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ACOUSTIC AND MARINE SPECIES MONITORING PLAN FOR THE  
NAVY'S IHA #5  
FUEL PIER REPLACEMENT PROJECT AT  
NAVAL BASE POINT LOMA

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Submitted to:

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Draft Final - July 2017

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## **TABLE OF CONTENTS**

<b>ACRONYMS</b> .....	<b>iii</b>
<b>1 INTRODUCTION</b> .....	<b>1-1</b>
1.1 Purpose of the Monitoring Plan.....	1-1
1.2 Scope and Timing.....	1-3
<b>2 FUEL PIER REPLACEMENT PROJECT</b> .....	<b>2-1</b>
2.1 Project Description.....	2-1
2.2 Project Area.....	2-1
2.3 Construction and Demolition-related Activities.....	2-1
2.4 Activities Monitored During this IHA Period.....	2-1
2.4.1 Construction.....	2-1
2.4.2 Demolition.....	2-2
2.5 Anticipated Construction, Demolition and Monitoring Equipment.....	2-2
2.5.1 Construction:.....	2-3
2.5.2 Demolition.....	2-3
2.5.3 Marine Species and Acoustic Monitoring Equipment.....	2-3
2.6 Determination of the Distances to Acoustic Thresholds.....	2-5
<b>3 MARINE MAMMAL MONITORING</b> .....	<b>3-7</b>
3.1 Objectives.....	3-7
3.2 Methods.....	3-7
3.2.1 Marine Mammal Observer Qualifications.....	3-11
3.2.2 Marine Species Data Collection.....	3-11
<b>4 ACOUSTIC MONITORING</b> .....	<b>4-1</b>
4.1 Objectives.....	4-1
4.2 Methods.....	4-2
4.2.1 Acoustic Data Collection.....	4-2
<b>5 ACTIVITIES ASSOCIATED WITH Each SUBSEQUENT IHA</b> .....	<b>5-1</b>
<b>6 INTERAGENCY NOTIFICATION</b> .....	<b>6-1</b>
<b>7 REPORTING</b> .....	<b>7-1</b>
<b>8 REFERENCES</b> .....	<b>8-1</b>

## **LIST OF FIGURES**

Figure 1-1. Regional Location – Fuel Pier Replacement Project, Naval Base Point Loma. ....	1-2
Figure 3-1. Monitored ZOIs at the Fuel Pier Project Location.....	3-9
Figure 3-2. Monitored ZOIs at the NMAWC Project Location.....	3-10
Figure 3-3. Example of the Monitoring Locations for Demolition at the Fuel Pier. ....	3-15
Figure 3-4. Example of the Monitoring Locations for Pile Driving and Extraction at NMAWC.....	3-17

## **LIST OF TABLES**

Table 2-1. Activity Summary, Pile Driving and Demolition.....	2-2
Table 2-2. Acoustic Monitoring Equipment. ....	2-4
Table 2-3. PTS Onset for Marine Mammal Functional Hearing Groups. ....	2-5
Table 2-4. Measured or Calculated Distances to Level A (Injury) and Level B (Disturbance) Thresholds for Project-related Sound at the Fuel Pier and NMAWC. ....	2-6
Table 3-1. Monitored Distances to Level A (Injury) and Level B (Disturbance) Thresholds for Sound at the Fuel Pier and NMAWC .....	3-8

## ACRONYMS

$\mu\text{Pa}$	micropascal
APE	American Piledriving Equipment
dB	decibel(s)
EA	Environmental Assessment
ESA	Endangered Species Act
ft	feet
gpm	gallons per minute
GPS	Global Positioning System
Hz	hertz
IHA	Incidental Harassment Authorization
in	inch/inches
IPP	Indicator Pile Program
kHz	kilohertz
LD	Larson Davis
$LZ_{eq}$	z-weighted sound levels
m	meters
MMO	Marine Mammal Observer
NAVFAC SW	Naval Facilities Engineering Command, Southwest
NBPL	Naval Base Point Loma
NEPA	National Environmental Policy Act
NIST	National Institute of Standards and Technology
NMAWC	Naval Mine & Anti-Submarine Warfare Command Complex
NMFS	National Marine Fisheries Service
PC	Precast piles
PTS	Permanent Threshold Shift
psi	pound-force per square inch
re 1 $\mu\text{Pa}$	referenced to one micropascal
rms	root mean square
SEL	sound exposure level
SLM	Sound Level Meter
SOP	Standard Operating Procedures
SPL	sound pressure level
SSC	Space and Naval Warfare Systems Center Pacific
USLM	Hydro DB real-time Underwater Sound Level Meter
UW	University of Washington
VM	Variable Moment
ZOI	zone of influence

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## **1 INTRODUCTION**

### **1.1 Purpose of the Monitoring Plan**

The purpose of this Monitoring Plan is to provide protocols for acoustic and marine species monitoring activities in accordance with the Incidental Harassment Authorization (IHA) #5, including the 2017/2018 in-water pile driving and demolition activities associated with the final phase of the Navy's Fuel Pier Replacement Project (Project) at Naval Base Point Loma (NBPL), California (Figure 1-1). The final phase includes completion of demolition of the old fuel pier and temporary mooring dolphin at NBPL, and moving the Navy Marine Mammal Program enclosures back to their home location of SPAWAR Systems Center Pacific (SSC), adjacent of the fuel pier. The Marine Mammal Program enclosures had been relocated to the Naval Mine & Anti-Submarine Warfare Command Complex (NMAWC) at the beginning of the Project, and their removal from that location will entail pile removal and the re-installation of guide piles to return the NMAWC facilities back to their original configuration. No guide piles are expected to be driven at the SSC location as the Marine Mammal Program transitions to the return of the animal enclosures.

The Navy worked closely with the National Marine Fisheries Service (NMFS) during the previous IHA phases to develop specific acoustic and marine mammal data collection methodologies for the Project. These methodologies were memorialized in Standard Operating Procedures (SOPs) that have undergone updates over the course of the Project in response to the scheduled construction and demolition activities.

This monitoring plan incorporates lessons learned from previous years' monitoring efforts, while avoiding conflicts with the many military and non-military activities that occur continually in San Diego Bay. Monitoring locations have been selected to provide good vantage points and sight lines for marine species observations while avoiding the federal navigation channel and other primary routes of vessel transit. The number of monitors and types of data to be collected have been specified according to type of construction or demolition activity. Acoustic data collected during previous monitoring efforts for this Project have been used to calculate zone of influence (ZOI) distances associated with potential Level A (injury) and Level B (behavioral disturbance) harassment according to type of activity, as applicable. The most recent acoustic guidance (NMFS 2016) was used to calculate distances to the Level A regulatory thresholds for marine mammals according to functional hearing groups. The Level B ZOIs were based on *in-situ* acoustic data recorded at source (near project activity) during previous IHA monitoring efforts for this Project, and either previously validated by *in-situ* far-field acoustic data collection or calculated using a practical spreading loss model. Acoustic data will be collected during the IHA #5 monitoring to confirm or refine ZOI boundaries.



Figure 1-1. Regional Location – Fuel Pier Replacement Project, Naval Base Point Loma.

Monitoring will be conducted before, during, and after construction and demolition activities to achieve the following objectives:

1. Monitor for the presence and behavior of marine mammals and other protected species during in-water construction and/or demolition activities to minimize impacts to marine species and effectively document marine species occurring within ZOI boundaries.
2. Collect underwater and/or airborne acoustic data to measure source sound levels and confirm ZOI boundaries.

