



Marine Mammal Monitoring Report
**EHW-1 Pile Replacement
Project, 2015**
Naval Base Kitsap-Bangor, WA

Prepared for



5 April 2016
1275603



Marine Mammal Monitoring Report
EHW-1 Pile Replacement Project, 2015
Naval Base Kitsap-Bangor, WA

Prepared for



5 April 2016
1275603

Prepared by
Hart Crowser, Inc.

Emily Duncanson
Marine Biologist

Jeffrey C. Barrett, PhD
Principal in Charge

Suggested Citation

DoN 2016. Marine Mammal Monitoring Report, EHW-1 Pile Replacement Project 2015, Naval Base Kitsap-Bangor Washington. Prepared by Hart Crowser, Inc. for Naval Facilities Engineering Northwest, Silverdale, Washington. US Department of the Navy. April 2016.

Acronyms and Abbreviations

APE	American Piledriving Equipment
BSS	Beaufort sea state
cfm	cubic feet per minute
CMP	Construction Monitoring Program
dB	decibel(s)
DoN	US Department of the Navy
EHW-1	Explosives Handling Wharf #1
EHW-2	Explosives Handling Wharf #2
ft	foot/feet
GPS	global positioning system
IHA	Incidental Harassment Authorization
km	kilometers
km ²	square kilometers
m	meter(s)
MC	monitoring coordinator
MMO	marine mammal observer
MMPA	Marine Mammal Protection Act
μPa	micropascal
NBK	Naval Base Kitsap
NMFS	National Marine Fisheries Service
PRP	Pile Replacement Project
PPE	personal protective equipment
PSB	Port Security Barrier
re	referenced to
RMS	root mean square
SSP	Strategic Systems Programs
TPP	Test Pile Program
WRA	Waterfront Restricted Area

Contents

ACRONYMS AND ABBREVIATIONS	inside cover page
1.0 INTRODUCTION	1
2.0 METHODS	1
2.1 Project Area	1
2.2 Project Staffing	3
2.3 Marine Mammal Monitoring Platforms	3
2.3.1 Marine Mammal Observer Platforms	3
2.3.2 Monitoring Coordinator Platforms	3
2.4 Construction Monitoring Summary	4
2.5 Monitoring Zones	5
2.5.1 Shutdown Zone	5
2.5.2 Buffer Zone	5
2.6 Monitoring Techniques	6
2.7 Visual Monitoring Protocol	7
2.7.1 Pre-Construction Monitoring	7
2.7.2 During Construction Monitoring	7
2.7.3 Post-Construction Monitoring	8
2.8 Piles and Pile Driving Equipment	9
2.8.1 Pile Descriptions	9
2.8.2 Pile Driving Equipment	9
2.9 Environmental Data	9
3.0 RESULTS	9
3.1 Marine Mammal Sightings	9
3.1.1 Marine Mammal Sightings during All Periods	10
3.1.2 Marine Mammal Sightings during Pile Driving	10
3.2 Observed Exposures (Takes)	11
3.3 Extrapolated Exposures (Takes)	12
3.4 Marine Mammal Mitigation Procedures: Construction Delays and Shutdowns	13
3.5 Marine Mammal Behavior	14
3.5.1 Quantitative Analysis	14
3.5.2 Qualitative Behavioral Observations	17
3.6 Environmental Conditions	18
4.0 LIST OF PREPARERS	18
5.0 REFERENCES	18

TABLES

1	Project Staff	3
2	Summary of Construction Monitoring Efforts	5
3	Summary of Observed Level B Harassment Takes (includes re-sightings)	12
4	Extrapolated Level B Harassment Takes in the Unmonitored Area of the Behavioral Harassment Zone	13
5	Summary of Observed and Extrapolated Level B Harassment Takes	13

FIGURES

1	EHW-1 pile replacement project vicinity map	2
2	EHW-1 PRP project area and observer platforms	4
3	2015 EHW-1 PRP marine mammal sightings	11
4	Harbor seal behaviors by construction monitoring period	15
5	Harbor seal behaviors by construction type	16
6	Harbor seal relative motion by construction type	17

APPENDIX A

Marine Mammal Monitoring Plan, Trident Support Facilities Explosives Handling Wharf (EHW-1)

APPENDIX B

Marine Mammal Observation Record Form and Sighting Codes

APPENDIX C

In-water Noise-producing Events

APPENDIX D

Marine Mammal Sightings

APPENDIX E

Beaufort Sea State

Marine Mammal Monitoring Report

EHW-1 Pile Replacement Project, 2015

Naval Base Kitsap-Bangor, Washington

1.0 INTRODUCTION

This report summarizes the marine mammal monitoring effort implemented for the Explosives Handling Wharf #1 Pile Replacement Project (EHW-1 PRP) which occurred from 3 through 5 August 2015. The purpose of the EHW-1 PRP was to remove and install piles to maintain the structural integrity of the wharf (DoN 2014). As part of the US Navy's sea-based strategic deterrence mission, its Strategic Systems Programs (SSP) directs research, development, manufacturing, test, evaluation, and operational support of the Trident Fleet Ballistic Missile (Trident) program. SSP currently uses the existing EHW-1 to accomplish its mission. Repairs and maintenance were needed so that the operational requirements of the Trident program could continue to be met.

The marine mammal monitoring performed for this project is derived from the Trident Support Facilities Explosives Handling Wharf (EHW-1) Marine Mammal Monitoring Plan (Monitoring Plan; Appendix A). The Monitoring Plan was developed in coordination with the National Marine Fisheries Service (NMFS) to ensure compliance with the Incidental Harassment Authorization (IHA) issued for in-water construction (NMFS 2015). The Monitoring Plan included the requirement that a marine mammal monitoring report be prepared and submitted to the Navy. This document is meant to satisfy that reporting requirement.

2.0 METHODS

2.1 Project Area

Naval Base Kitsap at Bangor, Washington (NBK-Bangor) is located on Hood Canal approximately 20 miles (32.2 kilometers [km]) west of Seattle, Washington (Figure 1). NBK-Bangor provides berthing and support services to US Navy submarines and other fleet assets. EHW-1 is located within the northern portion of NBK-Bangor's waterfront restricted area (WRA). Marine mammal monitoring was focused within this area and the waters immediately adjacent to the WRA, where sound pressure levels associated with pile installation activities could potentially be transmitted at levels that could affect marine mammals.

The wharf is a U-shaped concrete structure built in 1977 for ordinance handling operations in support of the Trident Submarine squadron home ported at NBK - Bangor (DoN 2011). EHW-1 consists of two 100-foot (30.48 meters [m]) access trestles and a main pier deck that measures approximately 700 feet (ft; 213 m) in length and is approximately 500 ft (183 m) wide. The wharf is supported by both 16-inch- and 24-inch-diameter, hollow, octagonal, pre-cast concrete piles (approximately 130 ft [40 m] in length; DoN 2011), which have been systematically replaced with steel pipe piles during previous pile replacement projects (PRPs).

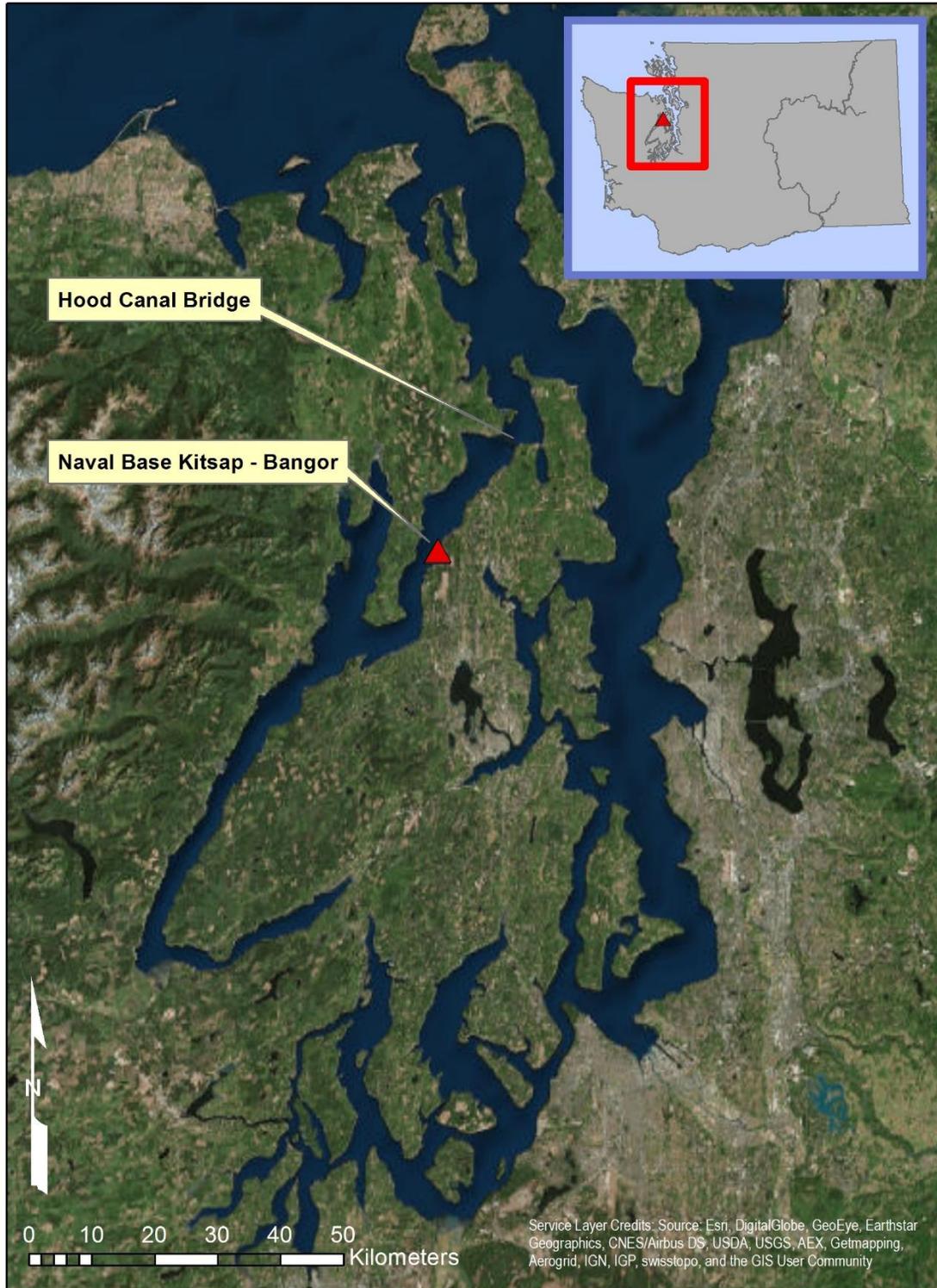


Figure 1 – EHW-1 pile replacement project vicinity map

2.2 Project Staffing

Staff for the 2015 EHW-1 PRP (Table 1) included the Monitoring Coordinator (MC), Marbled Murrelet Observer, and Marine Mammal Observers (MMOs). All MCs and MMOs were experienced in marine mammal identification, and had extensive knowledge of the biology and behavior of locally occurring marine species. Without exception, all staff had been observers for one or more of the following previous marine mammal monitoring efforts at Bangor: (1) the 2011 Test Pile Program (TPP) for NBK at Bangor; (2) the 2011/2012 EHW-1 Pile Replacement Project; and (3) the Year 1, 2, and 3 EHW-2 Construction Monitoring Program (CMP) monitoring efforts. All MMOs were dedicated to marine mammal monitoring, and served no other function while conducting observations. Marbled murrelet monitoring methods and findings are presented in a separate report (DoN 2015b).

Table 1 – Project Staff

Name	Role
Hans Hurn	Monitoring Coordinator / Project Manager
Michelle Havey	Marine Mammal Observer
Emily Duncanson	Marine Mammal Observer
Nick Galvin	Marine Mammal Observer

2.3 Marine Mammal Monitoring Platforms

The Monitoring Plan required that MMOs be positioned at the best practicable vantage points, taking into consideration security, safety, and space limitations on the waterfront. Three monitors were land (pier)-based. The MC and one MMO were dedicated to the monitor the shutdown zone, and one MMO focused observations on the behavioral disturbance (buffer) zone (Figure 2).

2.3.1 Marine Mammal Observer Platforms

MMOs used observation platforms on the EHW-1 pier. EHW-1 monitoring platforms were located approximately 33 to 525 ft (10 to 160 m) from the work area. Platform locations were chosen to provide the MMO with the best view of the project area, while maintaining a safe distance from construction activities. The exact location of the MMO platform was adjusted to provide complete coverage of the shutdown zone during pile driving.

2.3.2 Monitoring Coordinator Platforms

The MC was positioned on EHW-1 with a view of the shutdown zone, contiguous to the work area and within 33 ft (10 m) of the pile. This monitoring platform ensured direct, line-of-sight communication with the contractor, a partial view of the shutdown zone (which was fully covered by at least one other MMO), and views of the adjacent waters. The location of the MC platform was adjusted to provide the best combination of coverage of the shutdown zone, direct communication with the pile-driver operator, and safety from overhead hazards. Pile-driving events were communicated between the foreman and MC. Pile specifications, construction activity type, and other details were transmitted by the MC to the other observers, all of whom monitored the same radio channel.

