during pile driving at Wharf C-2 sound levels above 65 dBA may overlap with over-water critical habitat for piping plovers. However, this will not affect the primary constituent elements associated with the critical habitat, and no impacts associated with temporary reductions in water quality, increases in turbidity, or shifts in prey availability are anticipated. Potential noise exposure is likely to be limited to birds transiting the area in flight, and be at levels well below what would be disruptive to their behavior.

3.9.3.2.2 Conclusions

Pursuant to NEPA, no significant impacts to bird populations are expected to result from the Wharf C-2 Recapitalization project.

Pursuant to the ESA, a may affect, not likely to adversely affect determination was made by the Navy for piping plovers, and a no effect determination was made for their critical habitat.

Wood storks and red knots are not expected to occur inside the project area due to a lack of suitable foraging and nesting habitat, and existing anthropogenic noise and activities. Therefore, a no effect determination was made by the Navy for both species. The Navy submitted a biological evaluation for the Wharf C-2 Recapitalization project in May 2013. See Appendix A for agency correspondence.

3.10 Environmental Health and Safety

3.10.1 Affected Environment

The NAVSTA Mayport turning basin is restricted from public access. Figure 1-3 indicates the restricted areas and danger zones in and around the turning basin. The restricted area and danger zone was established by the CFR, Title 33, Chapter 11, Part 334.500. This restriction is in place 24 hours a day, seven days a week. NAVSTA Mayport's approximately one mile-long beach is closed to the general public and is patrolled by the NAVSTA Mayport Security Department. As a result, recreational access, commercial fishing and other public activities, are restricted from the NAVSTA Mayport turning basin and entrance channel.

3.10.2 Environmental Consequences

3.10.2.1 No Action Alternative

Under the No Action Alternative the recapitalization of Wharf C-2 would not occur. Baseline conditions for environmental health and safety, as described above, would remain unchanged. Therefore, there would be no impacts to environmental health and safety from implementation of the No Action Alternative.

3.10.2.2 Proposed Action

Construction activities associated with the proposed action conducted by Navy and contractor personnel are governed by regulations established under the Navy Safety and Occupational Health Program and Occupational Safety and Health Administration. NAVSTA Mayport implements the Navy Safety and Occupational Health Program in accordance with OPNAVINST 5100.8G.

The proposed action would result in construction activities occurring within the turning basin at NAVSTA Mayport for an 18-month period beginning September 30, 2013. Work would occur between one hour post-sunrise and one hour prior to sunset. The proposed action would not be expected to result in any impacts related to public environmental health and safety. Activities would not be likely to release hazardous materials to the environment. Section 3.3.3.2.1.1 provides an analysis of the effects of noise on the human environment within the project area. Adverse effects from noise would be limited to behavioral disturbance, and would not be expected to significantly impact recreational users of the St. Johns River.

A floating security barrier prevents recreational and commercial boater access to the waterfront area of the base. Boaters are allowed to pass by the security fencing but must be outside the restricted area. Since no public recreational uses occur within the project area, the proposed action would have no direct impact to recreational uses or access in the surrounding community. Therefore, there would be no significant impacts to environmental health and safety from implementation of the proposed action.

3.11 Socioeconomics

Socioeconomics is defined as the basic attributes and resources associated with the human environment, generally including factors associated with regional demographics and economic activity. This section also describes issues of environmental justice (minority and low income populations) and the protection of children. NAVSTA Mayport is bordered by the Village of Mayport to the northeast, the City of Jacksonville to the south and southwest, and Kathryn Abbey Hannah Park to the southeast. The area described includes Duval County and the City of Jacksonville, with an emphasis on NAVSTA Mayport.

3.11.1 Regulatory Overview

3.11.1.1 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was signed into law on February 11, 1994. This Executive Order requires each federal agency to identify and address, as appropriate, disproportionately high and adverse human health or environmental impacts of its programs, policies, and activities on minority and low-income populations including Native American populations. USEPA and CEQ emphasize the importance of incorporating environmental justice review in the analyses conducted by federal agencies under NEPA and of developing protective measures that avoid disproportionate environmental impacts on minority and low-income populations.

3.11.1.2 Protection of Children

The President issued Executive Order 13045, *Environmental Health Risks and Safety Risk to Children*, on April 21, 1997. This order requires each federal agency to "…make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and shall…ensure that its policies, programs, activities, and standards address disproportionate risks to children…" This order was issued because a growing body of scientific knowledge demonstrates that children may suffer disproportionately from environmental health risks and safety risks.

3.11.1.3 Navy Supplemental Environmental Planning Policy

Executive Order 12898 and Executive Order 13045 require each federal agency to identify and address impacts of their programs, policies, and activities. The Navy implemented Executive Order 12898 and Executive Order 13045 through the Chief of Naval Operations Supplemental Environmental Planning Policy signed on September 23, 2004 which is incorporated in to the OPNAVINST 5090.1C, the current policy. This policy provides instructions for naval personnel to identify and assess stressors to, and disproportionately high and adverse impacts upon, minorities, low-income populations, and children. A component of this policy institutes processes that result in consistent and efficient consideration of environmental impacts on Navy decision-making.

3.11.2 Affected Environment

NAVSTA Mayport is located in northern Florida along the St. Johns River and the Atlantic Ocean. The base is located approximately 18 miles (29 km) east of Jacksonville, also in Duval County. According to the 2010 census, Duval County had a total population of 864,263 and the estimated 2011 population totaled 870,709. The demographic characteristics of the area are provided in Table 3-22.

Duval County is approximately 56.4 percent Caucasian with the remainder of the population (minority populations) consisting of 29.8 percent African American; 7.9 percent Hispanic origin; 4.3 percent Asian; 0.4 percent American Indian or Alaska Native; and 0.1 percent Native Hawaiian and Other Pacific Islander (United States Census Bureau 2012a). The median family income in Duval County is $60,712 and approximately 11 percent of the families are low income. Individuals living below the poverty level account for 23.8 percent of the population in Duval County (U.S. Census Bureau 2012b).

Table 3-22. Demographic Characteristics

Location	2010 Population	Estimated 2011 Population	Percent Minority	Percent Youth	Percent Low Income
City of Jacksonville	821,784	827,908	43.2 (2010)	23.9 (2010)	15.2 (2007-2011)
Duval County	864,263	870,709	42.5 (2011)	23.3 (2011)	14.2 (2006-2010)

Source: U.S. Census Bureau 2012 a, c

NAVSTA Mayport employs approximately 8,374 military personnel, 1,247 civilian personnel, and 45 contractor personnel. The estimated economic impact NAVSTA Mayport has on the surrounding community (includes Duval, Nassau, Clay, and St. John Counties) is $5.28 billion dollars and 53,721 jobs.

There are no residences in the immediate vicinity of the project area. The nearest off-base residence is approximately 1 mile west of Wharf C-2 and the closest on-base residence is approximately 1 mile southeast of Wharf C-2.