Marine mammal and other protected species monitoring will be conducted before, during, and after all pile driving (installation) and demolition activities within the appropriate ZOIs for potential injury and behavioral disturbance thresholds. The proposed monitoring will enumerate the occurrence of species in proximity to the Project site and document the number of marine mammal species exposed to underwater and airborne sound levels that would constitute “take” under the Marine Mammal Protection Act (MMPA). Endangered Species Act (ESA) listed species (e.g., California least terns and green sea turtles) will also be monitored, as appropriate. As sufficient results from acoustic monitoring become available, marine species monitoring protocols based on modeled ZOIs may be adjusted accordingly.

## **1.2 Scope and Timing**

The scope of monitoring encompasses acoustic and marine species monitoring developed to comply with environmental monitoring mutually agreed upon as a result of the Navy's National Environmental Policy Act (NEPA) Environmental Assessment (EA) (Navy 2013a), or as a condition of approval by other regulatory agencies. The monitoring will be conducted during in-water construction and demolition activities conducted during the period covered by IHA #5, 8 October 2017 through 7 October 2018. This Monitoring Plan will be managed by Naval Facilities Engineering Command Southwest (NAVFAC SW) Southwest using the same contractors that performed the monitoring in accordance with the previous IHAs for this Project.

## **2 FUEL PIER REPLACEMENT PROJECT**

### **2.1 Project Description**

The IHA #5 application (Navy 2017) describes the background of the Proposed Action and the construction and demolition activities associated with the Project. Refer to the EA (Navy 2013a) and previous IHA Applications (Navy 2012, 2013b, 2014, 2015, 2016) for detailed descriptions of the Project and its implementation.

### **2.2 Project Area**

The Project area for IHA #5 encompasses two locations and their vicinities in northern San Diego Bay (Figure 1-1). The primary site, the existing fuel pier (P-180) and temporary mooring dolphin on NBPL, is where remaining fuel pier associated demolition will be completed. A separate site, located further northeast at NMAWC, is where the Marine Mammal Program enclosures were temporarily moved to avoid impacts to the marine mammals during construction of the new fuel pier. Moving the Marine Mammal Program back to their regular facilities near the fuel pier will require construction and demolition activities at NMAWC to restore gangway access to the recreational marina. These areas will be monitored both acoustically and for the presence/absence of marine species (marine mammals, green sea turtles, and California least terns).

### **2.3 Construction and Demolition-related Activities**

Table 2-1 lists the in-water construction and demolition activities according to location, that will be implemented during the time frame covered by IHA #5. The Navy estimates that the contractor will conduct these activities over 196 days at varying rates per day, depending on activity, equipment, and environmental conditions. Although addressed for the 2016/2017 production year covered by IHA #4 (Navy 2016), both the installation of piles at NMAWC and completion of the demolition at the old fuel pier (the removal of piles and remaining caissons) are expected to occur under IHA #5. Table 2-1 provides the anticipated number of piles to be driven and removed during the 2017/2018 production year based on the submitted construction and demolition plan provided by the construction contractor, and approved by the Navy. Descriptions of pile installation, removal and demolition activities are provided in the past and current IHA Applications (Navy 2012, 2013b, 2014, 2015, 2016, 2017).

### **2.4 Activities Monitored During this IHA Period**

#### **2.4.1 Construction**

During IHA #5, only the NMAWC location will require monitoring for pile installation activities. Both impulsive (impact pile driving) and non-impulsive (vibratory pile driving) sound sources are expected to occur during the driving of 23 concrete piles over the course of 25 days (Table 2-1).

**Table 2-1. Activity Summary, Pile Driving and Demolition.**

<b>Activity/Method</b>	<b>Location and Timing<sup>1</sup></b>	<b>Estimated # of Days</b>	<b>Pile Type</b>	<b># Piles Installed</b>	<b># Piles Removed</b>
<b>Construction</b>					
Pile Driving – vibratory and/or impact hammer	NMAWC	25	16-inch PC concrete guide piles	23	
<b>Subtotal</b>		<b>25</b>		<b>23</b>	
<b>Demolition</b>					
Piles clipped off at mudline with pile cutter	NBPL old pier, south segment and trestle	100	Square PC concrete piles (max size 24-inch)		180
Caissons cut off at mudline with diamond belt saw	NBPL old pier caissons	35	66-inch concrete-filled steel caisson		30
Caissons cut off at mudline with diamond belt saw	NBPL old pier caissons	15	84-inch concrete-filled steel caisson		5
Piles cut off at mudline with plasma torch	NBPL Temporary mooring dolphin, south of old pier	6	30-inch steel		12
Piles dead pulled or jetted out	NMAWC	15	16-inch round PC concrete piles		64
<b>Subtotal</b>		<b>171</b>			<b>291</b>
<b>Estimated Total In-Water Construction Days - 196</b>					

Notes: # = number; PC = Precast; <sup>1</sup>Timing for all activities is 8 Oct, 2017 to 7 Oct, 2018.

## 2.4.2 Demolition

Pile demolition and removal activities are expected at both the old fuel pier (adjacent to new fuel pier location) and NMAWC during IHA #5 (Table 2-1). Demolition activities at the old fuel pier and temporary mooring dolphin will include pile clipping, caisson cutting, and pile cutting. A total of 180 piles and 35 caissons will be clipped or cut off at the mudline over an estimated 135 number of days. Demolition activities at NMAWC will include the extraction of 64 piles over an estimated 15 days.

## 2.5 Anticipated Construction, Demolition and Monitoring Equipment

The crane/barge systems that have been used in previous IHA's are anticipated to be used throughout the construction/demolition efforts for IHA #5. This included a Manitowoc 888 hydraulic crawler crane with a 60.9-meter (m) [200-foot, (ft)] boom secured to a 54.9 x 15.2 x 3.7 m [180 x 50 x 12 ft] spud barge, and a 48.8 x 12.2 m (160 x 40 ft) flat deck material barge. Depending on the crane load needs, this crane/barge may be used in conjunction with one or more smaller cranes (i.e., Link-Belt RTC 8065 extendable boom crane) to facilitate the installation of removal of piles and/or caissons. If a smaller crane is used it will either be based on the old pier itself, or on a barge, depending on the needs at the time. The sections below provide details on the anticipated construction/demolition equipment to be used during the IHA #5 time-period.

### **2.5.1 Construction:**

- American Pile Driving Equipment, Inc. (APE) Variable Moment 250 VM or 400 VM Vibratory Hammer Extractor, powered by a model 630 or 765 hydraulic power source, creating a maximum driving force of 2,389 kilonewtons (269 tons).
- APE single action diesel impact hammer, model D25-32, or similar, with maximum energies of 58,245 ft-lbs and minimum energy of 29,484 ft-lbs. The hammer is fitted with a manual power level modulator and shut off trip.