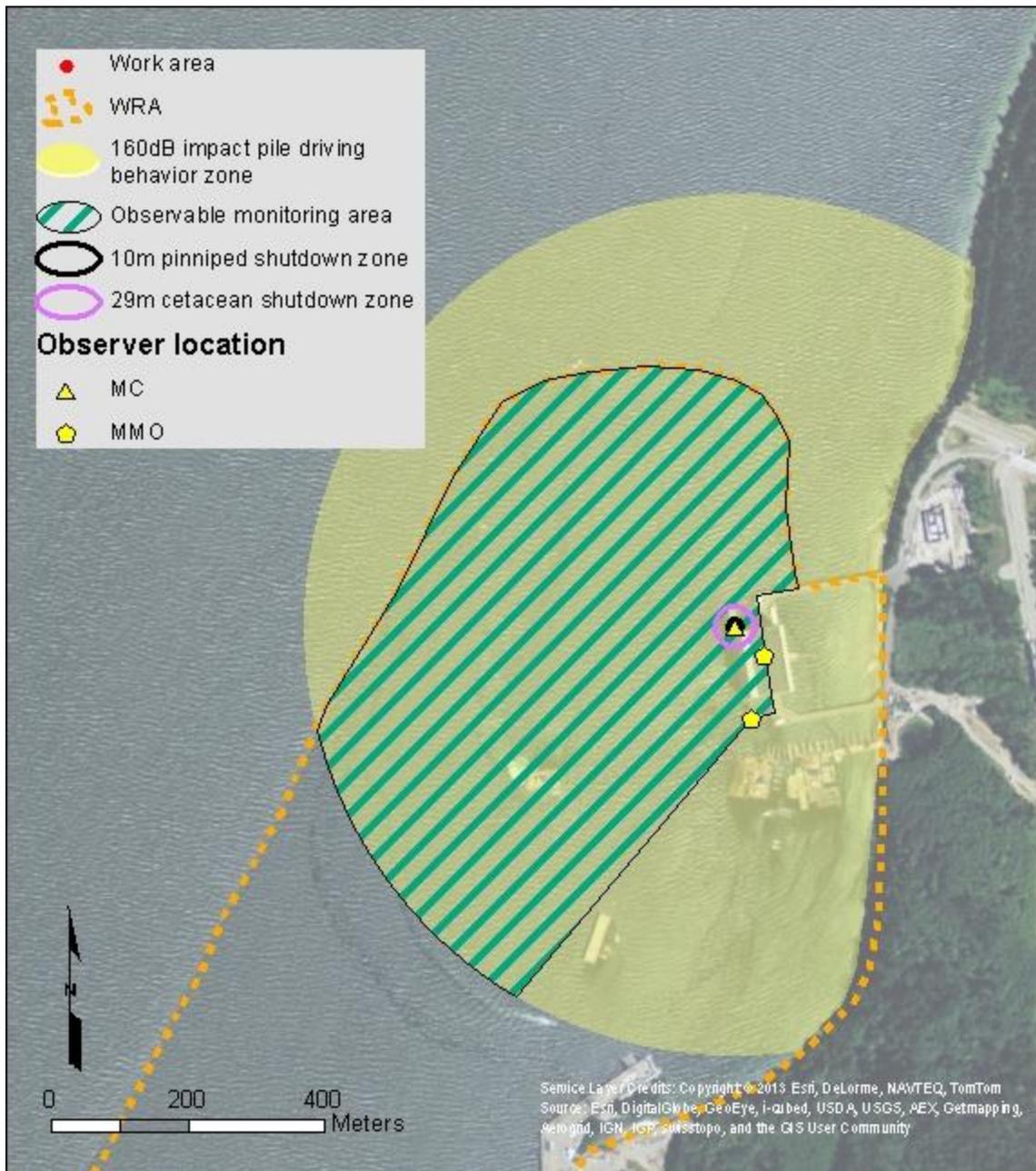


Figure 2 – EHW-1 PRP project area and observer platforms

2.4 Construction Monitoring Summary

Construction monitoring for EHW-1 was performed over the period from 3 to 5 August 2015 (Table 2). To gather baseline marine mammal sighting data, monitoring was performed throughout the workday, regardless of whether or not construction occurred during the monitoring. For all construction days, the monitoring team consisted of the MC, and two MMOs stationed on the EHW-1 Pier. As described in the monitoring plan (Appendix A), one EHW-1 MMO assisted the MC with observations in the

shutdown zone, which ensured the entire zone was monitored effectively. A third MMO was stationed at the southwest corner of the EHW-1 Pier to maximize observations in the behavioral visual monitoring zone. General positions of the monitoring locations for the project are shown in Figure 2.

Table 2 – Summary of Construction Monitoring Efforts

Date	Start Time (hh:min)	End Time (hh:min)	Total Time (hh:min)
3 August 2015	16:20	18:52	2:32
4 August 2015	07:45	10:19	2:34
5 August 2015	08:00	11:45	3:45
TOTAL			8:51

2.5 Monitoring Zones

Marine mammal monitoring was conducted before, during, and after every vibratory and impact pile-driving activity. These construction activities involved noise levels with the potential to impact marine mammals (noise-producing activities) either through direct injury, or behavioral disturbance (DoN 2014). Accordingly, a safety shutdown zone was monitored to avoid possible Level A harassment (taking by injury), and a disturbance zone (buffer zone) was monitored to avoid Level B harassment (behavioral disturbance) in order to prevent harm to marine mammals as described in the IHA. The IHA was valid during the time period in which this work was performed (see NMFS 2015).

2.5.1 Shutdown Zone

MMOs monitored a 33-ft (10 m) radius shutdown zone for pinnipeds and a 95-ft (29-m) radius shutdown zone for cetaceans from each pile before, during, and after all in-water construction activities having the potential to affect marine mammals (Figure 2). The 10-m shutdown zone encompassed the modeled distance to the 190 decibel (dB) root mean square (rms) and 180 dB rms (both referenced to [re] 1 micropascal [μ Pa]) impact-driving injury zone for pinnipeds and cetaceans, respectively. The 33-ft and 95-ft shutdown zones applied to pile driving involving vibratory and impact hammers (DoN 2015a).

2.5.2 Buffer Zone

MMOs also monitored areas within a 2,070-foot (631-meter) behavioral disturbance zone that applied to both pinnipeds and cetaceans. The 631-m behavioral disturbance zone for impact pile driving is the distance noise levels were estimated to be at or above the 160 dB (re 1 μ Pa) Level B behavioral threshold (Figure 2). A larger Level B behavioral zone, estimated to extend 6.3 km, was estimated to occur during vibratory pile driving. Because monitoring these two larger zones was not practicable, a smaller “Observable Monitoring Area” was monitored, as depicted in Figure 2, and included in the Monitoring Plan. The Observable Monitoring Area was based on visibility at the project site. Visibility was effectively limited within the Level B zones by the Port Security Barrier (PSB). In addition, the EHW-1 overwater building and wharf structure, as well as the EHW-2 construction to the south of EHW-1, effectively limited visibility of the Level B zone. Therefore, even though the behavioral zones for impact and vibratory pile driving extended beyond this area, monitoring was limited to the smaller

Observable Monitoring Area (DoN 2014) approved by the Monitoring Plan. However, monitors scanned waters outside of the Observable Monitoring Area whenever possible.

2.6 Monitoring Techniques

Pile installation activities occurred intermittently throughout each construction day. In order to best characterize marine species occurrence and behavior in the area, MMOs surveyed throughout the day, regardless of whether or not pile driving was occurring at that time. Therefore, data gathered on construction days includes observations made during both construction and non-construction periods. Construction monitoring began at least 15 minutes prior to the initiation of pile driving (pre-construction monitoring) and ended at least 30 minutes after completion of all pile driving (post-construction monitoring). Observers recorded time, number of animals, behavior, distance and bearing to the animal(s), and distance to pile for each sighting using a standardized marine mammal observation record form (Appendix B). This form was digitally reproduced, allowing MMOs to enter data directly into a database using handheld tablet computers. A sheet of sighting codes was supplied to each MMO as a reference to project-specific codes for construction type, weather, and marine mammal species and behavior (Appendix B). At the end of each day all digitized sightings underwent a rigorous quality control process before being appended to the primary database. Other standard MMO equipment included personal protective equipment (PPE), binoculars with rangefinders, a global positioning system (GPS) unit, a VHF radio, a clipboard, and a marine mammal identification guide. The required PPE for all observers while on site was a personal flotation device, hardhat, steel toe boots, and hearing and eye protection.

To minimize the probability of multiple observers counting a single animal (and thereby potentially overestimating takes), sightings were tracked on a continuous basis by an observer on one monitoring platform, and then “handed off” to an observer at a second location if the animal(s) headed in the direction of the second monitoring platform. Observers kept detailed sighting data and, whenever possible, indicated in their field notes if an animal was a re-sight. However, due to large populations of marine mammals in the WRA and animals often being observed at great distances, re-sighting numbers are conservative.

Every attempt was made to protect marine mammals from Level A (injury) harassment via the use of sound attenuation devices and continuous monitoring of the behavioral harassment and near-field injury zones. Monitoring coverage of the entire Level A shutdown zone was consistently excellent. The efficacy of visual detection of marine mammals depended on several factors, including the observer’s ability to detect the animal, the environmental conditions (visibility and sea state), and the position of the monitoring platforms. Pile driving was not initiated until the shutdown zone was clear of marine mammals. In addition, pile driving was halted when a marine mammal was sighted within or approaching the shutdown zone during pile-driving activities.

2.7 Visual Monitoring Protocol

MMOs collected sighting data and behaviors of marine mammal species observed in the pre-driving, during construction, and post-driving periods. The following survey methodology was implemented for all monitoring activities.

- Observers surveyed the shutdown and buffer zones. Monitoring of the shutdown zone took place from 15 minutes prior to initiation through 30 minutes post-completion of pile driving to ensure there were no marine mammals present.
- Marine mammal observation record forms (Appendix B) were used to document observations.
- Observers were trained and experienced marine mammal observers in order to accurately verify species sighted.
- Observers used binoculars and the naked eye to search continuously for marine mammals.

2.7.1 Pre-Construction Monitoring

Prior to the start of pile operations, the shutdown and buffer zones were monitored for at least 15 minutes to document the presence of marine mammals. The following monitoring methodology was implemented prior to commencing pile installation activities.

- MMOs monitored the shutdown zone and buffer zones. They ensured that no marine mammals were seen within the shutdown zone before pile driving began.
- If marine mammals were present within or approaching the shutdown zone prior to pile driving, monitoring continued and the start of pile driving was delayed until the animals left the shutdown zone voluntarily and had been visually confirmed beyond the shutdown zone, or if 15 minutes had elapsed without re-detection of the animal.
- If marine mammals were not within the shutdown zone (i.e., if the zone was deemed clear of marine mammals), the observers radioed the MC who then notified the pile-driving foreman that pile driving could commence.
- If marine mammals were detected within the buffer zone, pile driving or other in-water construction activities (activities not involving a pile driver, but having the potential to affect marine mammals; e.g., “stabbing” the pile) were not delayed, but observers monitored and documented the behavior of marine mammals that remained in the buffer zone.
- Marine mammal observation record forms were used to document observations (Appendix B).

2.7.2 During Construction Monitoring

The shutdown and buffer zones were monitored throughout the time required to install or remove a pile and during other in-water construction activities. The following monitoring methodology was implemented during pile operations:

- If a marine mammal was observed entering the buffer zone, an “exposure” was recorded and behaviors documented. However, that pile segment would be completed without cessation unless the animal entered or approached the shutdown zone, at which point all pile installation activities associated with that rig were halted. The observers immediately radioed to alert the MC, who alerted the pile-driving foreman. This action required an immediate “all-stop” to pile operations.
- Under certain construction circumstances where initiating the shutdown and clearance procedures would result in an imminent concern for human safety, the Monitoring Plan provided that the shutdown provision would be waived. The shutdown provision was not waived during the 2015 EHW-1 PRP.
- Pile installation activities were delayed until the animal voluntarily left the shutdown zone and had been visually confirmed beyond the shutdown zone, or 15 minutes had passed without re-detection of the animal.
- During the pile driving delay, monitoring continued to be conducted and pile driving did not resume until the shutdown zone had been deemed clear of all marine mammals.
- Once marine mammals were no longer detected within the shutdown zone, or 15 minutes had elapsed without the re-sighting of the animal in the shutdown zone, the observers radioed the MC that activities could re-commence.
- If marine mammals were detected outside the shutdown zone, the observers continued to monitor these individuals and recorded their behavior, but pile driving proceeded. Any marine mammals detected outside the shutdown zone after pile driving was initiated continued to be monitored and their behaviors were recorded.
- Marine mammal observation record forms were used to document observations (Appendix B).
- Experienced marine mammal observers were trained to accurately verify species sighted.
- Observers used binoculars and the naked eye to search continuously for marine mammals.
- In case of fog or reduced visibility, the observers had to be able to see the shutdown and buffer zones; otherwise, pile driving was halted or not initiated until visibility in these zones improved to acceptable levels.
- During impact pile driving, marbled murrelet monitoring protocols were run concurrently with the above described monitoring efforts.

2.7.3 Post-Construction Monitoring

Monitoring of the shutdown and buffer zones continued for 30 minutes following completion of pile installation activities. The post-monitoring period was not required for other in-water construction. These monitoring efforts focused on observing and reporting unusual or abnormal behavior of marine mammals. During these efforts, if any injured, sick, or dead marine mammals had been observed, the

Navy was to notify NMFS immediately. No injured, sick, or dead marine mammals were observed during the 2015 EHW-1 PRP. Monitoring results were noted on a digitized version of the marine mammal observation record form (Appendix B).

2.8 Piles and Pile Driving Equipment

2.8.1 Pile Descriptions

During the 2015 EHW-1 PRP, four steel pipe piles were driven by vibratory and impact hammers. Each pile was driven by a vibratory hammer and subsequently proofed by an impact hammer. All piles were driven into the substrate at an angle (batter piles) and were 30 inches in diameter.

2.8.2 Pile Driving Equipment

Pile driving equipment was provided and operated by Manson Construction's pile-driving crews. Vibratory (American Piledriving Equipment [APE] 200-6) and impact hammers (APE D50-52) were used during the project.

The APE 200-6 has a drive force of 271 tons. The impact hammer APE D50-52 is rated for 124,031 foot-pounds. All piles were driven with an impact hammer and therefore required formal monitoring for marbled murrelets. Marbled murrelet monitoring methods and findings are presented in a separate report (DoN 2015b).

A sound attenuation bubble curtain was utilized during all impact driving events. The bubble curtain was a multi-ring system, with the bottom ring seated on the seafloor. A Sullivan Palatek D210PHDZ compressor, rated at 210 cubic feet per minute (CFM), was used to provide pressurized air to the bubble curtain rings.

2.9 Environmental Data

Environmental parameters were obtained either by direct measurement within the WRA or from coastal weather stations. Wind speed and air temperature data were collected from permanent weather stations. Environmental parameters were obtained from a coastal weather station in Lofall, Washington, 5.25 miles to the northeast of the work site. Visual observations of wave height, wind direction, and weather conditions continued to be based on observations within the WRA, and were included in the sightings data.

3.0 RESULTS

The MC logged pile driving times and related construction activities for each pile, which served as the basis for marine mammal sightings data quality control (Appendix C).