Employment characteristics for the Duval County are presented in Table 3-23. For 2007-2011, the civilian labor force in Duval County was estimated at 451,644 persons, of which an estimated 406,350 were employed. The unemployment rate was 10 percent. The armed forces accounted for 1.6 percent of total employment in Duval County overall (U.S. Census Bureau 2012b).

Table 3-23. Estimated Employment Characteristics 2007-2011

Location	Civilian Labor Force	Employment	Percent Unemployed
City of Jacksonville	427,453	383,689	10.2
Duval County	451,644	406,350	10

Source: U.S. Census Bureau 2012 b, d

Average annual employment by industry is depicted in Table 3-24. The military, specifically the Navy, is the largest employer in Duval County. As of 2011, the Navy employed 37,910 jobs, of which 12,670 directly supported NAVSTA Mayport (Jacksonville Partnership for Regional Economic Development 2012).

Table 3-24. Average Annual Employment by Industry

Employment Category	Percent by Category	
	Duval County	Florida
Natural Resource & Mining	0.1	1.2
Construction	4.6	4.6
Manufacturing	5.1	4.3
Trade, Transportation and Utilities	20.9	20.7
Information	1.8	1.9
Financial Activities	11.3	6.6
Professional & Business Services	16.7	14.6
Education & Health Services	15.1	14.9
Leisure and Hospitality	9.9	13.3
Other Services	2.6	3.3
Government	11.9	14.5

Source: Office of Economic and Demographic Research 2012

3.11.3 Environmental Consequences

3.11.3.1 No Action Alternative

Under the No Action Alternative the recapitalization of Wharf C-2 would not occur. Baseline conditions for demographics, the local community, environmental justice and the protection of children, as described above, would remain unchanged. Therefore, there would be no impacts to socioeconomics from implementation of the No Action Alternative. The No Action Alternative would not result in a finding of any disproportional impacts to minorities, low income populations, or children.

3.11.3.2 Proposed Action

The socioeconomic impacts related to construction employment would occur only for the 18-month duration of the recapitalization of Wharf C-2. The proposed action would generate very few temporary jobs and would contribute minimally to local earnings spending. This is because construction employment associated with this project would likely be accommodated by labor resources already in the region (Table 3-24). The additional population would not create undue demand on housing, schools, or other social services. As such, no permanent or long lasting socioeconomic impacts are anticipated as a result of the construction associated with the proposed action. Therefore, the proposed action would not result in a significant impact to socioeconomics.

Environmental justice concerns related to construction activity typically include: exposure to noise, safety hazards, pollutants, and other hazardous materials. Although low income and minority populations are present in the surrounding areas (see Table 3-22), none reside near the project area and, thus, would not be subject to any disproportionate impacts. Therefore, the proposed action would not result in a finding of any disproportional impacts to minorities, low-income populations, or children.

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4 Minimization and Monitoring

The Navy will employ the measures listed in this section to avoid and minimize impacts to marine mammals, fish, and sea turtles; their habitats; and forage species. 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.

4.1 General Construction Best Management Practices

- All work will adhere to performance requirements of the Clean Water Act, Section 404 permit and Section 401 Water Quality Certification. No in-water work will begin until after issuance of regulatory authorizations.
- The construction contractor is responsible for preparation of an Environmental Protection Plan. The plan will 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.
- No petroleum products, lime, chemicals, or other toxic or harmful materials shall be allowed to enter surface waters. Washwater resulting from washdown of equipment or work areas shall be contained for proper disposal, and shall not be discharged unless authorized.
- Equipment that enters surface waters shall be maintained to prevent any visible sheen from petroleum products.
- 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 will occur. Fuel hoses, oil drums, oil or fuel transfer valves, fittings, etc. shall be checked regularly for leaks and will be maintained and stored properly to prevent spills.
- No cleaning solvents or chemicals used for tools or equipment cleaning shall be discharged to ground or surface waters.
- Construction materials will not be stored where high tides, wave action, or upland runoff could cause materials to enter surface waters.
- Barge operations will be restricted to tidal elevations adequate to prevent grounding of a barge.

4.2 Pile Removal and Installation Best Management Practices

- A containment boom surrounding the work area shall be used during creosote-treated pile removal to contain and collect any floating debris and sheen. In some cases, the boom may be lined with oil-absorbing material to absorbed released creosote.
- Oil-absorbent materials shall be used in the event of a spill if any oil product is observed in the water.
- All creosote-treated material and associated sediments shall be disposed of in a landfill that meets Florida environmental standards.
- Removed piles and associated sediments (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.
- Piles 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 piles, the contractor shall use the minimum size bucket required to pull out piles based on pile depth and substrate. The clam shell bucket shall be emptied of piles 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. In some cases (depending on access, location, etc.), piles may be cut below the mud line and the resulting hole backfilled with clean sediment.
- 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.
- 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.
- 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.

4.2.1 Timing Restrictions

All in-water construction activities shall occur during daylight hours (sunrise to sunset[7]). Non in-water construction activities could occur between 6:00 a.m. and 10:00 p.m. during any time of the year.

4.3 Additional Minimization Measures for Marine Species

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.

[7] 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.

4.3.1 Coordination

The Navy shall conduct a pre-construction briefing with the contractor. During the briefing, all personnel working in the Project area will watch the Navy's Marine Species Awareness Training video. Information will also be provided on how to identify piping plovers, wood storks, and red knots.

4.3.2 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.

4.3.3 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 a vibratory or impact driver operating at full capacity; thereby, exposing fewer animals to loud underwater and airborne sounds. Should the brief use of impact pile driving be necessary, a soft start procedure shall be used.

For impact pile driving, 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").

4.3.4 Standard Conditions

The contractor shall adhere to all requirements of the following:

- U.S. Fish and Wildlife Services (USFWS) 2005 Standard Manatee Conditions for In-Water Work (Appendix C)
- National Marine Fisheries Services (NMFS) 2006 Sea Turtle and Smalltooth Sawfish Construction Conditions (Appendix D)
- NMFS 2012 Southeast Region Marine Mammal and Sea Turtle Viewing Guidelines (Appendix E)

- *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.

4.3.5 Visual Monitoring and Shutdown Procedures

A separate Marine Species Monitoring Plan is being submitted to NMFS and USFWS; it includes all details for Project monitoring efforts. 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 (Marine Species Monitoring Plan Attachment 1) has been included with the Monitoring Plan to aid in identifying species should they be observed in the vicinity of the Project.

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.

The contractor will adhere to all requirements of the following:

- U.S. Fish and Wildlife Service 2005 Standard Manatee Conditions for In-Water Work (Marine Species Monitoring Plan, Appendix C)
- National Marine Fisheries Service 2006 Sea Turtle and Smalltooth Sawfish Construction Conditions (Marine Species Monitoring Plan, Appendix D)
- National Marine Fisheries Service 2012 Southeast Region Marine Mammal and Sea Turtle Viewing Guidelines (Marine Species Monitoring Plan, Appendix E)

Methods

The observer(s) will monitor the shutdown zone (Figure 4-1) before, during, and after pile driving and removal.