### **2.5.2 Demolition**

- Concrete 24-inch diameter piles being clipped at the mudline will continue to be cut with Prime® Concrete Pile Cutter (Model 24) with a hydraulically actuated blade that cuts through the piles using approximately 3,000 pounds per square inch of pressure. The clipper will be placed over the pile with a Link-Belt RTC 8065 extendable boom crane. The piles will then be cleaned of biological accumulation, and removed from the site by either a truck or a barge.
- Caissons will be cut with a diamond belt saw capable of cutting caissons with diameters of up to 84 inches. The saw being used is a Mactech DWS-1021 102-inch inline hydraulic feed diamond wire saw, that is positioned in place by a Link-Belt RTC 8065 extendable boom crane. The saw is set up on one side of the caisson with constant pressure applied via the saw, or the pressure could be modulated via a manual lever on an associated barge. The wire saw may not be able to get close enough to the mudline to meet requirements to cut the caissons at the mudline. Similar to IHA #4, high pressure hoses, or an “airlift” system, may be used to remove enough sediment to allow the wire saw to properly cut the caisson at the mudline.
- The 30-inch steel pipe piles that make up the temporary mooring dolphin will be cut at the mudline via a diver utilizing a plasma torch cutter.
- The 16-inch concrete piles at NMAWC will be removed using one of the following methods: 1) Dead-pull/jet out or 2) extract with vibratory hammer (see Section 2.5.1). Pile jetting will entail jetting around piles with an external pipe attached to a Godwin HL130M Dri-Prime high-pressure jet pump (rated for 285 pounds-force per square inch [psi] and 1300 gallons per minute [gpm]).

### **2.5.3 Marine Species and Acoustic Monitoring Equipment**

The following equipment will be required to conduct marine species and acoustic monitoring:

- Survey boats will include: a fixed marine radio for the Captain to monitor channel 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 Global Positioning System (GPS) units. Vessels will comply with all Coast Guard regulations and be able to pass a Coast Guard safety inspection;
- Airborne and underwater Sound Level Meters (SLMs) with microphones and hydrophones, respectively (Table 2-2);
- Hearing protection for all personnel and boat operators near the source;
- Portable marine radios for the observers to communicate with the monitoring coordinator, construction contractor, and other observers;

- Cellular phones (one per boat/observing location), and the contact information for the other observers, and monitoring coordinator;
- Flags (one green, one red per boat/observing location) as back-up for radio communication;
- Nautical charts;
- Daily tide tables for the Project area within San Diego Bay;
- Watch or Chronometer;
- Binoculars with built-in compass (quality of 7x50 or better);
- Laser rangefinder;
- Monitoring plan, IHA permit, and/or other relevant permit requirement specifications in sealed transparent plastic cover;
- Tablets with marine species and acoustic databases for data collection;
- Notebook with pre-standardized monitoring Marine Mammal Observation Record forms on waterproof paper (e.g., Rite-in-the Rain);
- Marine mammal identification guides on waterproof paper;
- Clipboard; and
- Pen / Pencil.

Sound data acquisition during pile driving will utilize a combination of equipment used during previous monitoring efforts (Table 2-2). The Hydro DB real-time Underwater Sound Level Meter (USLM) will be deployed as the primary acoustic monitoring device. DSG-ST Ocean (Loggerhead®) acoustic data loggers may be used as a backup device for hydro-acoustic measurements, but data will not be analyzed, unless specifically needed to validate the USLM measurements. The acoustic monitoring equipment will be deployed by Acoustic Technicians (ATs) at the appropriate locations prior to construction activities.

**Table 2-2. Acoustic Monitoring Equipment.**

Item	Make	Model
DSG-Ocean acoustic data logger	Loggerhead	DSG-Ocean
<i>Hydrophone (Loggerhead® DSG-Ocean)</i>	HTI	96-min
Hydro DB USLM	Hydro DB	Custom
<i>Hydrophone (Hydro DB USLM)</i>	HTI	96-min
Sound Level Meter	Larson Davis (LD)	831
<i>Microphone (LD SLM)</i>	PCB	377B02
<i>Preamplifier for microphone (LD SLM)</i>	PCB	PRM 831
Pistonphone, Hi Pressure	ETMC Technologies	42AC

The ATs will conduct real-time monitoring of in-water activities to determine root mean square (rms) SPL values. The USLM will be used to document rms SPLs at both source and far-field locations for vibratory pile driving events, as well as during demolition activities. When necessary, the USLM will be used to validate the SPL thresholds at the initiation of pile production. All underwater sound monitoring systems will deploy hydrophones at mid-water depth. The Larson Davis (LD) 831 Class 1 integrated SLM will be used to record airborne SPLs. The LD 831 is equipped with data logging firmware capable of recording a variety of metrics including  $LZ_{F_{max}}$  (rms value), and  $LZ_{eq}$  (1sec, Sound Exposure Level [SEL] value) for each recorded event. When

necessary, an LD 831 SLM with detachable LD microphone will be placed on a tripod to collect airborne sound levels at source (15 m [50 ft] from activity) to validate previously established airborne marine mammal ZOIs.

All hydrophones, microphones, and recording systems will be checked prior to deployment each day to ensure proper operation. All sensors, signal conditioning equipment, and sampling equipment will be calibrated prior to each use to National Institute of Standards and Technology (NIST) standards.

## **2.6 Determination of the Distances to Acoustic Thresholds**

Per NMFS (2016), the underwater Level A ZOIs were revised to account for marine mammal functional hearing groups, with a permanent threshold shift (PTS) occurring at different received levels, depending on the species (Table 2-3). The ZOIs associated with the revised Level A criteria (NMFS 2016) are based on exposure to potentially harmful sound over an extended period of time. Therefore, mean source levels were used to calculate the Level A ZOIs to account for exposure to sound over time. The current Level B criteria are based on instantaneous exposure, and the maximum source levels were used to calculate the maximum distance to the Level B ZOIs to account for the maximum exposure potential if the animal were inside of the Level B ZOI. All mean and maximum source levels were based on Project-related data provided in previous reports (NAVFAC SW 2014, 2015, 2016a,b, 2017). Both peak SPLs and SEL<sub>cum</sub> data were evaluated relative to the appropriate threshold criteria; however, none of the peak SPLs for the various sound sources reached the injury thresholds identified in the new NMFS (2016) Technical Guidance; therefore, injury from peak sound levels were not considered as part of the ZOI determination.

**Table 2-3. PTS Onset for Marine Mammal Functional Hearing Groups.**

<b>Functional Hearing Group</b>	<b>PTS Onset</b>		
	<b>Impulsive</b>		<b>Non- Impulsive</b>
	<b>Peak SPL</b>	<b>SEL<sub>cum</sub></b>	
Low-Frequency Cetaceans	219	183	199
Mid-Frequency Cetaceans	230	185	198
Phocid Pinnipeds	218	185	201
Otariid Pinnipeds	232	203	219

Based on a combination of both the revised Level A, and Level B regulatory thresholds, the distances to the Level A and B regulatory thresholds are presented in Table 2-4. Calculations were used to determine the Level A ZOIs for the functional hearing groups identified in the NMFS (2016) acoustic guidance. The Level B ZOIs were based either on *in-situ* source and far-field acoustic data collected during previous IHA years, or calculated using a practical spreading loss model based on *in-situ* measured source SPLs. These distances represent the area likely to be ensonified by sounds emanated by the Project, and constitute the basis for all marine species monitoring efforts identified in this monitoring plan.