3.1 Marine Mammal Sightings

Harbor seals (*Phoca vitulina*) were the only marine mammal species observed during the 2015 EHW-1 PRP. Harbor seals are regulated by NMFS and are protected under the Marine Mammal Protection Act.

3.1.1 Marine Mammal Sightings during All Periods

Marine mammal sightings include sightings made during pile-driving activities and during down time (non-construction periods). Observers surveyed for marine mammals during the entire construction day. All marine mammal sightings are presented in Figure 3.

A total of 47 sightings of 57 individual animals were observed during marine mammal surveys of the 2015 EHW-1 PRP (Appendix D). A sighting could include more than one animal, which is why the total number of sightings is less than the total number of animals. Harbor seals were most commonly observed alone, but were also observed as an apparent mother-pup pair. Most harbor seal sightings occurred while the seals were in the water, but on occasion, harbor seals hauled out on the Navy's oil boom at EHW-1.

3.1.2 Marine Mammal Sightings during Pile Driving

Pile installation activities included installation by vibratory and impact hammers (including soft start). Soft starts were intended to provide an opportunity for nearby marine animals to voluntarily leave the area, and thus avoid potential harassment or injury. Vibratory driving times ranged from 6 seconds to 11 minutes, with a total time of 40 minutes, 51 seconds for all piles combined. Impact drives lasted between 1 second (single-strike) and 4 minutes (208 strikes), with a total time for all piles of 15 minutes, 44 seconds (712 strikes).

A total of seven sightings of eight marine mammals were observed when pile driving was occurring. Of these, three harbor seal sightings (three animals) occurred during impact pile driving, and four harbor seal sightings (five animals) occurred during vibratory pile driving.

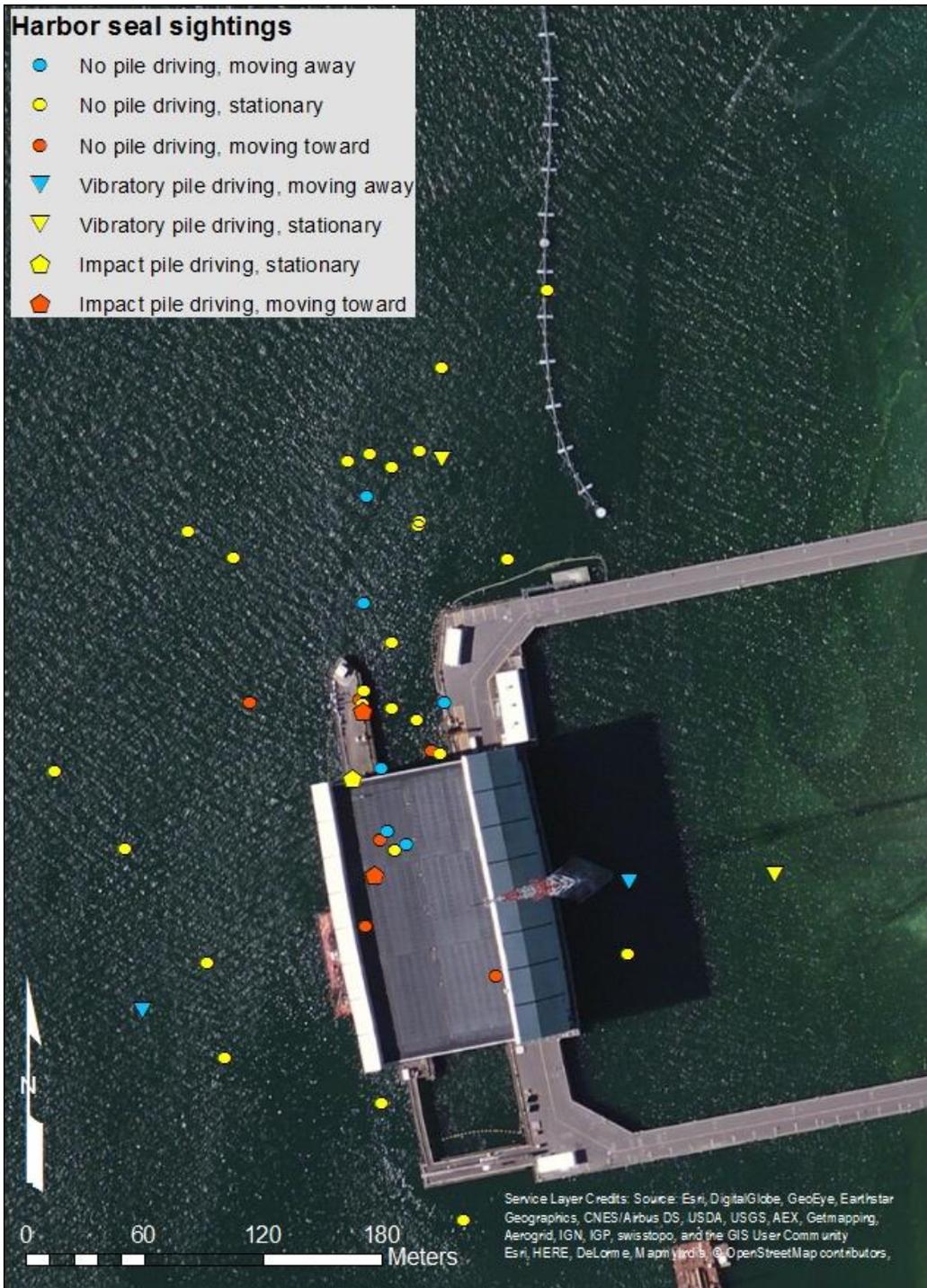


Figure 3 – 2015 EHW-1 PRP marine mammal sightings

3.2 Observed Exposures (Takes)

Injury and behavioral harassment takes were calculated based on marine mammals sighted during impact and vibratory pile driving for the 2015 EHW-1 PRP. Takes were calculated by: (1) measuring sighting distance to the pile for all animals observed during construction activities, and (2) comparing

this distance to underwater and airborne injury and behavioral harassment thresholds on a per-species and per-pile basis. Distance to pile was estimated (typically verified using laser rangefinders) and recorded by observers on field data sheets. Takes are reported as the number of individuals observed and as the number of sightings within a given zone.

There was one sighting of a harbor seal within the impact pile-driving shutdown zone during the 2015 EHW-1 PRP. Although the seal was within the 10-m shutdown zone, pile driving was immediately stopped before the seal entered the 6 meter zone that sound modeling had identified as the injury or Level A take zone (that is, the shutdown zone was bigger than the actual injury zone). This sighting is discussed in the Marine Mammal Mitigation Procedures section below.

Level B harassment takes for marine mammals during the 2015 EHW-1 PRP are summarized in Table 3. All animal sightings, including re-sightings of previously identified animals, are included here to provide the most conservative estimate of takes. Harbor seals were the only marine mammal observed during construction monitoring or at any other time during the 2015 EHW-1 PRP. Consequently, no observed takes were recorded for any other marine mammal species. No exceedances of any of the IHA-authorized Level B harassment take numbers occurred during the 2015 EHW-1 PRP (NMFS 2015). Takes were also calculated on a per-pile basis (all observed Level B harassment takes per number of production piles driven) and summarized in Table 3.

Table 3 – Summary of Observed Level B Harassment Takes (includes re-sightings)

Species	Takes During Vibratory Driving	Takes During Impact Driving	Total Takes	Takes Per Day	Takes Per Pile	Allowed Takes
Harbor Seal	5	3	8	2.67	2	2,640

3.3 Extrapolated Exposures (Takes)

The calculated behavioral harassment zone during vibratory pile driving was defined as the marine area within the average distance to the 120 dB isopleth during the 2015 EHW-1 PRP. This is a large area, with a total covered area of 32.4 square kilometers (km²; DoN 2015a). Only a subset of this area was consistently monitored (0.71 km²) as outlined above and in the Monitoring Plan. It is therefore appropriate to estimate the number of potential Level B marine mammal takes that may have occurred in the ensonified, but unmonitored, zone.

Marine mammal density numbers taken from the 2015 EHW-1 IHA Application and, for species not included in the EHW-1 Application, the 2014 EHW-2 IHA Application, were used to develop this extrapolation. Specifically, extrapolated takes were calculated by multiplying the density of marine mammals in Hood Canal near the WRA (i.e., total animal sightings per km² per day) by the total unmonitored area inside the 120 dB isopleth (31.7 km²). This product was then multiplied by the total days of vibratory pile driving during the 2015 EHW-1 PRP to arrive at the extrapolated number of takes in the unmonitored zone (Table 4).

Table 4 – Extrapolated Level B Harassment Takes in the Unmonitored Area of the Behavioral Harassment Zone

Species	Density Estimate* (IHA)	Unmonitored Level B Harassment Zone (Area, km ²)	Estimated Abundance In the Unmonitored Area	Total Vibratory Pile Driving Days	Extrapolated Takes
California Sea Lion	0.63	31.7	20.0	2	40
Harbor Porpoise	0.149		4.7		10
Harbor Seal	7.93		251.4		503
Steller Sea Lion	0.028		0.9		2
Killer Whale	0.04		1.3		3

*Density=observed animals/km²/day

Extrapolated take levels were summed with observed takes to derive an estimate of the total number of behavioral harassment takes during the 2015 EHW-1 PRP (Table 5). The total takes ranged from an estimate of 2 for Steller sea lion to 511 for harbor seal. For all species, the estimate of total takes was less than the IHA authorized levels for the 2015 EHW-1 PRP.

Table 5 – Summary of Observed and Extrapolated Level B Harassment Takes

Species	Observed Takes, Vibratory Driving	Extrapolated Takes, Vibratory Driving	Observed Takes, Impact Driving	Total Takes	Authorized Takes
California Sea Lion	-	40	-	40	568
Harbor Porpoise	-	10	-	10	48
Harbor Seal	5	503	3	511	2,640
Steller Sea Lion	-	2	-	2	48
Killer Whale	-	3	-	3	12

3.4 Marine Mammal Mitigation Procedures: Construction Delays and Shutdowns

If a marine mammal was observed in or approaching the shutdown zone, ongoing construction was to be stopped, and imminent construction was to be delayed. During the 2015 EHW-1 PRP, there was one construction shutdown due to a harbor seal observed at the surface within the shutdown zone during impact pile driving. However, due to the 6-m modeled Level A take zone, the harbor seal was not close enough to the pile to result in a Level A take. The harbor seal was subsequently observed outside of the shutdown zone and did not exhibit behaviors consistent with injury or distress. There

were no other construction delays during the 2015 EHW-1 PRP. No sightings occurred within the 6-m Level A take zone during pile driving.

3.5 Marine Mammal Behavior

3.5.1 Quantitative Analysis

Observers typically searched for marine mammals continuously and data were recorded from the beginning of pre-watch until the end of the monitoring effort for the day (see Table 2 for a summary of the monitoring effort). Behavior was recorded during both construction and non-construction periods (Appendix D). Behavioral analyses for harbor seals are presented below, and behavior codes are found in Appendix B. No other marine mammals were observed during the 2015 EHW-1 PRP. The number of observed animals and the number of observed behaviors are not necessarily the same due to: (1) instances where multiple animals were observed exhibiting the same behavior, and (2) situations where individual animals performed multiple behaviors during a single observation.

During pre-construction monitoring, harbor seals were most frequently observed “diving” and “swimming” (both 33%, n=2) (Figure 4). During construction, harbor seals demonstrated a greater number of behaviors including “diving” (24%, n=23), “swimming” (17%, n=16), “milling” (17%, n=16), and “resting” (16%, n=15). During post-construction monitoring, harbor seals were most commonly observed “diving,” “looking,” and “sinking” (each 21%, n=3). These behavior trends are similar to those observed during the EHW-2 CMP (DoN 2013, 2014, and 2015).

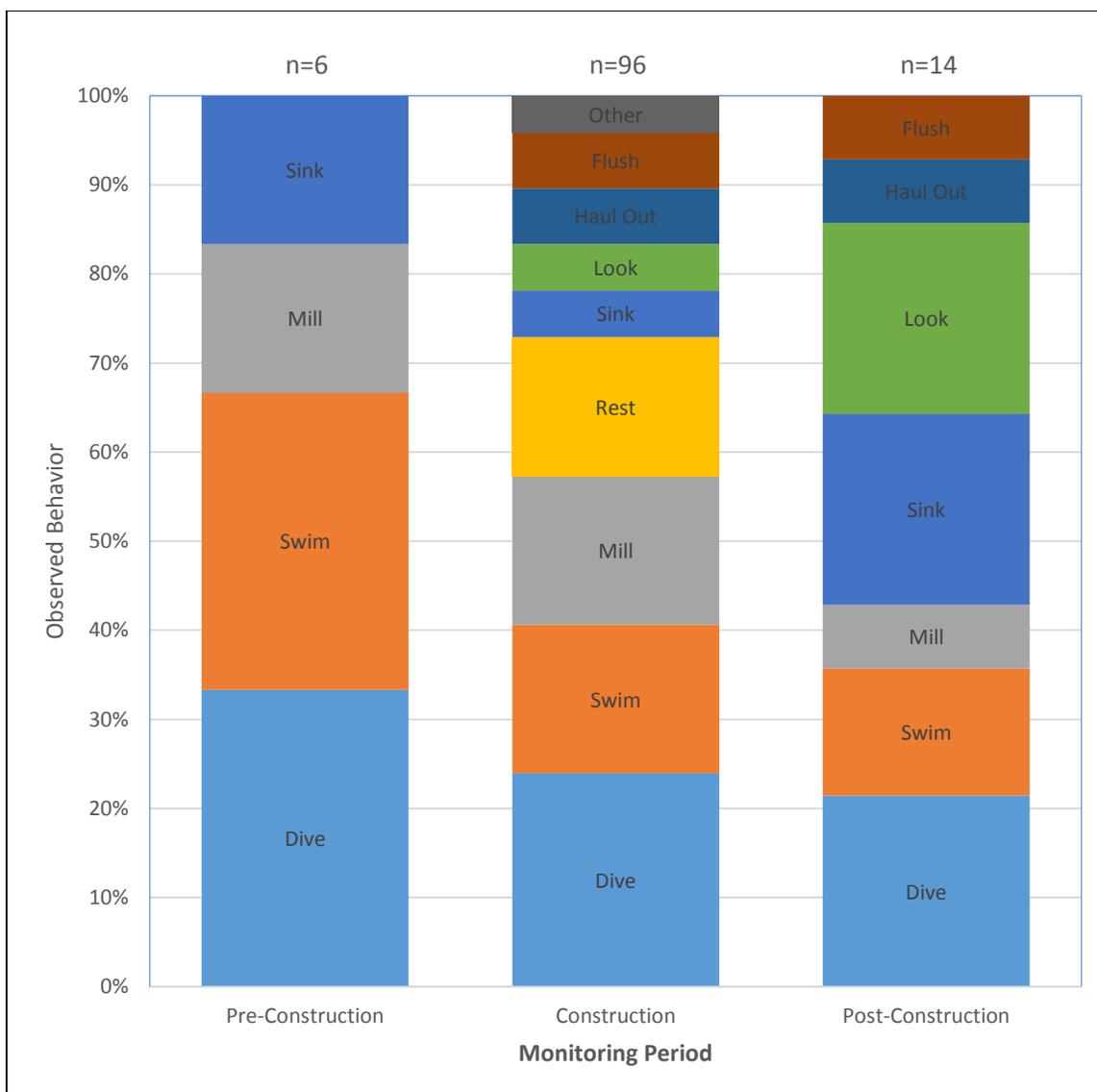


Figure 4 – Harbor seal behaviors by construction monitoring period

When analyzed by construction event type, harbor seals were frequently observed “diving” (21%, n=20), “swimming” (19%, n=18), “resting” (14%, n=14), and “milling” (n=13, 13%) during construction periods when pile driving was not occurring (labeled “None” in Figure 5). During vibratory pile driving, harbor seals were most frequently observed “diving” (45%, n=5) and “milling” (36%, n=4). During impact pile driving, harbor seals were most frequently observed “diving” (38%, n=3) and “swimming” (25%, n=2). These behavior trends are also similar to those observed during the EHW-2 CMP (DoN 2013, 2014, and 2015).