The observer(s) will 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 National Marine Fisheries Services' 2012 Southeast Region Marine Mammal and Sea Turtle Viewing Guidelines (Marine Species Monitoring Plan Attachment 4).

During all observation periods, observers would use binoculars and the naked eye to search continuously for marine mammals;

If the shutdown zone is obscured by fog or poor lighting conditions, pile driving will not be initiated until the entire shutdown zone is visible.

The shutdown zone will be monitored for the presence of protected species before, during, and after any pile driving or removal activity.

Pre-Activity Monitoring

The shutdown zone will be monitored for 15 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) leave the shutdown zone. Activity would resume only after the observer has determined, through re-sighting or by waiting approximately 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.

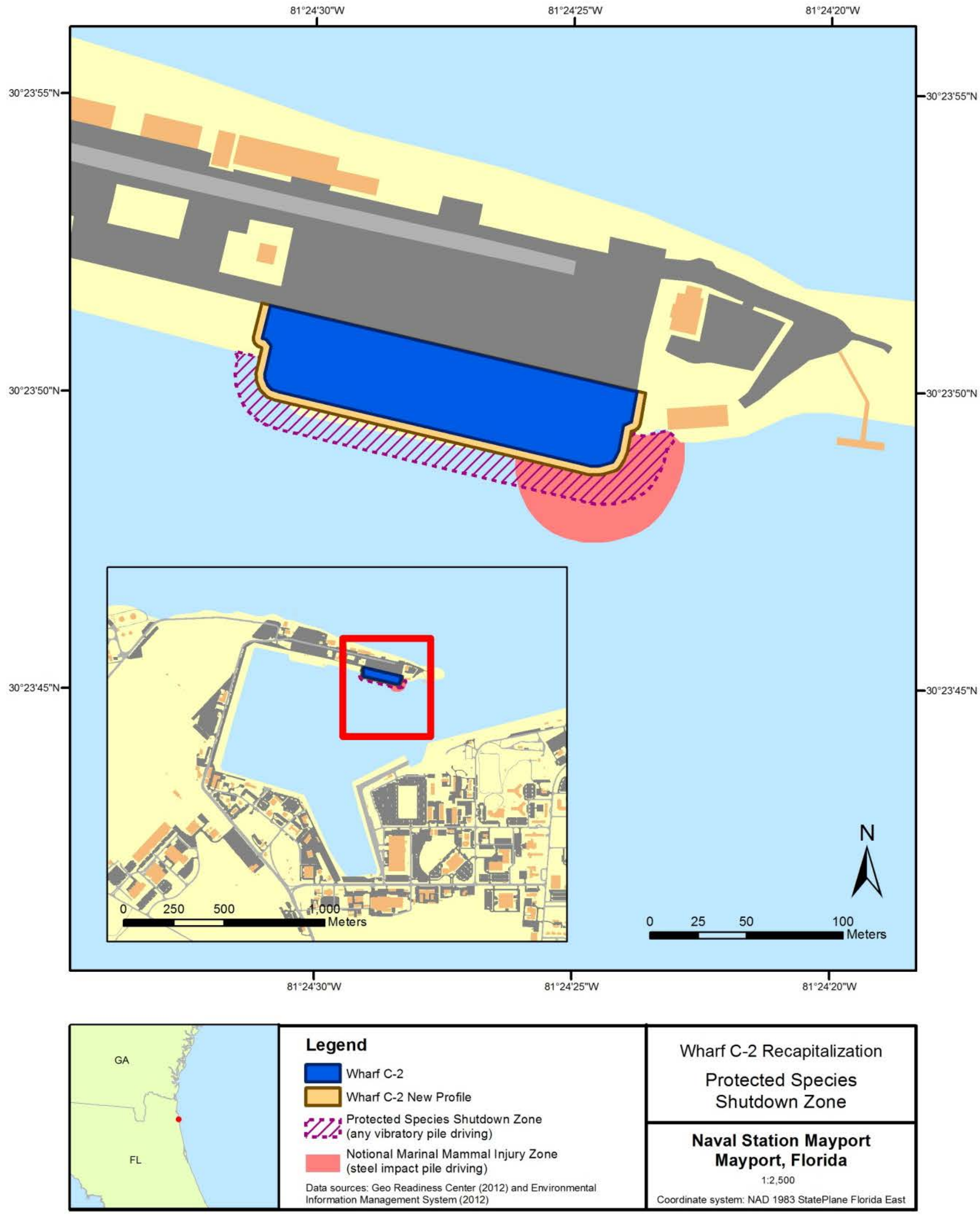

Figure 4-1. Shutdown Zones for Vibratory and (Contingency Only) Impact Pile Driving Activities

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 4-1). For contingency impact pile driving, the larger 40 m (130 ft) shutdown zone (Figure 4-1) shall be implemented for marine mammals only; the standard shutdown zone will continue to be applied for all other protected species.

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.

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 15 minutes following the completion of the activity.

4.3.6 Data Collection

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

- Date and time that pile driving or removal begins or ends
- 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 (Marine Species Monitoring Plan Attachments 5 and 6)

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.

4.3.7 Interagency Notification and Reporting

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
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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).

Care should be taken in handling dead specimens to preserve biological materials in the best possible state for later analysis of cause of death, if that occurs. 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.

A draft report of any incidents of marine mammals entering the shutdown zone will be forwarded to NMFS / USFWS no later than 17 January 2015. A final report would be prepared and submitted to NMFS within 30 days following receipt of comments on the draft report from NMFS.

5 Cumulative Impacts

5.1 Introduction

Council of Environmental Quality (CEQ) regulations stipulate that the cumulative effects analysis within an Environmental Assessment (EA) should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 1508.7). Recent CEQ guidance in considering cumulative effects involves defining the scope of the other actions and their interrelationship with the Proposed Action. The scope must consider geographical and temporal overlaps among the Proposed Action and other actions. It must also evaluate the nature of interactions among these actions.

Cumulative effects are most likely to arise when a relationship or synergy exists between the Proposed Action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in proximity to the Proposed Action would be expected to have more potential for a relationship than those more geographically separated.

To identify cumulative effects, three fundamental questions need to be addressed:

- Does a relationship exist such that affected resource areas of the Proposed Action might interact with the affected resource areas of past, present, or reasonably foreseeable actions?
- If one or more of the affected resource areas of the Proposed Action and another action could be expected to interact, would the Proposed Action affect or be affected by impacts of the other action?
- If such a relationship exists, then does an assessment reveal any potentially significant impacts not identified when the Proposed Action is considered alone?