**Table 2-4. Measured or Calculated Distances to Level A (Injury) and Level B (Disturbance) Thresholds for Project-related Sound at the Fuel Pier and NMAWC.**

Activity	Measured/Calculated Distances to Thresholds (m) and Areas of ZOIs (m <sup>2</sup> or km <sup>2</sup> )							
	Underwater						Airborne	
	Level A <sup>1,2,3</sup>				Level B <sup>4</sup>		Level B	
	LF	MF	PW	OW	160 dB	120 dB <sup>5</sup>	100 dB <sup>6</sup>	90 dB <sup>6</sup>
<b>Old Fuel Pier and Temporary Mooring Dolphin Demolition</b>								
66-inch and 84-inch caissons (Diamond saw cutting)	3.6 m 41 m <sup>2</sup>	0.3 m < 1 m <sup>2</sup>	2.2 m 15 m <sup>2</sup>	0.2m <1 m <sup>2</sup>	N/A	631 m 0.7157 km <sup>2</sup>	N/A	
Concrete piles (Pile clipping)	1.2 m 4 m <sup>2</sup>	0.1 m < 1 m <sup>2</sup>	0.7 m < 1 m <sup>2</sup>	0.0 m 1.0 m <sup>2</sup>	N/A	2,511 m 4.4512 km <sup>2</sup>		
30-inch steel piles (Plasma torch cutting) <sup>7</sup>	N/A							
<b>NMAWC Construction and Demolition</b>								
16-inch concrete piles (Vibratory extraction/driving) <sup>8</sup>	8.3 m 216 m <sup>2</sup>	0.7 m < 1 m <sup>2</sup>	5.1 m 82 m <sup>2</sup>	0.4 m < 1 m <sup>2</sup>	N/A	1,848 m 2.4473 km <sup>2</sup>	42 m 5,503 m <sup>2</sup>	149 m 69,646 m <sup>2</sup>
16-inch concrete piles (Impact driving) <sup>9</sup>	63.4 m 0.0126 km <sup>2</sup>	2.3 m 17 m <sup>2</sup>	33.9 m 3,610 m <sup>2</sup>	2.5 m 20 m <sup>2</sup>	270 m 0.1408 km <sup>2</sup>	N/A		
16-inch concrete piles (Jetting pile extraction)	3.9 m 47.8 m <sup>2</sup>	0.3 m <1 m <sup>2</sup>	2.4 m 18 m <sup>2</sup>	0.2 m <1 m <sup>2</sup>	N/A	1,165m 1.4268km <sup>2</sup>	N/A	
16-inch concrete piles (Pile dead-pull)	N/A							

*Notes:* <sup>1</sup> If measured value thresholds are less than 10 m (33 ft), the regulatory requirement is a minimum monitoring distance of 10 m (33 ft).  
<sup>2</sup> Based on measured mean source levels of 145 dB rms (24-in concrete pile clipping), 149 dB rms (diamond saw caisson cutting), 155 dB rms (24-inch concrete pile jetting extraction), unless otherwise specified. Pulse duration during impact driving was based on the value (0.03 seconds) previously reported during monitoring of impact pile driving (NAVFAC SW 2014, 2015, 2016).  
<sup>3</sup> LF = Low-frequency cetaceans; MF = Mid-frequency cetaceans; PW = Phocid pinnipeds; OW = Otariid pinnipeds. The high-frequency cetacean hearing group (HF) is omitted, because no species in the hearing group occur in, or around, the Project area.  
<sup>4</sup> Based on measured maximum source levels of 155.6 dB rms (diamond saw caisson cutting), 159.9 dB rms (24-inch concrete pile jetting extraction), and 165.3 dB rms (24-in concrete pile clipping), unless otherwise specified.  
<sup>5</sup> Average ambient sound levels in San Diego Bay are approximately 129.6 dB rms (NAVFAC SW 2015), and all 120 dB Level B ZOIs are based on this approximate ambient value.  
<sup>6</sup> Airborne ZOIs based on conservative representative data (collected during 30-inch vibratory pile driving from IHA #4). Airborne noise levels did not exceed regulatory thresholds during IHA #4 monitoring of demolition activities.  
<sup>7</sup> Plasma torch noise levels are not expected to exceed underwater or airborne regulatory thresholds.  
<sup>8</sup> Based on conservative representative source levels of 162.5 dB rms (30-inch steel vibratory pile driving).  
<sup>9</sup> Based on measured source levels of 188.9 dB rms and *in situ* data (16-inch poly-concrete impact pile driving) collected for the Level A and Level B ZOIs, respectively.

### **3 MARINE MAMMAL MONITORING**

#### **3.1 Objectives**

The objective of marine species monitoring is to monitor for the presence of marine mammals, and other protected species, in San Diego Bay relative to the injury (Level A) and behavioral (Level B) ZOIs. In doing so, the intent is to minimize and document the potential impacts of the Project on those species, while still allowing the Project to achieve the projected construction milestones.

#### **3.2 Methods**

The marine species monitoring component of this monitoring plan was developed by the Navy, taking into consideration the logistical, environmental, and security requirements for working in the Project area. During the construction and demolition activities for IHA #5, distances to regulatory thresholds (see Table 2-4) were based on acoustic data reported in previous IHA Monitoring Reports (NAVFAC SW 2014, 2015, 2016, 2017), as well as on calculated distances based on the latest acoustic threshold guidance for the Level A ZOIs (NMFS 2016). The distances to the ZOI boundaries were used to determine monitoring locations for the construction and demolition activities identified in this monitoring plan. The monitoring for green sea turtles and California least terns will co-occur during the marine mammal monitoring.

All Level A threshold distances were less than 10 m (33 ft) with two exceptions. The distances to the low-frequency cetacean and phocid pinniped thresholds during impact pile driving are the only thresholds to exceed 10 m (33 ft; Table 3-1). To simplify monitoring for the multiple functional hearing groups that could occur in the Project area, this maximum Level A ZOI was chosen as a single Level A ZOI for all functional hearing groups during impact and vibratory pile driving. Because no Level A “take” is being requested as part of this IHA application, a buffer of roughly double the distance to these Level A ZOIs was added to the Level A ZOI (Table 3-1). Figure 3-1 and Figure 3-2 show these ZOIs relative to the Project area. This buffered Level A ZOI is called “shutdown zone” for the purpose of this monitoring plan. Marine mammal monitoring will also occur for additional areas beyond the area for the Level A thresholds where sound pressure levels may cause behavioral harassment (Level B) of marine mammal species. During the course of acoustic data collection, if new *in-situ* data shows that source levels are higher or lower than expected, the distances to the regulatory thresholds will be adjusted accordingly. For all in-water activities that have a calculated Level A ZOI below 10 m (33 ft), a minimum in-water protective shutdown zone of 10 m (33 ft) for mechanical interaction is proposed.