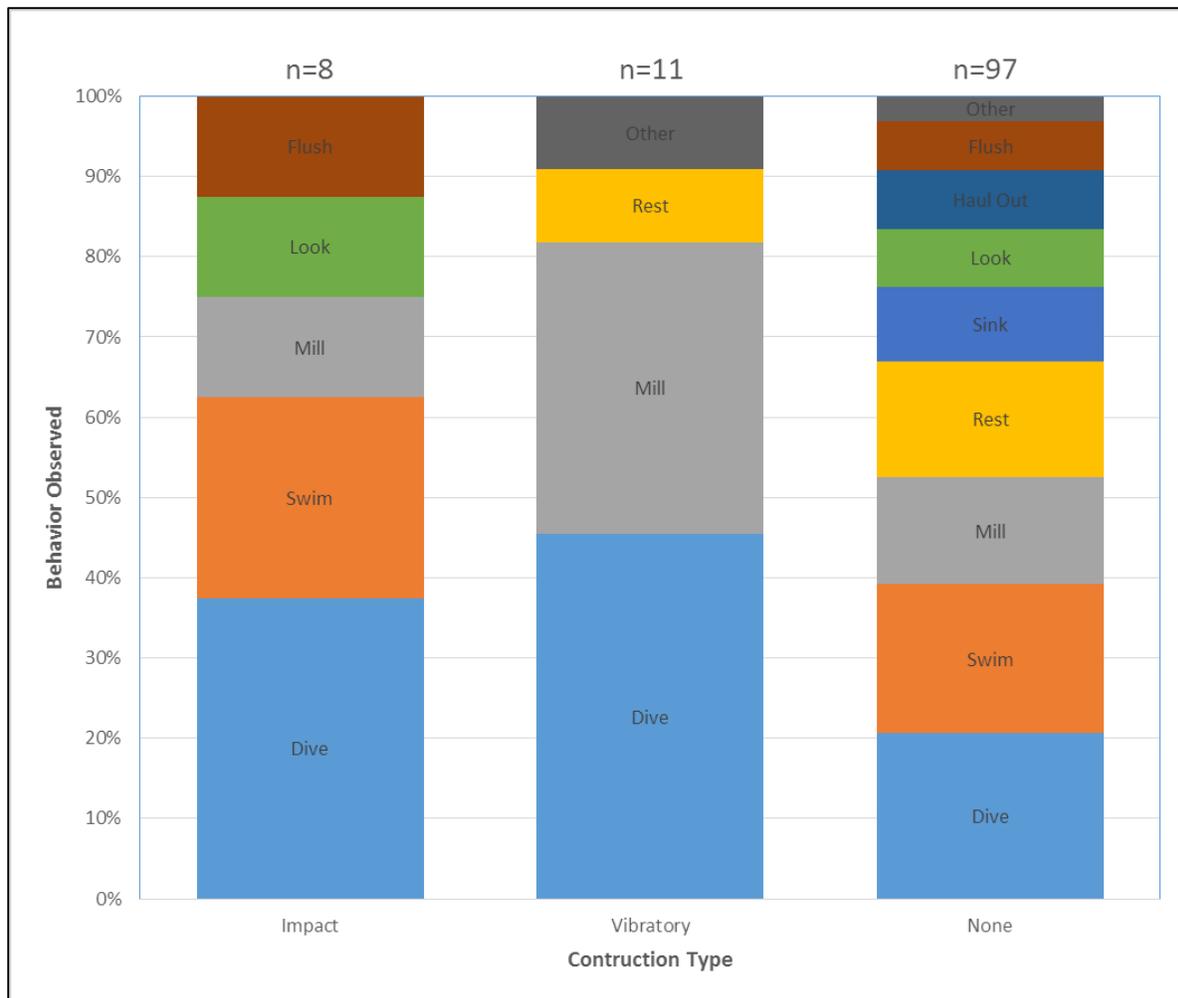


Figure 5 – Harbor seal behaviors by construction type

Because animals moving away from the construction area could indicate avoidance behaviors, the relative motion of observed animals was analyzed. During periods of no pile driving, marine mammals were most frequently observed having no relative motion to the construction area (69%, n=102; Figure 6). During vibratory pile driving, marine mammals were most frequently observed having no relative motion (60%, n=9), and were not observed moving toward the pile. A decrease in the number of animals moving toward the pile during vibratory pile driving was also observed during the EHW-2 CMP (DoN 2013, 2014, and 2015). During impact driving events, animals were observed moving toward the pile (66%, n=6) or with no relative motion (33%, n=3).

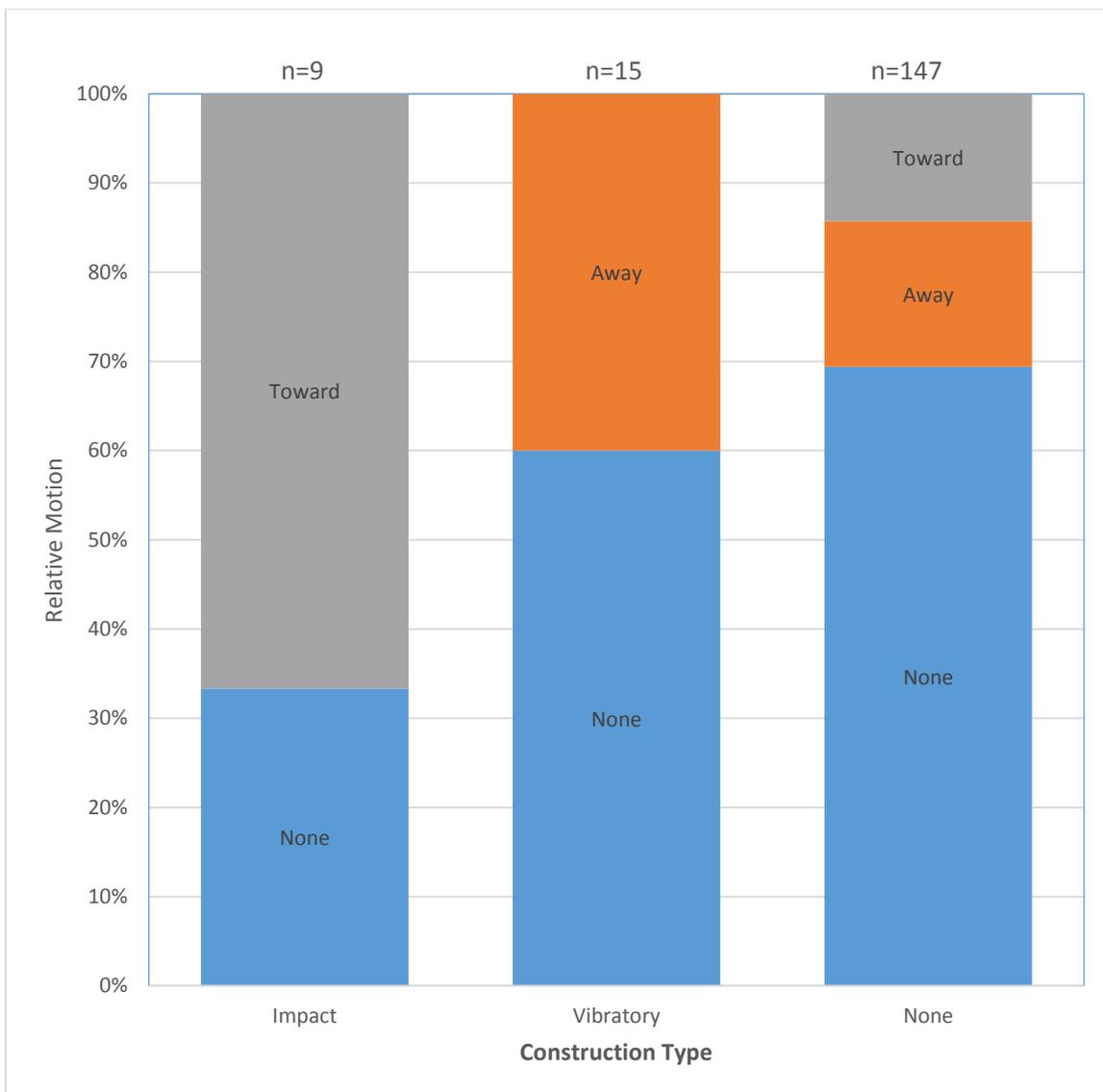


Figure 6 – Harbor seal relative motion by construction type

3.5.2 Qualitative Behavioral Observations

Understanding that subjective observations can be a useful adjunct to quantitative measurements, the MMOs were asked whether they had observed any behaviors consistent with injury, distress, or high-speed flight from the construction area. They did not report any such observations for harbor seals. In addition, the marine mammal observers watched individual seals just as impact or vibratory driving commenced to look for any instantaneous change in behavior potentially associated with the onset of pile-driving noise. Occasionally, individual animals would submerge with the onset of pile driving. During impact pile driving, one harbor seal seemed to be attracted to the pile. During the EHW-2 CMP, harbor seals were sometimes observed moving toward impact pile-driving operations, particularly when stunned fish were present in the vicinity of the pile (stunned fish were not observed for the EHW-1 PRP). MMOs generally felt that the behaviors of pinnipeds did not indicate adverse reaction to in-water construction activities.

3.6 Environmental Conditions

Observers noted “good” to “excellent” visibility during the 2015 EHW-1 PRP. During this period, the observed Beaufort sea state (BSS) was BSS 3 or below (winds at or below 16 knots; see Appendix E for the Beaufort scale), with wave heights at or below three feet. Favorable weather persisted throughout construction, and shutdowns due to reduced visibility were not required at any time.

4.0 LIST OF PREPARERS

Emily Duncanson	Jeffrey Barrett, PhD
Hart Crowser	Hart Crowser
Marine Biologist	Principal in Charge

5.0 REFERENCES

DoN 2011. Final Environmental Assessment. Explosives Handling Wharf 1 Pile Replacement Project Naval Base Kitsap at Bangor Silverdale WA. Submitted to National Marine Fisheries Service, Silver Spring, Maryland. US Department of the Navy.

DoN 2013. Naval Base Kitsap at Bangor Explosives Handling Wharf 2, Bangor, Washington. Draft Year 1 Marine Mammal Monitoring Report (2012–2013). Prepared by Hart Crowser, Inc. for Naval Facilities Engineering Northwest, Silverdale, Washington. US Department of Navy. April 2013.

DoN 2014. Naval Base Kitsap at Bangor Explosives Handling Wharf 2, Bangor, Washington. Final Year 2 Marine Mammal Monitoring Report (2013–2014). Prepared by Hart Crowser, Inc. for Naval Facilities Engineering Northwest, Silverdale, Washington. US Department of Navy. June 2014.

DoN 2015a. Naval Base Kitsap at Bangor Explosives Handling Wharf 2, Bangor, Washington. Draft Year 3 Marine Mammal Monitoring Report (2014–2015). Prepared by Hart Crowser, Inc. for Naval Facilities Engineering Northwest, Silverdale, Washington. US Department of Navy. March 2015.

DoN 2015b. Draft Marbled Murrelet Monitoring Report, EHW-1 Pier Replacement Project 2015, Naval Base Kitsap-Bangor, Washington. Prepared by Hart Crowser, Inc. for Naval Facilities Engineering Northwest, Silverdale, Washington. US Department of the Navy. November 2015.

NMFS 2015. Incidental Harassment Authorization to harass marine mammals incidental to a wharf maintenance project in the Hood Canal, Washington. National Marine Fisheries Service. Issued June 18, 2015.

R:\NOTEBOOKS\1275603_EHW-1 Pile Replacement Project 2015\Deliverables\Reports\Mammal Monitoring Report\20160405\EHW-1_Mammal_Report_20160405.docx

APPENDIX A
Marine Mammal Monitoring Plan, Trident Support
Facilities Explosives Handling Wharf (EHW-1)

Marine Mammal Monitoring Plan

TRIDENT SUPPORT FACILITIES
EXPLOSIVES HANDLING WHARF (EHW-1)



NAVAL BASE KITSAP at BANGOR
SILVERDALE, WA

October 2014

DEPARTMENT OF THE NAVY

This page is intentionally blank.