The scope of the cumulative effects analysis involves both the geographic extent of the effects and the timeframe in which the effects could be expected to occur. It is possible that analysis of cumulative impacts may go beyond the scope of the project-specific direct and indirect impacts to include expanded geographic and time boundaries and a focus on broad resource sustainability. This "big picture" approach is becoming increasingly important as growing evidence suggest that the most significant impacts result not from the direct impact of a particular action, but from the combination of individual, often minor, impacts of multiple actions over time. The underlying issue is whether or not a resource can adequately recover from the impact of an action before the environment is exposed to a subsequent action or actions.

The proposed action analyzed in this EA would not make radical changes to the environment in and around the NAVSTA Mayport turning basin. Rather the proposed action would result in temporary impacts to the environment. As such, there is limited potential for the affected resources of the proposed action to interact with the affected resources of past, present, or reasonably foreseeable actions. As discussed in Chapter 3 of this EA, environmental impacts of the recapitalization of Wharf C-2 at NAVSTA Mayport result in temporary changes to the noise environment and sediment and water quality. Potential interactions with other past, present, or reasonably foreseeable actions would generally be those actions that also may have effects on the noise environment, sediment and water quality of the NAVSTA Mayport turning basin.

5.2 Past, Present, and Reasonable Foreseeable Actions

Various types of past, present, and reasonably foreseeable actions not related to the Proposed Action have the potential to affect the resources identified in Chapter 3 of the EA. The overview of these actions in this section emphasizes components of the activities that are relevant to the impact analysis in Chapter 3. Geographic distribution, intensity, duration, and historical effects of similar activities are considered when determining whether a particular activity may contribute cumulatively and significantly to the impacts of the proposed action on the resource areas identified in Chapter 3.

Based on a review of past, present, and reasonably foreseeable actions at NAVSTA Mayport and the region (Duval County), it was determined that several actions be considered when analyzing the potential cumulative impacts of the actions. The projects listed in this section are those that have the greatest potential to cumulatively impact the resources assessed in this EA. These projects are described below, and the impacts of these projects, in combination with the impacts of the proposed action, are described in Section 5.3.

5.2.1 Federal Actions

5.2.1.1 Nuclear-Powered Aircraft Carrier Homeporting at NAVSTA Mayport

In a Record of Decision dated 14 January 2009, the Navy announced it wants to establish a second Atlantic Fleet nuclear-powered aircraft carrier (CVN) home port by homeporting a CVN at NAVSTA Mayport. Later that month, following the change in administrations, Obama Administrations officials testified they would review the proposal. On 10 April 2009, the Department of Defense (DOD) announced it had decided to delay a final decision on whether to propose transferring a CVN to Mayport until it reviewed the issues as part of its 2010 Quadrennial Defense Review. The DOD's final report on the 2010 Quadrennial Defense Review, released 1 February 2010, endorsed the Navy's desire to establish a second Atlantic Fleet CVN homeport by homeporting a CVN at NAVSTA Mayport.

The proposal requires certain facility upgrades to make NAVSTA Mayport capable of homeporting a CVN, including dredging and construction of nuclear propulsion plant maintenance facilities.

Navy plans called for having NAVSTA Mayport ready to homeport a CVN in 2019. However, the current schedule is uncertain because the Navy's proposed fiscal year 2013 budget defers the Navy's plan to homeport a CVN at NAVSTA Mayport. The Navy's proposed fiscal year 2013 budget and the fiscal year 2013 to 2017 Future Years Defense Plan contain no funding for Military Construction projects required to homeport a CVN at Mayport.

5.2.1.2 Homeporting of U.S. Coast Guard National Security Cutter and Other Ships at NAVSTA Mayport

The Coast Guard is proposing to homeport the U.S. Coast Guard Cutter VALIANT at NAVSTA Mayport, possibly starting in summer 2013. VALIANT is a multi-mission, medium endurance cutter currently homeported in Miami Beach, Florida. VALIANT operates in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico for Commander, Coast Guard Atlantic Area. In November 2011, the Coast Guard also requested assistance from the Navy in determining the feasibility of homeporting several ship classes at NAVSTA Mayport, including all or some of the following: two National Security Cutters and four additional medium endurance cutters. Potential cumulative impact issues associated with these possible actions include a slight increase in vessel traffic.

5.2.1.3 Wharf C-1 Repair at NAVSTA Mayport

A Categorical Exclusion was prepared for the repair of Wharf C-1 at NAVSTA Mayport. The Wharf C-1 was repaired by installing a new sheet pile bulkhead in front of the existing bulkhead and tying back into the existing sheet pile bulkhead. A second deck was constructed over top of the existing wharf deck.

5.2.1.4 NAVSTA Mayport Basin Dredging

The Navy currently removes approximately 900,000 cy of sediment from the NAVSTA Mayport turning basin and entrance channel every two years as part of its maintenance dredging program. Most of this material has been disposed of in the Jacksonville Ocean Dredged Material Disposal Site. Jacksonville Ocean Dredged Material Disposal Site has been in use since 1952 and NAVSTA Mayport has used the Ocean Dredged Material Disposal Site regularly since 1954.

5.2.1.5 Draft Environmental Assessment for Amphibious Assault Vehicle Training Exercises for Five Marine Force Reserve Centers

The purpose of the proposed action is to conduct Amphibious Assault Vehicle training operations at five separate Marine Corps Reserve Centers on the Gulf and East Coasts of the United States; Tampa, FL, Jacksonville, FL, Gulfport, MS, Galveston, TX, and Norfolk, VA. Marine reservists need to conduct Amphibious Assault Vehicle training in close proximity to the Marine Corps Reserve Centers in order to effectively and efficiently meet and sustain a combat ready force. The preferred alternative is to acquire the necessary real estate agreements to continue Amphibious Assault Vehicle training at all sites. In Jacksonville, FL, Mud Island is directly across from the Marine Corps splash point. This is considered the primary site for amphibious training in the St. Johns River. The Marine Corps is negotiating with the Port Authority and Corps of Engineers to use Bartram Island for one of their training sites. The island is owned by the Port Authority but portions of Bartram Island are going to be used by the Corps of Engineers for spoil disposal. The Marine Corps has made an official request to the Commanding Officer at NAVSTA Mayport to allow Amphibious Assault Vehicle training on the north end of the beach. Alternative 2, the no action alternative is the continuation of the current operations, status quo (formal agreements are not in place at all sites). Potential cumulative impact issues associated with these possible actions include a slight increase in vessel traffic in the St. Johns River inlet channel.

5.2.1.6 Atlantic Fleet Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement

The Navy is proposing to conduct training and testing activities – that may include the use of active sonar and explosives – within existing range complexes and testing ranges located along the east coast of the U.S, including the Jacksonville Range Complex. The proposed action also includes Navy surface ship and submarine sonar maintenance and testing that will take place at Navy ports and naval shipyards located along the east coast of the United States, including NAVSTA Mayport.