**Table 3-1. Monitored Distances to Level A (Injury) and Level B (Disturbance) Thresholds for Sound at the Fuel Pier and NMAWC**

Activity	Monitored Distances to Thresholds (meters [feet])							
	Underwater						Airborne	
	Level A			Level B			Level B	
	LF <sup>1</sup>	MF <sup>1</sup>	PW <sup>1</sup>	OW <sup>1</sup>	160 dB	120 dB <sup>2</sup>	100 dB	90 dB
<b>Old Fuel Pier and Temporary Mooring Dolphin Demolition</b>								
66-inch and 84-inch caissons (Diamond saw cutting)	10 (33)			N/A	631 (2,070)	N/A <sup>3</sup>		
Concrete piles (Pile clipping)	10 (33)			N/A	2,511 (8,238)			
30-inch steel piles (Plasma torch cutting)	10 (33)			N/A				
<b>NMAWC Construction and Demolition</b>								
16-inch concrete piles (Vibratory extraction/driving)	20 <sup>4</sup> (65.6)	10 (33)	N/A	1,848 (6,063)	42 (138)	149 (489)	N/A <sup>3</sup>	
16-inch concrete piles (Impact driving)	100 <sup>5</sup> (328)	60 <sup>6</sup> (197)	270 (886)	N/A				
16-inch concrete piles (Jetting pile extraction)	10 (33)		N/A	1,165 (3,822)				
16-inch concrete piles (Pile dead-pull)	10 (33)		N/A					

Notes: <sup>1</sup> LF = Low-frequency cetaceans; MF = Mid-frequency cetaceans; PW = Phocid pinnipeds; OW = Otariid pinnipeds. The high-frequency cetacean hearing group (HF) is omitted, because no species in the hearing group occur in, or around, Project area.

<sup>2</sup> Mean ambient sound levels in San Diego Bay are approximately 128 dB rms (NAVFAC SW 2015), and all 120 dB Level B ZOIs are based on the ambient value.

<sup>3</sup> Airborne noise levels did not exceed regulatory thresholds during previous IHAs. No airborne monitoring will take place for diamond saw cutting of caissons, plasma torch cutting of temporary mooring dolphin 30-inch steel piles, jetting or dead-pull extraction of concrete piles.

<sup>4</sup> Includes buffer of calculated Level A threshold out to 20 m (65.6 ft).

<sup>5</sup> Includes buffer of calculated Level A threshold out to 100 m (328 ft).

<sup>6</sup> Includes buffer of calculated Level A threshold out to 60 m (197 ft).

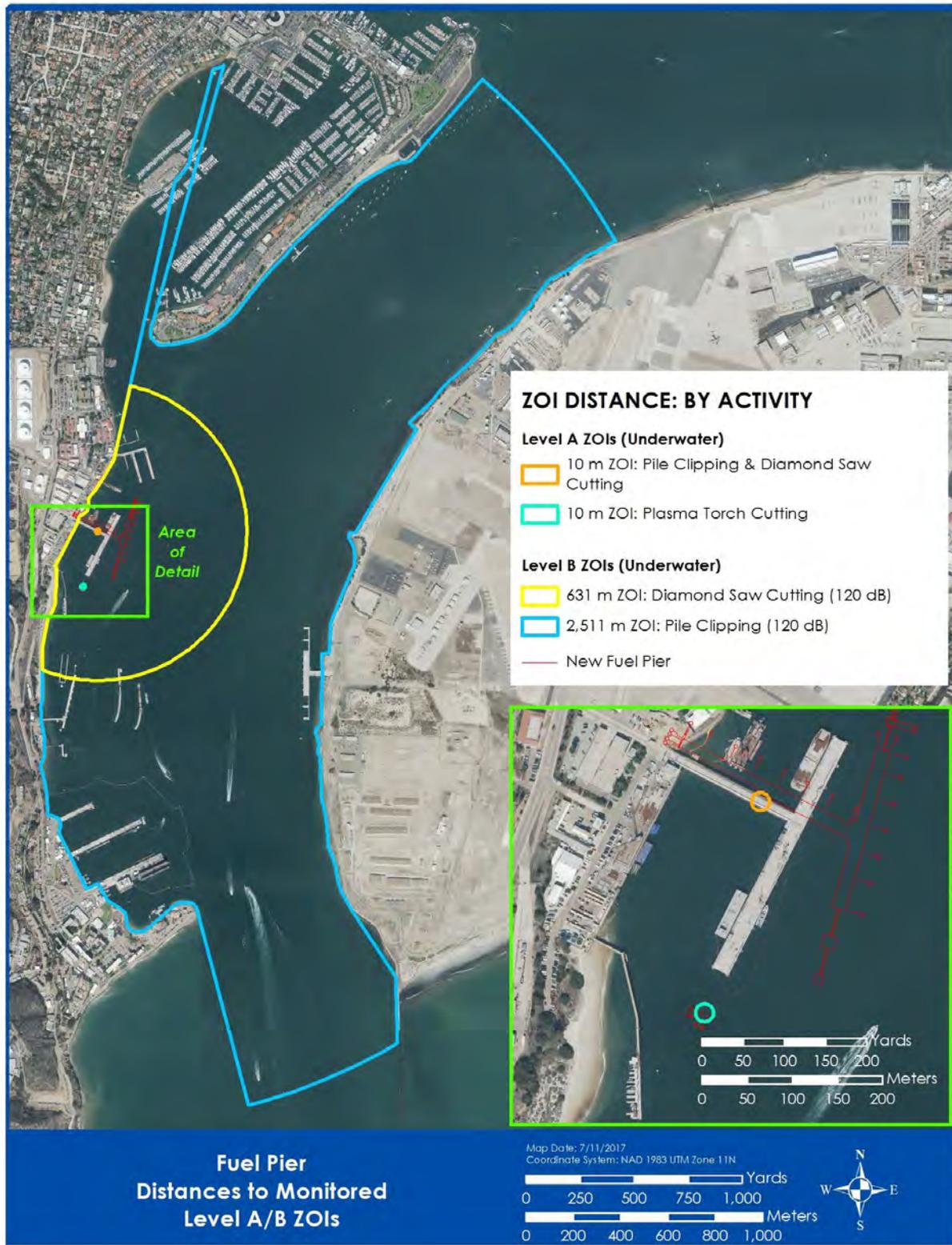


Figure 3-1. Monitored ZOIs at the Fuel Pier Project Location.