Table of Contents

Contents

[1.0 INTRODUCTION](#) 1

[2.0 METHODS](#) 1

[2.1. OBSERVER QUALIFICATIONS](#) 1

[2.2. DATA COLLECTION](#) 1

[2.3. EQUIPMENT](#) 2

[2.4. SHUTDOWN AND MONITORING ZONES](#) 2

[2.5. OBSERVER MONITORING LOCATIONS](#) 4

[2.6. MONITORING TECHNIQUES](#) 5

[2.6.1. Visual Survey Protocol – Pre-Activity Monitoring](#) 5

[2.6.2. Visual Survey Protocol – During Activity Monitoring](#) 5

[2.6.3. Visual Survey Protocol – Post-Activity Monitoring](#) 6

[3.0 INTERAGENCY NOTIFICATION](#) 6

[4.0 MONITORING REPORTS](#) 7

LIST OF APPENDICES

- A Marine Mammal Observation Record Form
- B Beaufort Wind Scale
- C Chain of Custody Form

This page is intentionally blank.

1.0 INTRODUCTION

The United States Navy (Navy) will complete necessary repairs and maintenance of the Explosive Handling Wharf #1 (EHW-1) facility at Naval Base Kitsap at Bangor. The purpose of this plan is to provide a protocol for marine mammal monitoring that will occur during in-water construction scheduled to begin July 16, 2015. Visual marine mammal monitoring will be conducted before, during, and after pile driving activities where noise levels may behaviorally disturb marine mammals. Noise levels from pile driving were determined to exceed the behavioral and injury thresholds for marine mammals. However, a zone will be visually monitored and pile driving will be shut-down if marine mammals are in the injury zone. This measure will preclude physical harm to marine mammals. This monitoring plan was developed to ensure compliance with the incidental harassment authorization issued for in-water construction from July 16, 2015 through January 15, 2013.

2.0 METHODS

2.1. OBSERVER QUALIFICATIONS

Monitoring will be conducted by qualified, trained marine mammal observers (hereafter, “observer”). An observer is a biologist with prior training and experience in conducting marine mammal monitoring or surveys, and who has the ability to identify marine mammal species and describe relevant behaviors that may occur in proximity to in-water construction activities. A trained observer will be placed at the best vantage point(s) practicable (e.g., from a small boat, the pile driving barge, on shore, or any other suitable location) to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the hammer operator. The observers will have no other construction related tasks while conducting monitoring.

A dedicated monitoring coordinator will be on-site during all construction days. The monitoring coordinator will oversee marine mammal observers. The monitoring coordinator will serve as the liaison between the marine mammal monitoring staff and the construction contractor to assist in the distribution of information.

2.2. DATA COLLECTION

Observers will use the most current NMFS-approved Marine Mammal Sighting Form supplied by the Navy (see Appendix A for example) which will be completed by each observer for each survey day.

- Date and time that pile driving begins or ends;
- Construction activities occurring during each sighting;
- Weather parameters (e.g., percent cover, percent glare, visibility);
- Water conditions (e.g., Tidal state [incoming (flood), slack (neither direction), or outgoing (ebb)], and sea state). The Beaufort Sea State Scale (Appendix B) will be used to determine sea-state.
- Species, numbers, and if possible, sex and age class of marine mammals;
- Marine mammal behavior patterns observed, including bearing from observer and direction of travel. If possible, include the correlation to sound pressure levels for context;
- Distance from pile driving activities to marine mammals and distance from the marine mammal to the observation point;

TRIDENT Support Facilities Explosives Handling Wharf #1

- Locations of all marine mammal observations;
- Other human activity in the area. Record the hull numbers of fishing vessels if possible.

The monitoring coordinator will complete a Marine Mammal Monitoring Summary Form (Appendix A) for each day of monitoring. The summary form compiles information collected on the individual sighting forms and provides additional details about construction activities during marine mammal monitoring. The summary form will be provided to the Navy each day following monitoring.

2.3. EQUIPMENT

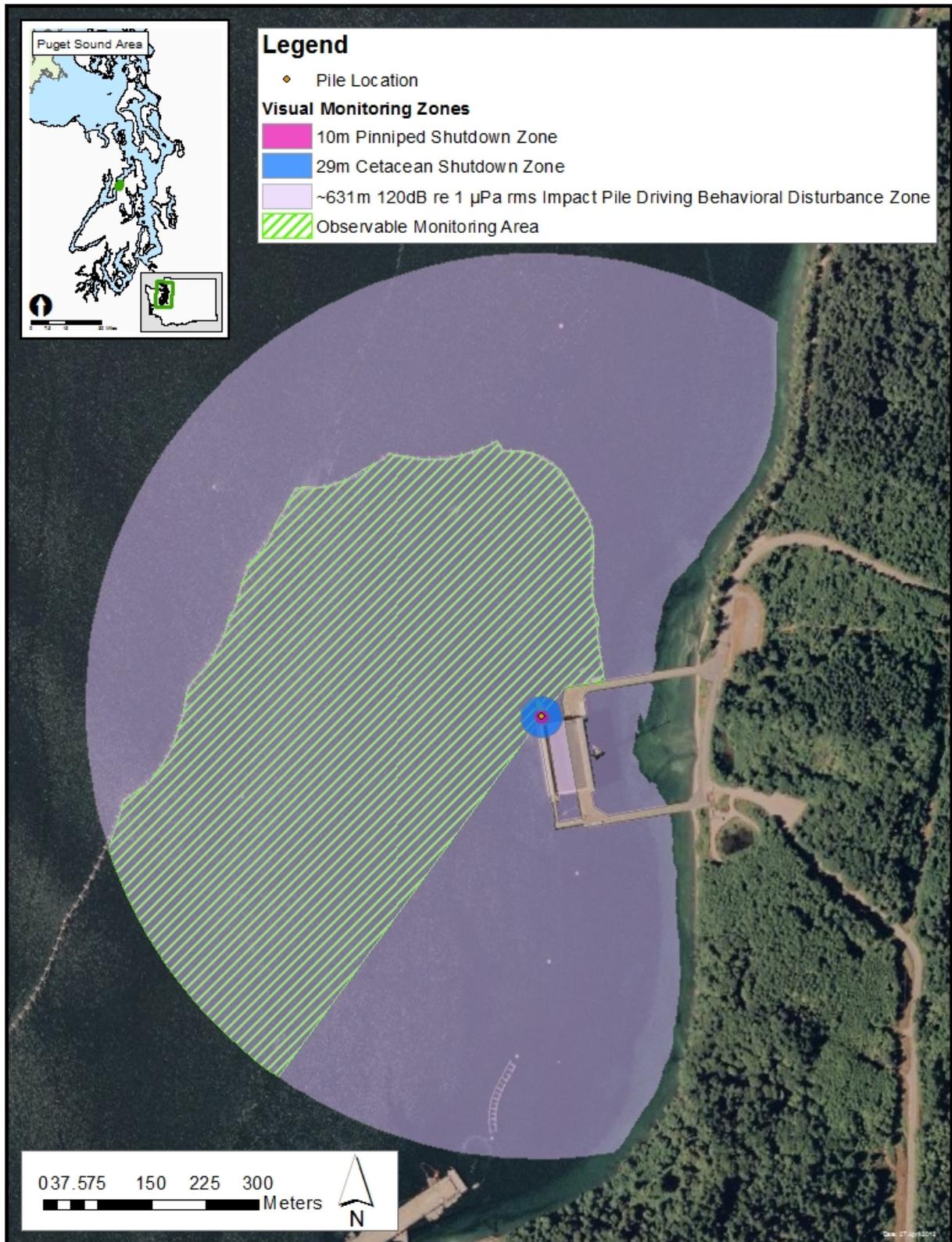
The following equipment will be required to conduct marine mammal monitoring:

- If boat based monitors are used, a survey boat (with flying bridge for elevated observations) will include: covered cabin areas to keep electrical equipment dry, a fixed marine radio for the Captain to communicate on Ch. 16 and other marine channels independent of observers communicating on a dedicated channel, depth finder, measuring tape, navigational plotting equipment, and both fixed and hand-held GPS Units. Vessels will comply with all Coast Guard regulations and be able to pass a Coast Guard safety inspection;
- Hearing protection for biologists and boat operators working near heavy construction equipment;
- Portable marine radios and headsets for the observers to communicate with the monitoring coordinator, construction contractor, and other observer(s);
- Cellular phones, without a camera (one per boat/observing location), and the contact information for the other observer(s), monitoring coordinator, and NMFS point of contact;
- Green flags (one per boat/observing location) as back-up for radio communication;
- Red flags (one per boat/observing location) as back-up for radio communication;
- Nautical charts;
- Daily tide tables for the project area within the Hood Canal;
- Watch or Chronometer;
- Binoculars with built-in rangefinder or reticles – (quality 7 x 50 or better);
- Monitoring plan, IHA permit, and/or other relevant permit requirement specifications in sealed clear plastic cover;
- Notebook with pre-standardized monitoring Marine Mammal Observation Record forms on non-bleeding paper (e.g Rite-in-the Rain);
- Marine mammal identification guides on waterproof paper
- Clipboard, pen / pencil

2.4. SHUTDOWN AND BEHAVIORAL VISUAL MONITORING ZONES

2.4.1 Behavioral Visual Monitoring Zone

The 631m behavioral zone for impact pile driving is the distance noise levels are estimated to be at or above 160 dB re 1 μ Pa Level B behavioral threshold (Figure 2-1). A larger Level B behavioral zone, estimated to extend 6.3 km during vibratory pile driving is also present. Because monitoring these two large zones is not practicable, a smaller monitoring zone depicted in Figure 2-1 will be monitored. This zone is based on visibility at the project site. Visibility is effectively limited within the Level B zones by the Port Security Barrier (PSB)



4

Figure 2-1. Visual Marine Mammal Monitoring Zone with Representative Monitoring Locations Shown.

approximately 400 meters to the north, north east and west of the project site. In addition, the EHW-1 overwater building and the wharf structure effectively limit visibility. Not shown on the Figure is the EHW-2 which is currently in construction directly south of EHW-1. This new wharf will also block monitoring efforts to the south of the green hatched area on Figure 2-1. Therefore, even though the behavioral zones for impact and vibratory pile driving will extend beyond this area, monitoring will be effectively limited to the smaller zone (Figure 2-1). However, monitors will, where possible, report any marine mammals they are able to see outside the monitoring area depicted in Figure 2-1.

2.4.2 Visual Shutdown Zone

To preclude injury to pinnipeds, a 10 meter radius Shutdown Zone from a pile will be implemented during pile driving. The 10 m Shutdown Zone is based on encompassing the distance to the 190 dB RMS re 1 μ Pa impact pile driving injury zone (calculated at 6 m for pinnipeds). To preclude injury to cetaceans, a 29 meter radius Shutdown Zone will be implemented while pile driving is conducted. This zone is within the Waterfront Restricted Area (WRA) where cetaceans have never been observed.

Modeling does not predict sound levels at or above the criteria for injury from vibratory pile driving. If the Navy determines another activity may physically harm marine mammals then a 10 meter radius Shutdown Zone from the activity will be monitored.

Visual Monitoring and Shutdown:

- During impact and vibratory pile driving, a 10 meter pinniped Shutdown Zone and, during impact driving, a 29 meter cetacean Shutdown Zone shall be established and monitored to prevent injury to marine mammal species from pile driving noise and physical interaction with construction equipment. Modeling does not predict sound levels at or above the criteria for injury from vibratory pile driving.
- During pile driving, the Visual Monitoring Zone shall include all areas within the Port Security Barrier (PSB) fence or out to approximately 631 meters where practicable (e.g. equivalent to where pile driving noise levels are estimated to be at or above 160 dB re 1 μ Pa impact pile driving behavioral threshold) (Figure 2-1).
- The Shutdown and Visual Monitoring Zones will be monitored throughout the time required to install a pile. If a marine mammal enters the Visual Monitoring Zone, an exposure would be recorded and behaviors documented. However, that pile would be completed without cessation, unless the animal approaches or enters the Shutdown Zone, at which point all pile removal activities will be halted.

2.5. OBSERVER MONITORING LOCATIONS

In order to effectively monitor the Shutdown Zone, marine mammal observers will be positioned at the best practicable vantage points, taking into consideration security, safety, and space limitations at the waterfront. A minimum of three monitors will be present. Because of the difficulty of seeing harbor seals swimming underneath the wharf and approaching the shutdown zone, two observers will monitor the 10 m Shutdown Zone. Monitors will be stationed in small vessels, on the wharf, or on the pile driving barge in a location that will provide adequate visual coverage of the Shutdown Zones. One additional observer will be stationed to maximize observations in the behavioral Visual Monitoring Zone (not including boat operators if a boat is used).

TRIDENT Support Facilities Explosives Handling Wharf #1

Security restrictions and operations inside the WRA as defined by the area inside the PSB fence line, may preclude the placement of boats/personnel at certain times and locations. If security restrictions result in movement of a monitoring location, an alternate location will be identified for monitoring by the monitoring coordinator in conjunction with the Navy. Additionally, security requires that all vessels maintain a minimum standoff distance of 25 feet from the PSB fence at all times.

2.6. MONITORING TECHNIQUES

The Navy will collect sighting data and behaviors of marine mammal species observed pre-, during, and post-driving period. The efficacy of visual detection depends on several factors including the observer's ability to detect the animal, the environmental conditions (visibility and sea state), and monitoring platforms. The following survey methodology will be implemented for all monitoring activities:

- Observers will survey the Shutdown and Visual Monitoring Zones. Monitoring of the Shutdown Zone will take place from 15 minutes prior to initiation through 30 minutes post-completion of pile driving to ensure there are no marine mammals present.
- Marine Mammal Observation Record forms (Appendix A) will be used to document observations.
- Any survey boats engaged in marine mammal monitoring will maintain speeds equal to or less than 10 knots.
- Observers will be trained and experienced marine mammal observers in order to accurately verify species sighted.
- Observers will use binoculars and the naked eye to search continuously for marine mammals.

2.6.1. Visual Survey Protocol – Pre-Activity Monitoring

The following survey methodology will be implemented prior to commencing pile driving:

- If marine mammal(s) are present within or approaching the Shutdown Zone prior to pile driving, the start of these activities will be delayed until the animal(s) leave the shutdown zone voluntarily and have been visually confirmed beyond the Shutdown Zone, or 15 minutes has elapsed without re-detection of the animal.
- If marine mammal(s) are not detected within the Shutdown Zone (i.e., the zone is deemed clear of marine mammals), the observers will raise a green flag and radio the monitoring coordinator/construction contractor that pile driving can commence.
- If marine mammal(s) are present within the Visual Monitoring Zone, pile driving would not need to be delayed, but observers would monitor and document, to the extent practical, the behavior of marine mammals that remain in the zone.
- In case of fog or reduced visibility, the observers must be able to see the Shutdown Zones or pile driving will not be initiated until visibility in these zones improves to acceptable levels.