5.2.1.7 Construction of the Undersea Warfare Training Range

On 5 August 2009, the Navy published its Record of Decision regarding the construction of an undersea warfare training range in the Jacksonville Operating Area. Construction is anticipated to start in fiscal year 2014, and initial operational capability is anticipated in fiscal year 2019.

5.2.1.8 NAVSTA Mayport Planned Development

NAVSTA Mayport has plans for an addition to the physical fitness center, additional parking, recapitalization of Wharfs B and C, an addition to the Southeast Regional Maintenance Center facility, and aircraft refueling facilities. The NAVSTA Mayport master plan establishes a plan for continued orderly growth and development of NAVSTA Mayport. When land use constraints are taken into account, the installation is nearly completely built-out. Therefore, the master plan focuses on recapitalization efforts. Future mission activities at NAVSTA Mayport could include the homeporting of the new littoral combat ship. The HSV2, a Navy-leased ship that may serve as a potential platform for the littoral combat ship, has recently been used by U.S. Navy Southern Command operations out of NAVSTA Mayport (Clark 2007).

5.2.2 Non-Federal Actions

5.2.2.1 Jacksonville Port Authority Dames Point Marine Terminal Intermodal Container Transfer Facility Draft Environmental Assessment

The original Jacksonville Port Authority, now known as JAXPORT, was created by a special act of the Florida Legislature in 1963 to develop, maintain and market Jacksonville's port facilities. Since the creation of JAXPORT, marine port operations in Jacksonville have continued to grow. The purpose of the Intermodal Container Transfer Facility is to provide access to rail transportation for in-bound container ships, overseas shipments and shippers who use highway semi-trailers and containers, and by attracting new distribution, manufacturing, and warehousing development to its vicinity, significantly decreasing the economic and environmental cost for draying trailers and containers between the Dames Point Marine Terminal and shippers' and receivers' facilities. The Intermodal Container Transfer Facility is needed to 1) add new rail access to support operations on Dames Point and the continued growth of JAXPORT; 2) stay economically competitive in the global marketplace; and 3) stimulate economic growth and provide jobs to a depressed local economy. The proposed action would involve a five track rail yard extending from the existing CSX line, two to six rubber tired gantry cranes, a paved area for containers, and several support uses including a road and gate for truck movement of cargo, a parking area, and stormwater retention facilities (Port of Jacksonville 2012).

5.2.2.2 Village of Mayport Community and Economic Development

The Village of Mayport is the oldest, continually occupied community in Duval County. The Mayport Waterfront Partnership was created by the cities of Atlantic Beach and Jacksonville in 1997 to bring economic revitalizing to the eastern shore of Duval County. The Partnership's zone of interest includes the North Jacksonville barrier islands, the Village of Mayport, and Ft. George and Fanning Islands. In 1998, the State of Florida designated the Village of Mayport as one of the first three waterfront communities in need of revitalization. In recent years, the Partnership oversaw the installation of a $4.2 million sanitary sewer line and the upgrading of water lines in the commercial section of the Village of Mayport. Also, the Waterfront Partnership wrote and sponsored the Mayport Village Overlay Zone Regulations, which provide protection for characteristics unique to the village (City of Jacksonville 2012).

5.2.2.3 Commercial Fishing

Commercial fishing can adversely affect fish populations, other species, and habitats. Potential impacts of commercial fishing include overfishing of targeted species and bycatch, both of which negatively affect fish stocks and other marine resources. Bycatch is the capture of fish, marine mammals, sea turtles, seabirds, and other nontargeted species that occurs incidental to normal fishing operations. Exclusion of commercial fishing in the NAVSTA Mayport basin has created a default sanctuary for fishery species, and may serve as a source population for depleted areas open to fishing. The potential benefits of a sanctuary from harvest should be considered in the cumulative impact analysis for the proposed action. Commercial and recreational fishing have, by far, the greatest impact on fish and shellfish populations across the globe (Jackson et al. 2001, Halperin et al. 2008, Crain et al. 2009). However, the highly altered nature of marine habitat in the basin becomes an issue for species attracted to the refuge.

5.2.2.4 Marine Vessel Traffic

The nearshore areas of NAVSTA Mayport, near the Jacksonville commercial port in particular, are heavily traveled by commercial, recreational, and government marine vessels. Recreational activities in the area consist primarily of motorboating, game and sport fishing, jetskiing, waterskiing, shellfishing, shrimping, sailing, sport diving, and bird and whale watching. Recreational boats range throughout the coastal waters, depending on season and weather conditions. A commercial ferry crosses the St. Johns River between Mayport, Florida, and Fort George Island, Florida. Primary concerns for the cumulative impacts analysis include vessels striking marine mammals and sea turtles and underwater sound from ships and other vessels.

5.3 Potential Cumulative Impacts

The following analysis examines the impact on the environment that would result from the incremental impact of the proposed action in addition to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. This analysis assesses the potential for an overlap of impacts with respect to project schedules and/or affected areas. Specific information on all of the projects listed in Section 5.2 is not available, so the cumulative impacts of these actions cannot yet be quantified. Therefore, this section presents a qualitative analysis of the cumulative impacts, based on significant activities anticipated for each project (e.g., underwater noise activities).

Two resource areas (archaeological resources, and commercial and recreational fishing) have been eliminated from consideration in this EA; therefore, no disturbance to any of these resources is anticipated, and the cumulative impacts of these resources are not considered in this section.

To determine the significance of each of the cumulative impacts of the proposed action and other actions, significance was determined according to Section 1508.27 of the Environmental Quality Improvement Act of 1970, as amended [43 CFR 56003, Nov. 29, 1978]. The primary factors considered for each resource area in determining significance as used in NEPA requires considerations of both context and intensity.

8. Context. This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed

action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

9. Intensity. This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:
   a. Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.
   b. The degree to which the proposed action affects public health or safety.
   c. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
   d. The degree to which the effects on the quality of the human environment are likely to be highly controversial.
   e. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
   f. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
   g. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
   h. The degree to which the action may adversely affect districts, sites, buildings, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.
   i. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the ESA of 1973.
   j. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

Based on the assessment of ongoing and reasonably foreseeable actions at NAVSTA Mayport, the proposed action would result in some less than significant cumulative impacts as a result of the various projects that would not be considered significant, as described below.

5.3.1 Sediments and Water Quality

Sediment impacts include changes in the transport and distribution of sediments (sedimentation) as well as changes in sediment quality or characteristics. Past, present, and future actions involving in-water construction (i.e., pile driving and dredging) in the NAVSTA Mayport turning basin have caused or will cause short-term disturbances to sediment. The periodic maintenance dredging events, similar to the deepening project, have and will create short-term suspended sediment and turbidity within the NAVSTA Mayport turning basin. However, as with the impacts to sediments resulting from the proposed action, the impacts associated with maintenance dredging will be temporary and localized. The proposed action, in combination with Navy and non-Navy past, present, and reasonably foreseeable future events would not have a significant cumulative impact on sediments.