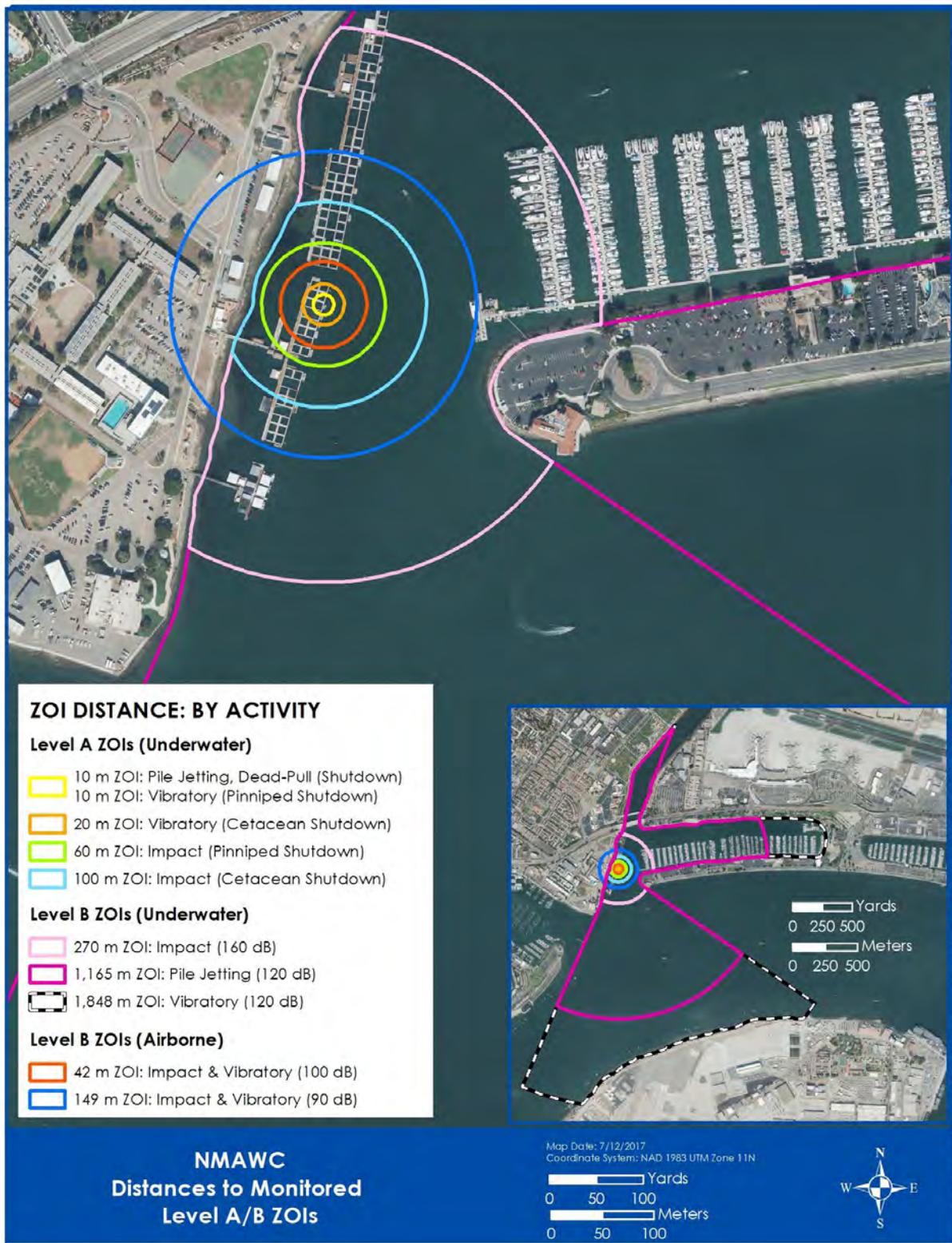


Figure 3-2. Monitored ZOIs at the NMAWC Project Location.

In the event that a marine mammal species is observed by an MMO that is not covered under IHA #5, the location and directional movement of the animal (or group) with respect to the applicable Level B ZOI will be determined, and all construction will be stopped immediately if the animal (or group) is likely to enter the ZOI. If a boat is available, MMOs will follow the animal (or group) at a distance of at least 100 m (328 ft) until the animal (or group) has left the Level B ZOI. Pile driving will commence if the animal (or group) has not been seen inside the Level B ZOI for at least one hour of observation. If the animal (or group) is re-sighted, pile driving will be stopped and a boat-based MMO (if available) will follow the animal until it has left the Level B ZOI.

During any monitored activity, any MMO can initiate shutdown procedures by calling the monitoring coordinator ("Command") located closest to the construction activities, who will then stop construction by notifying the construction crew via either verbal or visual communication procedures.

### **3.2.1 Marine Mammal Observer Qualifications**

Monitoring will be conducted by qualified observers with the following minimum qualifications:

- Visual acuity in both eyes (correction is permissible) sufficient for discernment of moving targets at the water's surface, with the ability to estimate target size and distance; use of binoculars may be necessary to correctly identify the target;
- A minimum of a Bachelor's degree in biological science, wildlife management, mammalogy, or related field;
- Prior training and experience conducting at-sea marine mammal monitoring and/or surveys, including the identification of marine mammal behavior;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations; and
- Ability to communicate orally, by radio or in person, with Project personnel to provide real-time information on marine mammals observed in the area as necessary.

### **3.2.2 Marine Species Data Collection**

The data collected during all pile installation or removal activities will not change regardless of the type and size of the pile. NMFS requires that at a minimum, the following information be collected by MMOs:

- 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 speed and direction, air temperature);
- Tide state and water currents;
- Visibility;
- Species, numbers, and if possible sex and age class of marine mammals;
- Marine mammal behavior patterns observed, including bearing and direction of travel, and if possible, the correlation to SPLs;

- Distance from pile driving activities to marine mammals and distance from the marine mammal to the observation point;
- Locations of all MMOs;
- Other human activity in the area.

The required data will be recorded by the MMOs on electronic database forms or paper datasheets. To the extent practicable, the MMOs will also record behavioral observations that may make it possible to determine if the same or different individuals are being “taken” as a result of Project activities over the course of a day. Marine species monitors will identify and document any occurrences of marine mammals, green sea turtles, or California least terns.

A dedicated monitoring coordinator will be available during all construction days. The monitoring coordinator will oversee the monitoring staff, including all acousticians and MMOs, and will serve as the liaison between the monitoring staff and the construction contractor to assist in the distribution of information.

The MMOs will monitor the Level A and B ZOIs before, during, and after all pile driving and demolition activities, except for dead-pull pile removal and plasma torch cutting methods, which will be monitored for mechanical interaction only. Marine mammal monitoring will include the following procedures:

- The MMOs will be located at the best vantage point(s) during in-water construction activities that allows them to see the entirety of the shutdown zones and as much of the Level B ZOIs as possible. The MMOs will primarily concentrate on monitoring the shutdown zones; however, monitoring of the disturbance zone will continue for actions that include a Level B ZOI, provided that it will not interfere with the effectiveness at sighting marine mammals in the shutdown zone. Depending on the pile location, the MMOs may be stationed on piers or docks near in-water construction activities, and/or in small vessels. The number of marine mammal observers will vary depending on the size and complexity of the shutdown and disturbance zones, as determined by the size and type of pile being installed or removed, or the activity type (i.e., pile driving or demolition activities);
- Observers shall record all incidences of marine mammal occurrence and behavioral observations using an approved paper-based or electronic data form;
  - Marine mammal observations shall include the following information:
    - Observer's location;
    - Location of the pile being driven;
    - Species, number of individuals (if more than one), sex, age class (if possible), distance to animal, bearing and direction of travel;
    - If acoustic monitoring is being conducted for that pile, a received SPL may be estimated, or the received level may be estimated based on past or subsequent acoustic monitoring; and
    - Photographs will be taken of non-IHA species, if possible.
  - Behavioral observations may include:
    - Changing durations of surfacing and diving, number of blows (cetaceans) per surfacing, moving direction and/or speed;

- Reduced/increased vocal activities of pinnipeds;
- Changing/cessation of certain behavioral activities (e.g., socializing or feeding);
- Visible startle response or aggressive behavior (e.g., tail/fluke slapping or jaw clapping);
- Avoidance of areas where sound sources are located;
- Flight responses (e.g., pinnipeds flushing into water from haul outs); and
- Increased haul out time and/or changes in vocalizations (pinnipeds)
- The following additional information should be collected on the data form:
  - Date and time that pile driving begins or ends;
  - Construction activities occurring during each observation period;
  - Weather parameters (e.g., percent cover, visibility);
  - Water conditions (e.g., sea state); and
  - Other human activity in the area;
- If a marine mammal approaches, or enters, the shutdown zone during construction or demolition operations, activities will be halted and delayed until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone, or 30 minutes (gray whales) and 15 minutes (all other marine mammals) has elapsed without a re-detection of the animal;
- During non-pile driving, in-water heavy machinery work with the potential to affect marine mammals shall cease and all project related vessels shall reduce speed to the minimum level required to maintain steerage and safe work conditions if marine mammals come within 10 m (33 ft);
- When there are two or more MMOs, all will be in radio communication with each other to enhance tracking of marine mammals that may be moving through the area and to minimize duplicate observation records of the same animal by different MMOs (i.e., a re-sighting);
- Marine species monitors may be co-located with the acoustic monitors;