2.6.2. Visual Survey Protocol – During Activity Monitoring

TRIDENT Support Facilities Explosives Handling Wharf #1

The Shutdown and Visual Monitoring Zones will be monitored throughout pile driving. The following survey methodology will be implemented during pile driving:

- If a marine mammal is observed within or entering the Visual Monitoring Zone during pile driving, an exposure would be recorded, behaviors documented, and the Shutdown Zone monitor alerted to the position of the animal. However, that pile segment would be completed without cessation, unless the animal approaches or enters the Shutdown Zone, at which point all pile driving activities will be halted. The observers shall immediately radio to alert the monitoring coordinator/construction contractor and raise a red flag. This action will require an immediate “all-stop” on pile operations.
- Under certain construction circumstances where initiating the shutdown and clearance procedures (which could include a delay of 15 min or more) would result in an imminent concern for human safety, the shutdown provision may be waived.
- Once a shutdown has been initiated, pile driving and other in-water construction activities will be delayed until the animal has voluntarily left the Shutdown Zone and has been visually confirmed beyond the Shutdown Zone, or 15 minutes have passed without re-detection of the animal.
- Once marine mammals are no longer detected within the Shutdown Zone (i.e., the zone is deemed clear of marine mammals), the observer will raise a green flag and radio the monitoring coordinator/construction contractor that activities can re-commence;
- If marine mammals are detected outside the Shutdown Zone, the observers will continue to monitor these individuals and record their behavior, but pile driving and other in-water construction may proceed. Any marine mammals detected outside the Shutdown Zone after pile driving is initiated shall likewise continue to be monitored and their behaviors recorded.

2.6.3. Visual Survey Protocol – Post-Activity Monitoring

Monitoring of the Shutdown Zones will continue for 30 minutes following completion of pile driving. These surveys will record marine mammal observations, and will focus on observing and reporting unusual or abnormal behavior of marine mammals. During these surveys, if any injured, sick, or dead marine mammals are observed, procedures outlined below in Section 3.0 should be followed.

3.0 INTERAGENCY NOTIFICATION

In the event that the Navy needs to modify terms of this monitoring plan, the NMFS representative will be promptly contacted for discussion of the requested modification. In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this IHA, such as an injury (Level A harassment), serious injury, or mortality, Navy shall immediately cease the specified activities and report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Northwest Regional Stranding Coordinator, NMFS. The report must include the following information:

- Time and date of the incident;
- Description of the incident;
 - Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);

TRIDENT Support Facilities Explosives Handling Wharf #1

- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s).

Activities shall not resume until NMFS is able to review the circumstances of the prohibited take. NMFS will work with Navy to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. Navy may not resume their activities until notified by NMFS.

In the event that Navy discovers an injured or dead marine mammal, and the lead observer determines that the cause of the injury or death is unknown and the death is relatively recent (e.g., in less than a moderate state of decomposition), Navy shall immediately report the incident to the Chief of the Permits and Conservation Division, Office of Protected Resources, NMFS, and the Northwest Regional Stranding Coordinator, NMFS. The report will include the same information as listed above. Activities may continue while NMFS reviews the circumstances of the incident. The Navy will work with NMFS to determine whether additional mitigation measures or modifications to the activities are appropriate.

In the event that Navy discovers an injured or dead marine mammal, and the lead observer determines that the injury or death is not associated with or related to the activities authorized in the IHA (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), the Navy shall report the incident to the Chief of Permits and Conservation Division, Office of Protected Resources, NMFS, and the Northwest Regional Stranding Coordinator, NMFS, within 24 hours of the discovery. Navy shall provide photographs or video footage or other documentation of the stranded animal sighting to NMFS.

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.

Primary points of contact for the Navy are:

1. Tyler Yasenak - (360) 315-2452
2. Greg Leicht - (360) 315-5411

Primary points of contact at NMFS are:

1. Modification to protocol - (360) 753-5835
2. Chief of the Permits and Conservation Division (301-427-8425)
3. Northwest Regional Stranding Coordinator (206-526-6550)

4.0 MONITORING REPORTS

A draft report will be submitted to NMFS within 90 work days of the completion of marine mammal monitoring. A final report will be prepared and submitted to the NMFS within 30 days following receipt of comments on the draft report from the NMFS. At a minimum, the report shall include:

- General data:

TRIDENT Support Facilities Explosives Handling Wharf #1

- Date and time of activities.
- Water conditions (e.g., sea-state, tidal state).
- Weather conditions (e.g., percent cover, visibility).

Specific pile data:

- Description of the pile driving activities including the size and type of pile,
- The installation methods used for each pile and the duration each method was used per pile
- Impact or vibratory hammer force used to drive/extract piles
- Detailed description of the sound attenuation system for impact driving, including the design specifications
- Depth of water in which the pile was driven
- Depth into the substrate that the pile was driven
- Pre-activity observational survey-specific data:
 - Dates and time survey is initiated and terminated.
 - Description of any observable marine mammal behavior in the immediate area during monitoring.
 - If possible, the correlation to underwater sound levels occurring at the time of the observable behavior.
 - Actions performed to minimize impacts to marine mammals.
- During-activity observational survey-specific data:
 - Description of any observable marine mammal behavior within monitoring zones or in the immediate area surrounding monitoring zones including the following:
 - Distance from animal to source.
 - Reason why/why not shutdown implemented.
 - If a shutdown was implemented, behavioral reactions noted and if they occurred before or after implementation of the shutdown.
 - If a shutdown is implemented, the distance from animal to source at the time of the shutdown.
 - Behavioral reactions noted during soft starts¹ and if they occurred before

¹ 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.

- A soft start procedure will be used at the beginning of each day's in-water pile driving or any time pile driving has ceased for more than 1 hour.
- For impact pile driving, the following soft-start procedures will be conducted:
 - If a bubble curtain is used for impact pile driving, the contractor will start the bubble curtain prior to the initiation of impact pile driving.
 - The contractor will 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").
- For vibratory pile driving, the contractor will initiate noise from vibratory hammers for 15 seconds at reduced

TRIDENT Support Facilities Explosives Handling Wharf #1

- or after implementation of the soft start.
 - Distance to the animal from the source during soft start.
- If possible, the correlation to underwater or airborne sound levels occurring at the time of this observable behavior.
- Actions performed to minimize impacts to marine mammals.
- Times when pile driving is stopped due to presence of marine mammals within the Shutdown Zones and time when pile driving resumes.
- Post-activity observational survey-specific data:
 - Results, which include the detections of marine mammals, species and numbers observed, sighting rates and distances, behavioral reactions within and outside of monitoring zones.
 - A refined take estimate based on the number of marine mammals observed during the course of construction. The refined take estimate will use the most current guidelines. If a contractor is used for visual monitoring, the Navy will furnish the guidelines to the contractor with this monitoring plan.

energy followed by a 30-second waiting period. The procedure shall be repeated two additional times. If additional marine mammal monitoring data indicates that there is no change in behavior of pinnipeds during vibratory pile driving or soft start procedures and the NMFS concurs, then the soft start procedure would no longer be required. Additionally, if unsafe working conditions during soft starts are reported by the contractor and verified by an independent safety inspection, the Navy may elect to discontinue vibratory soft starts. The Navy will inform NMFS HQ if the soft start procedure is discontinued.

APPENDIX A

Example MARINE MAMMAL OBSERVATION RECORD FORM

APPENDIX A
MARINE MAMMAL OBSERVATION RECORD FORM

Project Name: _____

Monitoring Location _____
(Pier Location, Vessel based, Land Location, other)

Page _____ of _____

Date: _____

Vessel Name: _____

Time Effort Initiated: _____

Time Effort Completed: _____

Sighting Data

Event Code	Sighting Number (1 or 1.1 if resight)	Time/Duration watching sighting (Start/End time if continuous)	WP # (every time a sighting is made)	Observer	Sighting cue	Species	Dist/ Dir to Animal (from Observer)	Dist to Pile (btwn animal & pile)	# of Animals Group Size (min/max/best) # of Calves	Relative Motion/and Behavior Code (see code sheet)	Const Type During Sighting	Mitigation used during sighting?	Mitigation Type?	Visibility	% Glare	Weath Cond	Sea State and Wave Ht	Swell Dir	Behavior Change/ Response to Activity/Comments
		: : : :					m or km °	m or km	/ / ___ calves	opening closing parallel none	PRE POST SSV SSI V I PC DP ST NONE	Y N	DE SD	B P M G E			Light Mod Heavy	N or S W or E	
		: : : :					m or km °	m or km	/ / ___ calves	opening closing parallel none	PRE POST SSV SSI V I PC DP ST NONE	Y N	DE SD	B P M G E			Light Mod Heavy	N or S W or E	
		: : : :					m or km °	m or km	/ / ___ calves	opening closing parallel none	PRE POST SSV SSI V I PC DP ST NONE	Y N	DE SD	B P M G E			Light Mod Heavy	N or S W or E	
		: : : :					m or km °	m or km	/ / ___ calves	opening closing parallel none	PRE POST SSV SSI V I PC DP ST NONE	Y N	DE SD	B P M G E			Light Mod Heavy	N or S W or E	
		: : : :					m or km °	m or km	/ / ___ calves	opening closing parallel none	PRE POST SSV SSI V I PC DP ST NONE	Y N	DE SD	B P M G E			Light Mod Heavy	N or S W or E	
		: : : :					m or km °	m or km	/ / ___ calves	opening closing parallel none	PRE POST SSV SSI V I PC DP ST NONE	Y N	DE SD	B P M G E			Light Mod Heavy	N or S W or E	
		: : : :					m or km °	m or km	/ / ___ calves	opening closing parallel none	PRE POST SSV SSI V I PC DP ST NONE	Y N	DE SD	B P M G E				N or S W or E	

Sighting #=chronological number of sightings, if resight of same animal, then 1.1, 1.2, etc. WP (Waypoint)=GPS recording of lat/long, time/date stamp. Critical for vessel observers.

Sighting Codes (Sighting Cue & Behavior Codes)

Behavior codes

Code	Behavior	Definition
BR	Breaching	Leaps clear of water
CD	Change Direction	Suddenly changes direction of travel
CH	Chuff	Makes loud, forceful exhalation of air at surface
DI	Dive	Forward dives below surface
DE	Dead	Shows decomposition or is confirmed as dead by investigation
DS	Disorientation	An individual displaying multiple behaviors that have no clear direction or purpose
FI	Fight	Agonistic interactions between two or more individuals
FO	Foraging	Confirmed by food seen in mouth
MI	Milling	Moving slowly at surface, changing direction often, not moving in any particular direction
PL	Play	Behavior that does not seem to be directed towards a particular goal; may involve one, two or more individuals
PO	Porpoising	Moving rapidly with body breaking surface of water
SL	Slap	Vigorously slaps surface of water with body, flippers, tail etc.
SP	Spyhopping	Rises vertically in the water to "look" above the water
SW	Swimming	General progress in a direction. Note general direction of travel when last seen [Example: "SW (N)" for swimming north]
TR	Traveling	Traveling in an obvious direction. Note direction of travel when last seen [Example: "TR (N)" for traveling north]
UN	Unknown	Behavior of animal undetermined, does not fit into another behavior
Pinniped only		
EW	Enter Water (from haul out)	Enters water from a haul-out for no obvious reason
FL	Flush (from haul out)	Enters water in response to disturbance
HO	Haul out (from water)	Hauls out on land
RE	Resting	Resting onshore or on surface of water
LO	Look	Is upright in water "looking" in several directions or at a single focus
SI	Sink	Sinks out of sight below surface without obvious effort (usually from an upright position)
VO	Vocalizing	Animal emits barks, squeals, etc.
Cetacean only		
LG	Logging	Resting on surface of water with no obvious signs of movement

Marine Mammal Species

Code	Marine Mammal Species
CASL	California Sea Lion
HSEA	Harbor Seal
STSL	Steller Sea Lion
HPOR	Harbor Porpoise
DPOR	Dall's Porpoise
ORCA	Killer Whale
HUMP	Humpback Whale
UNLW	Unknown Large Whale
RIVO	River Otter (not a mammam)
OTHR	Other
UNKW	Unknown

Event

Code	Activity Type
E ON	Effort On
E OFF	Effort Off
PRE	Pre Watch
POST	Post Watch
SSV	Soft start-vibratory
SSI	Soft start-impact
WC	Weather Condition/Change
S	Sighting
M-DE	Mitigation Delay
M-SD	Mitigation Shutdown

Construction Type

Code	Activity Type
SSV	Soft Start (Vibratory)
SSI	Soft Start (Impact)
V	Vibratory Pile Driving (installation and extraction)
I	Impact Pile Driving
PC	Pneumatic Chipping
DP	Dead pull
ST	Stabbing
NONE	No Pile Driving

Mitigation Codes

Code	Activity Type
DE	Delay onset of Pile Driving
SD	Shut down Pile Driving

Visibility

Code	Distance Visible
B	Bad (<0.5km)
P	Poor (0.5 – 1.5km)
M	Moderate (1.5 – 10km)
G	Good (10 - 15km)
E	Excellent (>15km)

Glare

Percent glare should be total glare of observers' area of responsibility. Are they covering 90 degrees or 180 degrees? Total glare for that area and write that area down on the datasheet so we know later what percentage of the field of view was poor due to glare.

Weather Conditions

Code	Weather Condition
S	Sunny
PC	Partly Cloudy
L	Light Rain
R	Steady Rain
F	Fog
OC	Overcast

Sea State and Wave Height

Use Beaufort Sea State Scale for Sea State Code. This refers to the surface layer and whether it is glassy in appearance or full of white caps. In the open ocean, it also takes into account the wave height, but in inland waters the wave heights (swells) may never reach the levels that correspond to the correct surface white cap number. Therefore, include wave height for clarity.