5.3.2 Air Quality

The geographic study area for evaluating cumulative impacts to air quality is Duval County. Duval County is in attainment with all National Ambient Air Quality Standards. The emissions generated during the implementation the proposed action would be additive to other emissions generated coincidentally within the region. Compliance with the Florida State Implementation Plan will ensure that implementation of the proposed action, in combination with past, present, and future actions, would not result in a new violation of existing National Ambient Air Quality Standards, nor contribute to an increase in the frequency or severity of violations of existing National Ambient Air Quality Standards, or delay the timely attainment of any National Ambient Air Quality Standards, interim milestones, or other milestones to achieve attainment.

Emissions from the proposed action are not expected to significantly add to the cumulative impacts to existing air quality of all past, present, and reasonably foreseeable actions. This is because existing levels of criteria pollutants and greenhouse gas emissions are low, emissions from the proposed action would be localized, future point sources would be required to control emissions and the level and the type of development that would occur in the reasonably foreseeable future would not produce substantial emissions.

5.3.3 Noise

Most past, present, and future actions have generated, are generating, or would generate some type of noise, either from a facility itself, from vehicles traveling to and from a site, or from humans. Noise is typically a nuisance factor for sensitive receptors such as residences, hospitals, or parks, where quiet conditions are important, and may also affect acoustically dependent non-human species. Close proximity to high sound levels can result in physiological problems or hearing damage. Over time the trend has been for noise levels to increase as development has occurred, particularly during daytime hours when activity levels are highest.

Human actions can produce noise that is either temporary (generally associated with construction or other short-term actions) or permanent. Permanent increase in noise may result from increased activity due to new facilities and other improvements (road size, etc.). Past actions resulting in temporary noise increases in and around NAVSTA Mayport have included recapitalization of existing wharves and buildings and new construction by the Navy, the Port of Jacksonville, and the Village of Mayport. The noise contributions from these actions were temporary and ceased upon completion of the relevant projects. Cumulative effects of permanent increases in noise from past actions and temporary and permanent increases from current and future actions are addressed below, with separate discussions of airborne and underwater ambient noise environments. The cumulative impacts of underwater noise on marine mammals, fish, and birds are discussed in Sections 5.3.4, 5.3.5, and 5.3.7, respectively.

5.3.3.1 Airborne Noise

Past, present, and future actions at and around NAVSTA Mayport may cumulatively affect airborne ambient noise. Permanent increases in airborne noise from past actions have resulted from increases in vessel and vehicle traffic and waterfront activities, and noise from these sources dominates the current daytime ambient noise environment; other noise is generated by wind, waves, and natural sources (e.g. songbirds). Current actions which may affect airborne ambient noise in the project area include existing vehicle and vessel traffic from commercial, recreational, and military activities, day-to-day port and waterfront activities, routine biennial maintenance dredging, and training operations. These actions are currently in compliance with City of Jacksonville noise regulations.

The proposed action would generate noise from equipment, industrial activities, vessel movement, pile driving, and humans. All actions would occur from one hour after sunrise to one hour before sunset. The proposed action would result in a temporary increase in noise in the vicinity of the project area. The impact pile driver (which is contingency only) is expected to produce a maximum peak level of 100 dBA re 20μPa at a distance of 36 ft (11 m) from the pile (WSDOT, 2010b). The vibratory hammer would be estimated to produce noise levels of 96 dBA re 20μPa at 50 ft (15 m) (Illingworth and Rodkin 2012). Impact and vibratory hammers would never operate simultaneously. City of Jacksonville noise regulations (Jacksonville Environmental Protection Board 1995) limit noise levels affecting sensitive receivers to 65 dBA (daytime). The impact and vibratory hammer would be used intermittently and would produce sound levels at or below 65 dBA around the nearest sensitive receptor at NAVSTA Mayport (Pelican's Roost RV Park; see Section 3.3.3). Any impacts from the proposed action would be temporary and would not have a significant impact on ambient noise along the NAVSTA Mayport turning basin nor violate existing noise limits.

Future Navy and non-Navy actions will also generate airborne noise. For example, proposed homeporting of a nuclear-powered aircraft carrier (CVN) would increase airborne noise from temporary construction of maintenance facilities and increased vessel traffic at NAVSTA Mayport. Other actions include homeporting of additional ships and land-based construction and recapitalization of existing facilities. The type of noise and noise levels produced by these actions would be dependent on the specific project, and the impact of these noise sources would depend on their location relative to sensitive receptors. It is likely that some of these future actions would produce nuisance noise. There are requirements to limit the level of noise produced by residential, commercial, or industrial land uses. Thus, some future development would have requirements to provide soundproofing measures.

5.3.3.2 Underwater Noise

The current underwater ambient noise environment in the NAVSTA Mayport turning basin and St. Johns River is likely to be dominated by noise from commercial, recreational, and military vessel traffic. Past Navy and non-Navy activities have increased noise levels via commercial shipping at the Port of Jacksonville, homeporting of military vessels at NAVSTA Mayport, routine biennial dredging of the turning basin, and day-to-day port activities, among other actions. Current activities which produce underwater noise include vessel traffic, port operations, and training for surface ships and submarines at NAVSTA Mayport (including pierside sonar activities).

The proposed action would have a temporary effect on underwater ambient noise levels in the project area. Pile driving would take place between one hour after sunrise and one hour prior to sunset; the primary installation method would be vibratory driving, with impact driving reserved for contingencies. Vibratory pile driving would be expected to produce noise levels up to 163 dB re 1µPa rms at 33 ft (10 m) (Illingworth & Rodkin 2012); maximum noise levels associated with impact driving would reach 189 dB re 1µPa rms at 33 ft (10 m) (WSDOT 2005). Impact and vibratory hammers would never operate simultaneously. Contingency clamshell dredging of the increased footprint area may also contribute short-term noise at significantly lower levels than impact pile driving. Any impacts from the proposed action would be temporary and would not have a significant impact on underwater ambient noise in the NAVSTA Mayport turning basin or St. Johns River.

Expected Navy and non-Navy future activities will also increase underwater noise levels in the project area. Homeporting of additional ships at NAVSTA Mayport will increase noise from vessel transits, docking activities, maintenance, and training activities. Associated construction will temporarily impact noise levels in and around the NAVSTA Mayport turning basin. Timing of these future activities is uncertain, but increases in vessel traffic may begin as soon as the summer of 2013 with the arrival of additional Coast Guard ships at NAVSTA Mayport and may overlap with the temporary increase in noise due to the proposed action. However, because the current ambient noise environment within the project area is already dominated by anthropogenic noise from vessels, the Navy does not anticipate that there will be any significant cumulative impacts on underwater ambient noise environments due to the proposed action.