### **3.2.2.1 Monitoring Protocols for Actions with Acoustic PTS Onset Thresholds**

- For in-water construction and demolition activities (i.e., impact and vibratory pile driving, pile clipping, caisson cutting, and pile jetting), monitoring will be conducted during daylight hours, no earlier than 45 minutes after sunrise and no later than 45 minutes before sunset. If lighting conditions do not allow MMOs to observe the Level A/B ZOIs effectively, construction will not be allowed to start (or continue) until conditions improve;
- Monitoring will be conducted before, during, and after the construction and demolition activities;
  - During all observation periods, the MMOs will use binoculars and/or the naked eye to search continuously for marine mammals;
  - Pile driving activities include the time to install a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than 30 minutes;
  - Monitoring will take place for 30 minutes after completion of pile driving or demolition activities.
- For all in-water construction and demolition activities with a calculated acoustic threshold, a minimum in-water protective shutdown zone of 10 m (33 ft) will be monitored;

- Prior to the start of pile driving or demolition activities, the shutdown and disturbance zones will be monitored for 15 minutes to ensure that driving will only commence once observers have declared the shutdown zone clear of marine mammals; animals will be allowed to remain in the shutdown zone (i.e., must leave of their own volition) and their behavior will be monitored and documented. The shutdown zone may only be declared clear, and pile driving or demolition started, when the entire shutdown zone is visible (i.e., when not obscured by a poor light, rain, fog, etc.). If the shutdown zones are obscured by fog or poor lighting conditions, activity at the location will not be initiated until that zone is visible. Should such conditions arise while pile driving or demolition is underway, the activity would be halted;
- Monitoring will take place for 30 minutes after completion of pile driving or demolition activities.

### **3.2.2.2 Monitoring Protocols for Actions with Only Mechanical Interaction Shutdown**

- For these in-water demolition activities (i.e., dead-pull pile extraction, plasma torch cutting), monitoring will be conducted from sunrise to sunset. If lighting conditions do not allow MMOs to observe the shutdown ZOI effectively, construction will not be allowed to start (or continue) until conditions improve;
- For all in-water construction and demolition activities without an acoustic threshold, a minimum in-water protective shutdown zone of 10 m (33 ft) will be monitored for potential mechanical interaction;
- The shutdown zone may only be declared clear, and demolition started, when the entire shutdown zone is visible (i.e., when not obscured by a poor light, rain, fog, etc.). If the shutdown zones are obscured by fog or poor lighting conditions, demolition at the location will not be initiated until that zone is visible. Should such conditions arise while demolition is underway, the activity would be halted;
- Monitoring will be only be conducted during these construction and demolition activities;
- Monitoring will not take place for 30 minutes after completion of these particular demolition activities;
- During all observation periods, the MMOs will use binoculars and/or the naked eye to search continuously for marine mammals.

### **3.2.2.3 Fuel Pier Demolition MMO Monitoring Locations**

Depending on the pile size and/or activity, at least one MMO will be used during all demolition activities (Figure 3-3). For the 30-inch pile temporary dolphin removal, caisson diamond saw cutting, pile jetting, and concrete pile clipping, one person will be responsible for the collection of activity start and stop times, as well as act as the MMO to identify all animals in the vicinity of the pile being removed. Table 3-1 shows the monitored airborne and underwater Level A/B ZOIs for all pile sizes and activity types based on representative pile locations.



Figure 3-3. Example of the Monitoring Locations for Demolition at the Fuel Pier.

The details below provide specific details on monitoring efforts associated with each pile size and type of activity:

### **Concrete Pile Clipping (All Sizes)**

- One MMO will be in place during pile clipping activities (Figure 3-3).
  - MMO will be positioned in a location to best observe the shutdown zone.
  - The MMO will use either verbal or visual communication procedures to stop active construction if an animal enters the shutdown zone for all pinnipeds and cetaceans (10 m [33 ft]).
  - The MMO will collect all species observations, as well as collect start and stop times of construction activities.

### **30-Inch Steel Pipe Pile (Plasma Torch Cutting)**

- One MMO will be in place during plasma torch cutting activities (Figure 3-3).
  - MMO will be positioned in a location to best observe the shutdown zone.
  - The MMO will use either verbal or visual communication procedures to stop active construction if an animal enters the shutdown zone for all pinnipeds and cetaceans (10 m [33 ft]).
  - The MMO will collect all species observations, as well as collect start and stop times of construction activities.

### **66-Inch and 84-Inch Caisson (Diamond Saw Cutting)**

- One MMO will be in place during caisson cutting activities (Figure 3-3).
  - MMO will be positioned in a location to best observe the shutdown zone.
  - The MMO will use either verbal or visual communication procedures to stop active construction if an animal enters the shutdown zone for all pinnipeds and cetaceans (10 m [33 ft]).
  - The MMO will collect all species observations, as well as collect start and stop times of construction activities.
  - If diamond saw cutting is occurring without any other construction activity, the MMO will monitor all areas within visual range of the action.

#### **3.2.2.4 NMAWC Construction and Demolition MMO Monitoring Locations**

Regardless of activity type, at least one MMO (“Command”) will be used during any construction or pile extraction activity (Figure 3-4). However, any action requiring the impact or vibratory hammer will necessitate two MMOs (“Command” plus an additional MMO). Depending on the pile location, a boat-based position may be used in lieu of a land-based MMO.

### **16-Inch Concrete Pile Extraction (Pile Jetting Method)**

- One MMO (“Command”) will be in place during pile extraction activities (Figure 3-4).
  - The MMO will remain in close proximity to the pile being extracted, and will log the activity start and stop times as well as act as an MMO. They will use either verbal or visual communication procedures to stop active construction if an animal enters the shutdown zone for pinnipeds and cetaceans (10 m [33 ft]).



### **16-Inch Concrete Pile Extraction (Dead-Pull Method)**

- One MMO (“Command”) will be in place during pile extraction activities (Figure 3-4).
  - If the contractor chooses to dead-pull the piles from the sediment, no acoustic thresholds apply, but the MMO will be monitoring for mechanical interaction, and will shut down the activity in the event any marine mammal or sea turtle enters the shutdown zone (10 m [33 ft]).
  - The MMO will remain in close proximity to the pile being extracted, and will log the activity start and stop times as well as act as an MMO. They will use either verbal or visual communication procedures to stop active construction if necessary.

### **16-Inch Concrete Pile Installation (Impact Pile Driving)**

- Two MMOs (one MMO and one “Command”) will be in place during pile driving activities (Figure 3-4).
  - One MMO will monitor the Level B ZOIs and will be positioned at a land- or water-based position, depending on the location of the pile being driven.
  - The “Command” position will remain near the pile being driven, and will log the activity start and stop times as well as act as an MMO monitoring the shutdown ZOI. They will use either verbal or visual communication procedures to stop active construction if an animal enters the shutdown zone for all cetaceans (100 m [328 ft]), or all pinnipeds (60 m [196 ft]).