Code	Wave Height
Light	0 – 3 ft
Moderate	4 – 6 ft
Heavy	>6 ft

Swell Direction

Swell direction should be where the swell is coming from (S for coming from the south). If possible, record direction relative to fixed location (pier). Choose this location at beginning of monitoring project.

APPENDIX B
BEAUFORT SEA STATE SCALE

APPENDIX B
BEAUFORT SEA STATE SCALE

US Navy and Beaufort Sea State Codes (<http://ioc.unesco.org> and <http://www.wrh.noaa.gov/pqr/info/beaufort.php>)

Beaufort SS	Wind speed (knots)	Wind description	Wave height (ft) Beaufort	Sea State – Beaufort	Notes specific to on-water seabird observations	Photos indicating Beaufort Sea State
0	<1	Calm	0	Calm; like a mirror	Excellent conditions, no wind, small or very smooth swell. You have the impression you could see anything.	 Force 0
1	1-3	Light air	¼ < ½	Ripples with appearance of scales; no foam crests	Very good conditions, surface could be glassy (Beaufort 0), but with some lumpy swell or reflection from forests, glare, etc.	 Force 1

Beaufort SS	Wind speed (knots)	Wind description	Wave height (ft) Beaufort	Sea State – Beaufort	Notes specific to on-water seabird observations	Photos indicating Beaufort Sea State
2	4-6	Light breeze	½ – 1 (max 1)	Small wavelets; crests with glassy appearance, not breaking	Good conditions, no whitecaps; texture/lighting contrast of water make murrelets hard to see. Surface could also be glassy or have small ripples, but with a short, lumpy swell, thick fog, etc.	
3	7-10	Gentle breeze	2 – 3 (max 3)	Large wavelets; crests begin to break; scattered whitecaps	Fair conditions, scattered whitecaps, detection of murrelets definitely compromised; a hit-or-miss chance of seeing them owing to water choppiness and high contrast. This could also occur at lesser wind with a very short wavelength, choppy swell.	

Beaufort SS	Wind speed (knots)	Wind description	Wave height (ft) Beaufort	Sea State – Beaufort	Notes specific to on-water seabird observations	Photos indicating Beaufort Sea State
4	11-16	Moderate breeze	3 ½ – 5 (max 5)	Small waves becoming longer, numerous whitecaps	Whitecaps abundant, sea chop bouncing the boat around, etc.	
5	17-20	Fresh breeze	6 – 8 (max 8)	Moderate waves, taking longer form; many whitecaps; some spray		

This page is intentionally blank.



APPENDIX C
CHAIN OF CUSTODY RECORD FORM



Chain of Custody Record				
Date and Time of Collection:	Duty Station:	Collection By:		
Source of Specimen (Person and/or Location) Found At:		Project Name:		
Item No:	Description of Specimen (include Species and Tag Number):			
Item No:	From: (Print Name, Agency)	Release Signature:	Release Date:	Delivered via: FEDEX U.S. Mail In Person Other:
	To: (Print Name, Agency)	Receipt Signature:	Receipt Date:	

*Appendix C
Wharf #1*

TRIDENT Support Facilities Explosives Handling

Item No:	From: (Print Name, Agency)	Release Signature:	Release Date:	Delivered via: FEDEX U.S. Mail In Person Other:
	To: (Print Name, Agency)	Receipt Signature:	Receipt Date:	
Item No:	From: (Print Name, Agency)	Release Signature:	Release Date:	Delivered via: FEDEX U.S. Mail In Person Other:
	To: (Print Name, Agency)	Receipt Signature:	Receipt Date:	
Item No:	From: (Print Name, Agency)	Release Signature:	Release Date:	Delivered via: FEDEX U.S. Mail In Person Other:
	To: (Print Name, Agency)	Receipt Signature:	Receipt Date:	
Item No:	From: (Print Name, Agency)	Release Signature:	Release Date:	Delivered via: FEDEX U.S. Mail In Person Other:
	To: (Print Name, Agency)	Receipt Signature:	Receipt Date:	
Item No:	From: (Print Name, Agency)	Release Signature:	Release Date:	Delivered via: FEDEX U.S. Mail In Person Other:

	To: (Print Name, Agency)	Receipt Signature:	Receipt Date:	
--	-----------------------------	-----------------------	---------------	--

APPENDIX B
Marine Mammal Observation Record Form
and Sighting Codes

Marine Mammal Observation Record Form

Lat: _____

Long: _____

Page _____ of _____

Project Name: _____

Monitoring Location: _____

Observer: _____

(Pier Location, Vessel-Based, Land Location, other)

Time Effort Initiated: _____

Date: _____

Vessel Name: _____

Time Effort Completed: _____

Sighting Data

Event Code	Pile Number	Sighting Number (1 or 1.1 if resight)	Start/End time	Sighting cue	Species	Dist/Dir to Animal (from Observer) (m)	Dist to Pile (btwn animal & pile) (m)	# of Animals Group Size (best/min/max) # of Juveniles	Relative (to pile) Motion/Behavior Code (see code sheet)	Const Type During Sighting	Mitigation Type?	Visibility	% Glare	Weather Cond	Sea State and Wave Ht	Swell Dir	Behavior Change/Response to Activity/Comments
CON PRE POST WC MD MS			: : : :					/ / ___ juveniles	away toward parallel none	SSV SSI V I DB ST None OTHER	DE SD None	B P M G E			0-3ft 4-6ft 6+ft	N S W E	
CON PRE POST WC MD MS			: : : :					/ / ___ juveniles	away toward parallel none	SSV SSI V I DB ST None OTHER	DE SD None	B P M G E			0-3ft 4-6ft 6+ft	N S W E	
CON PRE POST WC MD MS			: : : :					/ / ___ juveniles	away toward parallel none	SSV SSI V I DB ST None OTHER	DE SD None	B P M G E			0-3ft 4-6ft 6+ft	N S W E	
CON PRE POST WC MD MS			: : : :					/ / ___ juveniles	away toward parallel none	SSV SSI V I DB ST None OTHER	DE SD None	B P M G E			0-3ft 4-6ft 6+ft	N S W E	
CON PRE POST WC MD MS			: : : :					/ / ___ juveniles	away toward parallel none	SSV SSI V I DB ST None OTHER	DE SD None	B P M G E			0-3ft 4-6ft 6+ft	N S W E	
CON PRE POST WC MD MS			: : : :					/ / ___ juveniles	away toward parallel none	SSV SSI V I DB ST None OTHER	DE SD None	B P M G E			0-3ft 4-6ft 6+ft	N S W E	
CON PRE POST WC MD MS			: : : :					/ / ___ juveniles	away toward parallel none	SSV SSI V I DB ST None OTHER	DE SD None	B P M G E			0-3ft 4-6ft 6+ft	N S W E	
CON PRE POST WC MD MS			: : : :					/ / ___ juveniles	away toward parallel none	SSV SSI V I DB ST None OTHER	DE SD None	B P M G E			0-3ft 4-6ft 6+ft	N S W E	

Sighting #=chronological number of sightings. If resight of same animal, then 1.2, 1.2, etc. WP (Waypoint)=GPS recording of lat/long, time/date stamp. Critical for vessel observers.

Sighting Codes
(Sighting Cue & Behavior Codes)

Code	Behavior	Definition
BR	Breaching	Leaps clear of water
CD	Change Direction	Suddenly changes direction of travel
CH	Chuff	Makes loud, forceful exhalation of air at surface
DI	Dive	Forward dives below surface
DE	Dead	Shows decomposition or is confirmed as dead by investigation
DS	Disorientation	An individual displaying multiple behaviors that have no clear direction or purpose
FI	Fight	Agonistic interactions between two or more individuals
FO	Foraging	Confirmed by food seen in mouth
MI	Milling	Moving slowly at surface, changing direction often, not moving in any particular direction
PL	Play	Behavior that does not seem to be directed towards a particular goal; may involve one, two or more individuals
PO	Porpoising	Moving rapidly with body breaking surface of water
SL	Slap	Vigorously slaps surface of water with body, flipper, tail, etc.
SP	Spyhopping	Rises vertically in the water to "look" above the water
SW	Swimming	General progress in a direction. Note general direction of travel when last seen [Example: "SW (N)"]
TR	Traveling	Traveling in an obvious direction. Note direction of travel when last seen [Example: "TR (N)" for traveling north]
UN	Unknown	Behavior of animal undetermined, does not fit into another behavior
Pinniped Only		
EW	Enter Water (from haul out)	Enters water from haul-out for no obvious reason
FL	Flush (from haul out)	Enters water in response to disturbance
HO	Haul out (from water)	Hauls out on land
RE	Resting	Resting onshore or on surface of water
LO	Look	Is upright in water "looking" in several directions or at a single focus
SI	Sink	Sinks out of sight below surface without obvious effort (usually from an upright position)
VO	Vocalizing	Animal emits barks, squeals, etc.
Cetacean only		
LG	Logging	Resting on surface of water with no obvious signs of movement

Event Codes	
Code	Activity Type
CON	Construction
PRE	Pre Watch
POST	Post Watch
WC	Weather Change
MD	Mitigation Delay
MS	Mitigation Shutdown

Mitigation Codes	
Code	Activity Type
DE	Delay onset of Pile Driving
SD	Shut down Pile Driving

Visibility	
Code	Distance Visible
B	Bad (<0.5km)
P	Poor (0.5-1.5km)
M	Moderate (1.5-10km)
G	Good (10-15km)
E	Excellent (>15km)

Marine Mammal Species	
Code	Species
CASL	California Sea Lion
HSEA	Harbor Seal
STSL	Steller Sea Lion
HPOR	Harbor Porpoise
DPOR	Dall's Porpoise
ORCA	Orca
HUMP	Humpback Whale
UNLW	Unknown Large Whale
OTHR	Other
UNKW	Unknown

Glare
 Percent glare should be the total glare of observers' area of responsibility. This will provide needed information on what percentage of the field of view was poor due to glare.

Weather conditions	
Code	Species
S	Sunny
PC	Partly Cloudy
L	Light Rain
R	Steady Rain
F	Fog
OC	Overcast

Construction Type	
Code	Activity Type
SSV	Soft Start (Vibratory)
SSI	Soft Start (Impact)
V	Vibratory Pile Driving
I	Impact Pile Driving
DB	Dead Blow
ST	Stabbing
NONE	No Pile Driving
OTH	Other

Sea State and Wave Height
 Use Beaufort Sea State Scale for Sea State Code. This refers to the surface layer and whether it is glassy in appearance or full of white caps. In the open ocean, it also takes into account the wave height or swell, but in inland waters the wave height (swells) may never reach the levels that correspond to the correct surface white cap number. Therefore, include wave height for clarity.

Code	Wave Height
Light	0-3 ft
Moderate	4-6 ft
Heavy	>6 ft

Swell Direction
 Swell direction should be where the swell is coming from (S for coming from the south). If possible, record direction relative to fixed location (pier). Choose this location at beginning of monitoring project.

APPENDIX C

In-water Noise-producing Events

Appendix C
EHW-1 In-water Noise-producing Events

Date	Time Effort Initiated	Time Effort Completed	Event Code	Pile	Start Time	End Time	Blow Count	Const Type	Comments
8/3/2015	16:20	18:52	PRE		16:20:00	16:35:00		NONE	
8/3/2015	16:20	18:52	CON	1	16:47:59	16:48:41		V	
8/3/2015	16:20	18:52	CON	1	16:52:00	16:52:23		V	
8/3/2015	16:20	18:52	CON	1	16:52:53	16:53:11		V	
8/3/2015	16:20	18:52	CON	1	16:54:24	17:05:38		V	
8/3/2015	16:20	18:52	CON	2	18:10:58	18:11:13		V	
8/3/2015	16:20	18:52	CON	2	18:12:09	18:12:26		V	
8/3/2015	16:20	18:52	CON	2	18:13:16	18:13:31		V	
8/3/2015	16:20	18:52	CON	2	18:14:50	18:22:59		V	
8/3/2015	16:20	18:52	POST		18:22:00	18:52:00		NONE	
8/4/2015	7:45	10:19	PRE		7:45:00	8:00:00		NONE	
8/4/2015	7:45	10:19	CON	3	8:32:55	8:33:12		V	
8/4/2015	7:45	10:19	CON	3	8:34:17	8:34:31		V	
8/4/2015	7:45	10:19	CON	3	8:35:32	8:35:48		V	
8/4/2015	7:45	10:19	CON	3	8:36:53	8:39:55		V	
8/4/2015	7:45	10:19	CON	3	8:40:42	8:46:45		V	
8/4/2015	7:45	10:19	CON	4	9:35:42	9:35:54		V	
8/4/2015	7:45	10:19	CON	4	9:37:14	9:37:27		V	
8/4/2015	7:45	10:19	CON	4	9:38:45	9:38:51		V	
8/4/2015	7:45	10:19	CON	4	9:39:51	9:41:27		V	
8/4/2015	7:45	10:19	CON	4	9:42:00	9:43:39		V	
8/4/2015	7:45	10:19	CON	4	9:44:08	9:49:48		V	
8/4/2015	7:45	10:19	POST		9:49:00	10:19:00		NONE	
8/5/2015	8:00	11:45	PRE		8:00:00	8:30:00		NONE	
8/5/2015	8:00	11:45	CON	2	9:14:11	9:14:13	3	SSI	
8/5/2015	8:00	11:45	CON	2	9:20:04	9:20:06	3	SSI	
8/5/2015	8:00	11:45	CON	2	9:21:42	9:21:44	3	SSI	
8/5/2015	8:00	11:45	CON	2	9:22:50	9:22:53	1	I	
8/5/2015	8:00	11:45	CON	2	9:23:28	9:28:07	208	I	
8/5/2015	8:00	11:45	CON	1	9:44:22	9:44:22	1	I	
8/5/2015	8:00	11:45	CON	1	9:45:02	9:45:03	1	I	
8/5/2015	8:00	11:45	CON	1	9:45:59	9:46:01	1	I	
8/5/2015	8:00	11:45	CON	1	9:47:12	9:47:12	1	I	
8/5/2015	8:00	11:45	CON	1	9:47:44	9:47:44	1	I	
8/5/2015	8:00	11:45	CON	1	9:48:37	9:52:06	157	I	
8/5/2015	8:00	11:45	CON	3	10:36:36	10:36:37	1	SSI	
8/5/2015	8:00	11:45	CON	3	10:37:11	10:37:12	2	SSI	
8/5/2015	8:00	11:45	CON	3	10:37:53	10:37:54	3	SSI	
8/5/2015	8:00	11:45	CON	3	10:38:28	10:41:54	150	I	
8/5/2015	8:00	11:45	CON	4	10:59:21	11:01:53	114	I	
8/5/2015	8:00	11:45	MS	4	11:01:53	11:12:47		NONE	HSEA @9m. Resighted @ 30m. Resumed impact.
8/5/2015	8:00	11:45	CON	4	11:13:56	11:15:19	62	I	
8/5/2015	8:00	11:45	POST		11:15:00	11:45:00		NONE	