5.3.4 Marine Mammals

Operations and maintenance at the NAVSTA Mayport waterfront, such as the Wharf C-1 Recapitalization project and biennial dredging in the turning basin have likely resulted in temporary impacts such as displacement of marine mammals and their prey (forage fish and invertebrates), and temporary localized degradation of water quality. Over time, work at the NAVSTA Mayport waterfront has resulted in increased human presence, underwater and airborne noise, boat movement, and other activities, which has likely impacted some water-dependent wildlife such as marine mammals in the area. Increased anthropogenic noise in the marine environment has the potential to cause behavioral reactions in marine mammals including avoidance of certain areas. However, the abundance and coexistence of these species with existing anthropogenic activities suggests that cumulative effects have not been detrimental. Based on NMFS stock assessment reports, with the exception of North Atlantic right whales, population trend data for the marine mammal species that may occur in the project area are either stable or increasing in recent years (NMFS 2009a, 2010a, 2010b, 2011a, 2011b, Gubbins et al. 2003; Smith et al. 1999; FWC 2007). Because marine mammals are highly mobile, the noise impacts of the proposed action could be cumulative with underwater and airborne noise impacts to marine mammals from other actions and activities in and around Mayport. However, because the expected impacts of the proposed action on marine mammals in general would be temporary, cumulative impacts associated with pile driving noise are considered unlikely. Continued research into acoustic effects, combined with stock assessments and documentation of mortality causes, ensure that cumulative effects would be minimized. The regulatory process also ensures that each project proposing take of marine mammals is assessed in light of the status of the species and other actions affecting it in the same region. No long term, permanent impacts to populations of marine species, however, are expected, either as a result of each project or cumulatively when combined with other past, present, and reasonably foreseeable actions. Therefore, no cumulative adverse effects to marine mammals are expected.

Future Navy and non-Navy projects may have similar impacts to past and present actions including increased anthropogenic sound (both airborne and underwater), increased human presence, increased vessel traffic and other associated activities. These actions could result in behavioral impacts to local populations of marine mammals such as temporary avoidance of habitat and decreased foraging effort. Most impacts would likely be temporary and short term in nature, and are unlikely to affect the overall fitness of the animals. However, some projects such as the homeporting of the aircraft carrier and/or Coast Guard national security cutter and other ships at NAVSTA Mayport may result in more significant impacts due to longer construction timelines. Impacts to marine mammals are still expected to primarily result from behavioral disturbance from underwater sound pressure levels; however, indirect impacts to marine mammals may occur as a result of disruption of their prey base during construction and operation of the new ships' support facilities. Potential impacts to the forage fish and invertebrate prey base could include habitat disturbance or elimination, and overwater shading from new structures. Overwater shading would be long-term, but due to the existing degraded condition of the project area, further reduction in quality of habitat not expected to result in as dramatic an effect compared to similar consequences in high quality habitat. Overall reductions in habitat are expected to be minimal in comparison to the total habitat available in the waters off NAVSTA Mayport. Further, marine mammals in the area can be expected to have habituated to higher anthropogenic noise and activity levels.

With BMPs and minimization measures such as visual monitoring and use of shutdown zones implemented (Chapter 4 and Appendices B-D), cumulative impacts will not significantly affect marine mammal populations in the Wharf C-2 project area. Nevertheless, the proposed action and other future actions would contribute incrementally to cumulative marine mammal disturbance impacts at the NAVSTA Mayport waterfront. Continued adherence to the requirements of the ESA and MMPA by NAVSTA Mayport would limit disturbance to marine mammals. Further, existing regulatory mechanisms and mitigation measures would protect marine mammals and further decrease the likelihood of potential cumulative impacts to these species.

5.3.5 Marine Vegetation, Invertebrates, and Fish

In order to conduct an adequate assessment of cumulative impacts, there must first be a threshold for elevating one individually minor impact to a cumulatively large impact. The stressors of the proposed action include the demolition and reconstruction of an artificial structure and association noise impact on the water column. Given the lack of comprehensive/comparable data collection and established thresholds for these stressors, there can only be a comparison of activities with similar impacts in the local area. Other demolition and reconstruction or noise producing activities may be associated with all the current and future action noted in Sections 5.2.1 and 5.2.2., except on land and offshore areas (e.g., Construction of the Undersea Warfare Training Range).

The area of Mayport already has a highly developed shoreline in a tidally flushed ecosystem, which is a mitigating factor with regard to cumulative impacts on the local ecosystem. In other words, the threshold for cumulative physical impacts from shoreline development have probably been surpassed already; many of the shallow, nursery habitats for estuarine species have been lost to shoreline development in the lower St. Johns River estuary (NOAA Office of Response and Restoration 1997). In April 1939, the Navy Department initiated plans for this area, which included a site along the south jetties for the development of an aircraft carrier basin. In December of that year, Ribault Bay was selected as the location for such a basin. The basin was dredged to 29 ft and used by patrol craft, target and rescue boats and jeep carriers during World War II. The loss of Ribault Bay as a nursery habitat overshadows any further impacts on the area. The highly altered basin now serves as a default sanctuary for adult fishery species that find it suitable habitat (e.g., southern flounder, cobia).

The recapitalization of artificial structures around the shoreline will yield no lasting alteration of habitat for vegetation, invertebrates and fish inhabiting the area. However, the growing level of noise in the water column could be having a significant impact in terms of auditory masking of fish vocalizations, such as those of red drum and other sciaenids (i.e., drums) who spawn around inlets and estuarine waters. Based on the assessment of ongoing and reasonably foreseeable actions at NAVSTA Mayport, the proposed action may or may not result in significant cumulative impacts, in terms of noise, as a result of the various projects that would not be considered significant, as described in Section 5.2.

5.3.6 Sea Turtles

In addition to the Proposed Action and projects listed above, global and regional threats to sea turtles must be taken into account when considering cumulative impacts to sea turtles. Bycatch in commercial fisheries, ship strikes, and marine debris are some of the primary threats to sea turtles (Lutcavage et al. 1997). One comprehensive study estimates that worldwide, 447,000 sea turtles are killed each year from bycatch in commercial fisheries (Wallace et al. 2010). Precise data are lacking for sea turtle mortalities directly caused by ship strikes; however, live and dead turtles are often found with deep cuts and fractures indicative of collision with a boat hull or propeller (Hazel et al. 2007; Lutcavage et al. 1997). Marine debris can also be a problem for sea turtles through entanglement or ingestion (Lazar and Gracan 2011; Macedo et al. 2011). Sea turtles can mistake debris for prey; one study found 37 percent of dead leatherback turtles to have ingested various types of plastic (Mrosovsky et al. 2009). Plastic ingestion was identified as the cause of death in 9 percent of these cases. Other marine debris, including derelict fishing gear and cargo nets, can entangle and drown turtles in all life stages.