APPENDIX D

Marine Mammal Sightings

Appendix D
Marine Mammal Sightings

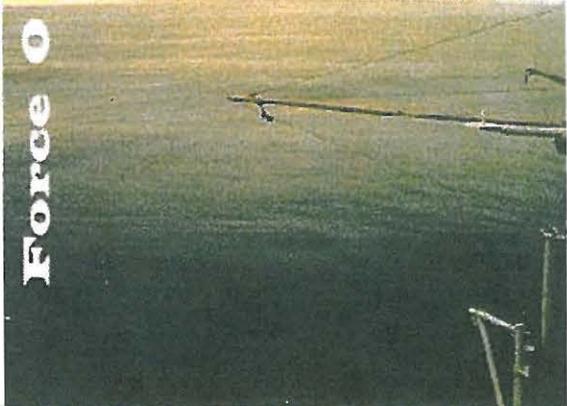
Date	Event Code	Constr. Type	Pile Number	Start Time	End Time	Species	Dist. To Animal (m)	Dir. To animal (deg)	Dist. to pile (m)	Best # of animals	# of juv	Relative motion	Behavior 1	Behavior 2	Behavior 3	Mitigation Type	Visibility	Glare (%)	Weather	Sea State	Wave ht.	Comments
8/5/2015	CON	1	3	10:41:00 AM	10:41:03 AM	HSEA	90	170	80	1	0	Toward	SW-N	DI		NONE	E	10	OC	1	0-3 ft	
8/5/2015	CON	1	4	11:02:18 AM	11:02:22 AM	HSEA	28	60	9	1	0	Toward	FL	SW-S	DI	SD	E	10	OC	1	0-3 ft	shutdown impact
8/3/2015	CON	NONE	1	4:36:32 PM	4:36:48 PM	HSEA	110	5	135	1	0	None	LO			NONE	E	1	S	1	0-3 ft	
8/3/2015	CON	NONE	1	4:42:41 PM	4:42:48 PM	HSEA	45	8	60	2	1	Away	SW-E			NONE	E	1	S	1	0-3 ft	
8/3/2015	CON	NONE	1	4:44:57 PM	4:45:07 PM	HSEA	104	5	114	1	0	Away	RE	DI		NONE	E	1	S	1	0-3 ft	
8/3/2015	CON	NONE	2	6:24:16 PM	6:24:26 PM	HSEA	175	15	185	2	1	Parallel	SW-E	DI		NONE	E	5	S	1	0-3 ft	
8/3/2015	POST	NONE	NA	6:39:43 PM	6:40:27 PM	HSEA	85	20	105	1	0	None	LO	SI		NONE	E	5	S	1	0-3 ft	
8/3/2015	POST	NONE	NA	6:41:12 PM	6:52:39 PM	HSEA	61	45	115	1	0	None	HO			NONE	E	5	S	1	0-3 ft	
8/3/2015	POST	NONE	NA	6:45:10 PM	6:45:39 PM	HSEA	87	20	107	1	0	None	LO	SI		NONE	E	5	S	1	0-3 ft	
8/5/2015	PRE	NONE	NA	8:15:18 AM	8:16:07 AM	HSEA	31	30	45	1	1	None	MI	SI		NONE	E	15	OC	1	0-3 ft	
8/5/2015	CON	NONE	NA	8:28:40 AM	8:28:54 AM	HSEA	15	75	23	2	1	None	MI	SI		NONE	E	15	OC	1	0-3 ft	
8/5/2015	CON	NONE	NA	8:35:12 AM	8:35:27 AM	HSEA	77	160	60	1	0	Away	MI	SW-S		NONE	E	15	OC	1	0-3 ft	
8/5/2015	CON	NONE	NA	8:45:41 AM	8:46:25 AM	HSEA	123	10	130	1	1	None	RE	DI		NONE	E	10	OC	1	0-3 ft	
8/5/2015	CON	NONE	NA	8:55:38 AM	8:56:06 AM	HSEA	85	160	70	1	0	None	MI	SI		NONE	E	10	OC	1	0-3 ft	
8/5/2015	CON	NONE	NA	8:58:13 AM	8:58:27 AM	HSEA	80	165	63	1	0	Toward	MI	SW-N	SI	NONE	E	10	OC	1	0-3 ft	
8/5/2015	CON	NONE	NA	9:01:52 AM	9:01:59 AM	HSEA	75	160	60	1	0	Toward	SW-N	DI		NONE	E	10	OC	1	0-3 ft	
8/5/2015	CON	NONE	NA	10:16:02 AM	10:16:35 AM	HSEA	85	155	70	1	0	Away	SW-SE	DI		NONE	E	10	OC	1	0-3 ft	
8/5/2015	CON	NONE	NA	10:19:38 AM	10:20:08 AM	HSEA	85	160	70	1	0	None	SP	DI		NONE	E	10	OC	1	0-3 ft	
8/5/2015	CON	NONE	NA	10:24:13 AM	10:24:17 AM	HSEA	60	110	50	1	0	Parallel	SW-N	DI		NONE	E	10	OC	1	0-3 ft	
8/5/2015	CON	NONE	NA	10:51:32 AM	10:51:43 AM	HSEA	230	25	240	1	0	None	RE	SI		NONE	E	10	OC	1	0-3 ft	
8/5/2015	CON	NONE	4	11:04:06 AM	11:04:21 AM	HSEA	32	30	12	1	0	Toward	SW-S	DI		NONE	E	10	OC	1	0-3 ft	Dove towards shutdown zone, at boundary
8/5/2015	CON	NONE	4	11:07:00 AM	11:07:09 AM	HSEA	30	45	11	1	0	None	FL	LO	DI	NONE	E	10	OC	1	0-3 ft	
8/5/2015	CON	NONE	4	11:12:38 AM	11:12:48 AM	HSEA	44	145	30	1	0	Away	SW-S	DI		NONE	E	10	OC	1	0-3 ft	confirmed out of zone, restart impact.
8/5/2015	POST	NONE	NA	11:25:03 AM	11:25:12 AM	HSEA	112	175	105	1	0	Toward	SW-N	DI		NONE	E	5	OC	1	0-3 ft	
8/5/2015	POST	NONE	NA	11:26:03 AM	11:26:23 AM	HSEA	33	30	17	1	0	None	FL	LO	DI	NONE	E	5	OC	1	0-3 ft	
8/3/2015	CON	NONE	1	4:37:16 PM	8:11:02 AM	HSEA	5	0	131	2	1	None	HO	RE	FL	NONE	G		S	3	0-3 ft	flushed immediately when vibe went on. Young still had portion of umbilical cord visible
8/3/2015	CON	NONE	1	5:18:36 PM	5:18:43 PM	HSEA	45	15	141	1	1	Parallel	SW-W			NONE	G		S	3	0-3 ft	Likely same as #2
8/4/2015	CON	NONE	3	8:28:30 AM	8:30:20 AM	HSEA	48	200	182	1	0	Parallel	SW-E			NONE	E		OC	3	0-3 ft	
8/4/2015	CON	NONE	3	8:38:08 AM	8:38:16 AM	HSEA	45	150	150	1	0	Toward	TR-N			NONE	E		OC	3	0-3 ft	lost sight under pier
8/4/2015	CON	NONE	3	8:39:55 AM	8:40:01 AM	HSEA	120	167	280	1	0	None	MI			NONE	E		OC	3	0-3 ft	
8/4/2015	CON	NONE	3	8:47:44 AM	8:47:51 AM	HSEA	38	210	142	1	1	None	LO	MI	DI	NONE	E		OC	3	0-3 ft	
8/5/2015	CON	NONE	3	8:30:14 AM	8:30:57 AM	HSEA	46	130	185	1	0	None	RE			NONE	E		OC	3	0-3 ft	lost sight under pier
8/5/2015	CON	NONE	3	8:57:12 AM	8:59:27 AM	HSEA	40	175	195	2	0	None	MI			NONE	E		OC	3	0-3 ft	
8/5/2015	CON	NONE	3	8:59:29 AM	8:59:44 AM	HSEA	40	110	45	1	0	Toward	RE	DI		NONE	E		OC	3	0-3 ft	
8/5/2015	CON	NONE	2	9:12:46 AM	9:12:57 AM	HSEA	20	240	130	2	1	None	RE	MI	DI	NONE	E		OC	3	0-3 ft	Mom pup pair. Very young pup, stayed close to mom.
8/5/2015	CON	NONE	2	9:16:18 AM	9:16:44 AM	HSEA	35	260	150	1	0	None	RE			NONE	E		OC	3	0-3 ft	
8/5/2015	CON	NONE	2	10:47:49 AM	10:47:56 AM	HSEA	50	320	125	1	0	Parallel	SW-N			NONE	E		OC	3	0-3 ft	
8/5/2015	POST	NONE	2	11:27:28 AM	11:27:38 AM	HSEA	55	280	50	1	0	Toward	SW-NE	DI		NONE	E		OC	3	0-3 ft	
8/5/2015	POST	NONE	2	11:30:17 AM	11:30:22 AM	HSEA	60	325	100	1	0	None	MI	SI		NONE	E		OC	3	0-3 ft	
8/3/2015	CON	NONE	1	5:32:28 PM	5:37:13 PM	HSEA	35	90	35	2	1	None	RE	HO	FL	NONE	E	5	S	2	0-3 ft	FL when crew boat passed at 20m from HSEA
8/3/2015	CON	NONE	1	5:39:13 PM	6:10:26 PM	HSEA	35	90	35	2	1	None	HO	RE	EW	NONE	E	5	S	1	0-3 ft	
8/5/2015	PRE	NONE	1	8:05:22 AM	8:05:36 AM	HSEA	65	80	50	2	0	Away	SW-E	DI		NONE	E	0	OC	1	0-3 ft	
8/5/2015	CON	SSI	3	10:36:11 AM	10:36:32 AM	HSEA	42	175	30	1	0	None	MI	LO	DI	NONE	E	10	OC	1	0-3 ft	Defecated and dove @ SSI.
8/3/2015	CON	V	1	4:59:04 PM	5:00:02 PM	HSEA	25	20	140	1	1	None	MI	DI		NONE	G		S	3	0-3 ft	Possibly same pup as #1
8/4/2015	CON	V	3	8:33:08 AM	8:33:30 AM	HSEA	41	215	180	1	0	Away	RE	MI	DI	NONE	E		OC	3	0-3 ft	
8/4/2015	CON	V	3	8:40:49 AM	8:41:11 AM	HSEA	90	110	230	2	0	None	MI	DI		NONE	E		OC	3	0-3 ft	
8/4/2015	CON	V	NA	8:45:59 AM	8:46:16 AM	HSEA	65	120	165	1	0	Away	TR-S	DI		NONE	E		OC	3	0-3 ft	light coloring

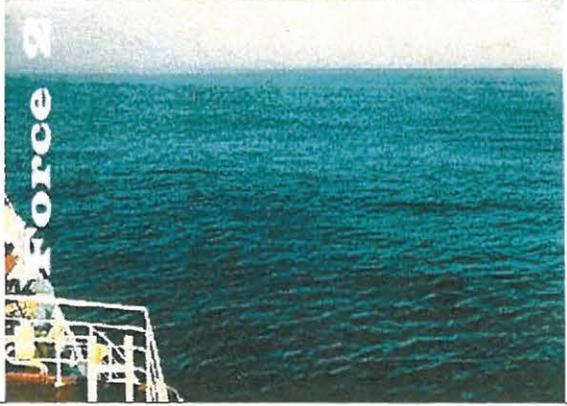
APPENDIX E

Beaufort Sea State

APPENDIX B
BEAUFORT SEA STATE SCALE

US Navy and Beaufort Sea State Codes (<http://ioc.unesco.org> and <http://www.wrh.noaa.gov/pqr/info/beaufort.php>)

Beaufort SS	Wind speed (knots)	Wind description	Wave height (ft) Beaufort	Sea State – Beaufort	Notes specific to on-water seabird observations	Photos indicating Beaufort Sea State
0	<1	Calm	0	Calm; like a mirror	Excellent conditions, no wind, small or very smooth swell. You have the impression you could see anything.	 <p>Force 0</p>
1	1-3	Light air	¼ < ½	Ripples with appearance of scales; no foam crests	Very good conditions, surface could be glassy (Beaufort 0), but with some lumpy swell or reflection from forests, glare, etc.	 <p>Force 1</p>

Beaufort SS	Wind speed (knots)	Wind description	Wave height (ft) Beaufort	Sea State – Beaufort	Notes specific to on-water seabird observations	Photos indicating Beaufort Sea State
2	4-6	Light breeze	½ – 1 (max 1)	Small wavelets; crests with glassy appearance, not breaking	Good conditions, no whitecaps; texture/lighting contrast of water make murrelets hard to see. Surface could also be glassy or have small ripples, but with a short, lumpy swell, thick fog, etc.	
3	7-10	Gentle breeze	2 – 3 (max 3)	Large wavelets; crests begin to break; scattered whitecaps	Fair conditions, scattered whitecaps, detection of murrelets definitely compromised; a hit-or-miss chance of seeing them owing to water choppiness and high contrast. This could also occur at lesser wind with a very short wavelength, choppy swell.	

Beaufort SS	Wind speed (knots)	Wind description	Wave height (ft) Beaufort	Sea State – Beaufort	Notes specific to on-water seabird observations	Photos indicating Beaufort Sea State
4	11-16	Moderate breeze	3 ½ – 5 (max 5)	Small waves becoming longer, numerous whitecaps	Whitecaps abundant, sea chop bouncing the boat around, etc.	
5	17-20	Fresh breeze	6 – 8 (max 8)	Moderate waves, taking longer form; many whitecaps; some spray		