Global climate change, with predictions of increased ocean and air temperatures as well as sea level rise, may also negatively affect turtles in all life stages from egg to adult (Griffin et al. 2007; Poloczanska et al. 2009; Santidrián Tomillo et al. 2012; Witt et al. 2007). Potential impacts include embryo death caused by high nest temperatures, skewed sex ratios because of increased sand temperature, loss of nesting habitat due to beach erosion, coastal habitat degradation (e.g., coral bleaching and disease), and spatial shifts in suitable habitat.

The above listed impacts to sea turtles are multiple orders of magnitude higher than any the Proposed Action would cause, which in general are minor and temporary. No significant cumulative impacts from the Proposed Action to any ESA-listed sea turtle species are anticipated.

5.3.7 Birds

Operations and maintenance at the NAVSTA Mayport waterfront, such as the Wharf C-1 Recapitalization project and biennial dredging in the turning basin have not likely resulted in significant impacts to piping plovers, wood storks, or red knots due to a lack of nesting and foraging habitat in the vicinity. Some impacts to non-listed diving birds may include displacement, temporary changes to pretty availability (forage fish and invertebrates), and temporary degradation of water quality. Over time, work at the NAVSTA Mayport waterfront has resulted in increased human presence, underwater and airborne noise, boat movement, and other activities, which has likely impacted some water-dependent wildlife such as some species of diving birds in the area. Marine birds typically avoid areas with continuous activity or that produce periodic impacts such as loud noises. Often, birds will return to these areas when human presence is lower or there is less activity. Increased anthropogenic noise in the underwater and in-air environment has the potential to cause behavioral reactions in birds including avoidance of certain areas. However, the abundance and coexistence of these species with existing anthropogenic activities suggests that cumulative effects have not been significant. Trend data for piping plovers and wood storks indicate that the species' population are stable or trending upward (USFWS 2007d, 2009b). Because birds are highly mobile, the noise impacts of the proposed action could be cumulative with underwater and airborne noise impacts from other actions and activities in and around Mayport. However, because the expected impacts of the proposed action on birds in general would be temporary, cumulative impacts associated with pile driving noise are considered unlikely. Continued regulation of impacts to birds under the MBTA and ESA (in the case of piping plovers, wood storks, and red knots [candidate]) to anthropogenic disturbance, combined with population monitoring, documentation of mortality causes, and research into acoustic effects, ensure that cumulative effects would be minimized. However, no long term, permanent impacts to populations of birds of any species are expected, either as a result of each project or cumulatively when combined with other past, present, and reasonably foreseeable actions. Therefore, no cumulative adverse effects to birds are expected.

Future Navy and non-Navy projects may have similar impacts to past and present actions including increased anthropogenic sound (both airborne and underwater), increased human presence, increased vessel traffic and other associated activities. These actions could result in behavioral impacts to local populations of birds such as temporary avoidance of habitat and decreased foraging effort. Most impacts would likely be temporary and short term in nature, and unlikely to affect the overall fitness of the animals. However, some projects such as the homeporting of the aircraft carrier and/or Coast Guard national security cutter and other ships at NAVSTA Mayport may result in more significant impacts due to longer construction timelines. Impacts to birds are still expected to primarily result from behavioral disturbance from underwater (in the case of diving birds) and airborne sound pressure levels. However, indirect impacts to birds may occur as a result of disruption of their prey base during construction and operation of the new ships' support facilities. Potential impacts to the forage fish and invertebrate prey base could include habitat disturbance or elimination, and overwater shading from new structures. Overwater shading would be permanent, but due to the existing degraded ecological condition of the project area, further reduction in quality of habitat not expected to result in as dramatic an effect compared to similar consequences in high quality habitat. Overall reductions in habitat are expected to be minimal in comparison to the total habitat in the areas surrounding NAVSTA Mayport. Further, birds in the area can be expected to have habituated to higher anthropogenic noise and activity levels.

With BMPs and minimization measures (Chapter 4), cumulative impacts will not significantly affect bird in the Wharf C-2 project area. Nevertheless, the proposed action and other future actions would contribute incrementally to cumulative bird disturbance impacts at the NAVSTA

Mayport waterfront. Continued adherence to the requirements of the ESA and MBTA by NAVSTA Mayport would limit disturbance to birds. Further, existing regulatory mechanisms and mitigation measures would protect birds and further decrease the likelihood of potential cumulative impacts to these species.

5.3.8 Environmental Health and Safety

The geographic study area for evaluating cumulative impacts to environmental health and safety is defined as the NAVSTA Mayport turning basin and the immediate surrounding area, including portions of the St. Johns River. Environmental health and safety has the potential to be affected by activities along the St. Johns River, such as the construction of piers, docks, marinas, and other in-water and shoreline construction. These actions produce ambient and underwater noise, have the potential to stir up contaminants in the sediments, and have the potential to contaminate the water with toxins and chemicals from fuel spills and other accidental discharges.

Future Navy and non-Navy actions have the potential to affect the environmental health and safety of St. Johns River residents. Sediment contaminants, toxins and other pollutants, noise and other impacts result from in-water and shoreline construction. Although Navy actions occur in restricted areas where the public access is restricted, non-Navy actions can occur in public areas where more precautionary measures must be taken (due to increased risk to the public).

The proposed action would occur within the restricted area of the NAVSTA Mayport turning basin. As a result, there would not be any impacts to public safety or access because the public is restricted from the area. For the safety of Navy and contractor personnel, the Navy Safety and Occupational Health Program will be implemented.

Off-base residences are located approximately two miles west of the NAVSTA Mayport turning basin. As a result, noise associated with pile driving would attenuate to allowable levels per the City of Jacksonville noise ordinance. The lack of adverse cumulative impacts of ambient noise is discussed in Section 5.3.3.1. Boat traffic along the St. Johns River could increase as a result of Jacksonville Port Authority Dames Point Marine Terminal Intermodal Container Transfer Facility. However, the noise impact to the NAVSTA Mayport turning basin would be expected to remain similar to existing conditions since the area is restricted from access from the public. Therefore, implementation of the proposed action in conjunction with other past, present, and future actions would not result in significant cumulative impacts to environmental health and safety.

5.3.9 Socioeconomics

The impacts associated with the proposed action would be associated with a small increase in contractor activity at NAVSTA Mayport. The proposed action would have a temporary and localized impact to employment, income, and the demand for public services. The population of Duval County would not be significantly impacted as a result of the proposed action. In addition to the proposed action, other future projects are proposed for the St. Johns River and the NAVSTA Mayport turning basin. These projects are transient and temporary in nature and would not contribute to a significant cumulative impact. The proposed action would not contribute to cumulative impacts when considered with other past, present, and future actions. This is because the small increase in staff and dependents would only have a localized impact to employment, income, and demand for public services.

The proposed action would have no impact to minority or low income populations, because there are no low income or minority populations located within the range of impacts from the project. There would be no disproportionately high and adverse environmental, human health and socioeconomic affects upon minority and low income populations, or children. Therefore, there would be no cumulative impact to environmental justice populations or the protection of children as a result the proposed action in combination with other past, present, and future actions.

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