### **16-Inch Concrete Pile Installation (Vibratory Pile Driving)**

- Two MMOs (one MMO and one “Command”) will be in place during pile driving activities (Figure 3-4).
  - One MMO will monitor the Level B ZOIs and will be positioned at a land- or water-based position, depending on the location of the pile being driven.
  - The “Command” position will remain near the pile being driven, and will log the activity start and stop times as well as act as an MMO monitoring the shutdown ZOI. They will use either verbal or visual communication procedures to stop active construction if an animal enters the shutdown zone for all cetaceans (20 m [65.6 ft]), or all pinnipeds (10 m [33 ft]).

#### **3.2.2.5 Concurrent Actions**

#### **Concurrent Actions Occurring at New Fuel Pier Location**

There is a possibility that an overlap of multiple demolition activities could occur at the old fuel pier location. If multiple demolition activities (e.g., diamond saw cutting, pile clipping) occur at the same time, then two MMO/“Command” positions would be in place, and both would have the ability to shutdown construction. Based on acoustic measurements of all Project in-water construction activities, and an understanding of sound propagation from those sources, the overall ZOI's for the Project area would not change.

### **Concurrent Actions Occurring Between Old Fuel Pier and NMAWC Locations**

Although unlikely, the possibility remains for construction and/or demolition activities to occur simultaneously at both Project locations. If multiple demolition activities (e.g., diamond saw cutting, pile clipping, or pile jetting) occur at the same time at both locations, each action would have independent MMO/"Command" positions. These positions would act independently, and would not need to relay sighting information to one another, as the Level B disturbance zones will not overlap. However, sightings of cetacean groups at one Project location that are moving towards the other Project location will be communicated among the MMOs, to increase the awareness of an incoming potential sighting.

In the unlikely event that jetting and vibratory pile driving occur at the same time at NMAWC, the action will be monitored as one sound source, with the shutdown or the Level B ZOIs associated with the louder of the two actions. Since jetting is more likely to occur as an independent action at NMAWC, *in-situ* acoustic recording of the jetting activity at NMAWC will be collected and analyzed to compare against source level data previously collected from jetting activities at the new fuel pier location.

In the event there are simultaneously occurring demolition activities at the old fuel pier location and pile installation (impact or vibratory pile driving) at the NMAWC site, the MMOs will be in contact with each other to communicate sightings. In this specific case, the Level B disturbance zones for these activities would overlap to a certain degree, and sightings occurring in the overlap zone will need to be individually tracked to properly assess potential Level B "take." In addition, and as previously noted, communication among the MMOs at the two Project locations will increase awareness of marine mammals potentially moving between the two locations.

## **4 ACOUSTIC MONITORING**

### **4.1 Objectives**

The primary purpose of acoustic monitoring during IHA #5 is to validate Level A and B ZOIs based on acoustic data collected during previous IHA monitoring efforts for the Project. The ZOIs were defined by acoustic thresholds established by NMFS, and each zone encompasses the area within the underwater or airborne threshold isopleths. NMFS (2016) acoustic thresholds for the onset of Permanent Threshold Shifts (PTS) for functional hearing groups of cetaceans and pinnipeds (Table 4-1) were used to calculate Level A ZOIs. Cetaceans and pinnipeds are divided into distinct functional hearing groups, with each group having a different received level (dB) that qualifies as the onset acoustic threshold for injury. The Navy has committed to a shutdown of pile driving when any marine mammal or green sea turtle is present within the defined Level A ZOIs. See definitions below:

1) Level A (injury) Zones

a) Underwater (Impulsive and Non-Impulsive)

Table 2-3 lists the new marine mammal functional hearing groups and associated SPL thresholds for PTS onset. For impact pile driving, rms is calculated over the period of the pulse that contains 90% of the acoustical energy (typically the time interval between 5 percent and 95 percent). For vibratory pile driving, rms refers to the SPL of the signal averaged over 10 seconds of continuous operation.

b) Airborne

There is no airborne injury threshold for marine mammals; only a behavioral disturbance threshold discussed below.

2) Level B (behavioral disturbance) Zones:

a) Underwater

The behavioral disturbance zone includes the area within the 160 dB rms isopleth for marine mammals during impact pile driving, and the 120 dB rms isopleth for marine mammals during vibratory pile driving. As the mean ambient sound levels in San Diego Bay are approximately 128 dB (NAVFAC SW 2015), and thus higher than the 120 dB regulatory threshold, the resulting 120 dB ZOIs will be adjusted upward based on this data. Shutdowns are not required for sightings within the Level B underwater zones.

b) Airborne

The distance to marine mammal disturbance thresholds will be measured. These are currently 90 dB re 20 $\mu$ Pa (unweighted) for harbor seals and 100 dB re 20 $\mu$ Pa (unweighted) for all other pinnipeds. Shutdowns are not required within the airborne zones.

## **4.2 Methods**

The acoustic component of this monitoring plan was developed by the Navy, taking into consideration the logistical, environmental, and security requirements for working in the Project area. During activities associated with IHA #5, acoustic monitoring will occur to verify distances to regulatory thresholds determined from previously collected data. For activities, such as the impact and vibratory pile driving of 16-in concrete piles at NMAWC, the Navy will use previously collected source data during driving of 16-inch round poly-concrete piles and 30-inch steel pipe piles, respectively, to initially position MMOs based on the calculated ZOIs (see Table 2-4). These data from previous IHA periods are the closest analog available to impact and vibratory driving of 16-inch concrete piles. Acoustic data will be collected *in-situ* during IHA #5 at the start of the installation of the 16-inch piles and results used to adjust the Level A and B ZOIs, if appropriate. In all likelihood, the contractor will choose either the vibratory or impact method, but if both methodologies are used, acoustic data will be collected for each method. Cumulative sound exposure levels ( $L_E$ ,  $1\mu\text{Pa}$ ) over a 24-hour period for all installation and demolition activities are expected to be below 188.9 dB ( $1\mu\text{Pa}^2\text{s}$ ) at the source. The Navy will continue to collect *in-situ* acoustic data to validate source SPLs and ZOI's for all construction and demolition activities. All acoustic monitoring stations will be located per NMFS (2012). Underwater acoustic monitoring will use the USLM acoustic data logger as the primary data collection device, and the Loggerhead DSG-ST as a secondary backup device. Dr. Peter Dahl of the University of Washington will be consulted on any acoustic issues, if needed.

### **4.2.1 Acoustic Data Collection**

When acoustic data is collected, hydro-acoustic and airborne monitoring stations will be located at source and graduated distances away from the in-water construction activities. For vibratory removal activities, the USLM system will be set to record and analyze vibratory SPLs. Vibratory pile driving is treated as a non-impulsive continuous sound source because it provides SPL over a given time frame. The real-time display of rms SPLs observed from the USLM system will be used to validate expected SPLs, determine Level A/B threshold distances, and refine monitoring locations. Collected acoustic data are considered as "sufficient" when the unique obtained values are demonstrated to be consistent over multiple recorded activities. Sufficient data provides substantiation that collected values fit within the modeled values for any specific pile across the total number of piles that are recorded for that type. Some Level B ZOIs were determined based on simplistic practical spreading loss models based on actual Project data. Table 4-1 lists the acoustic data that will be collected during the IHA #5 monitoring period.

**Table 4-1. Acoustic Data Collection Activities and Locations**

<i>Activity</i>	<i>Acoustic Recording Location</i>			
	<i>Underwater</i>		<i>Airborne</i>	
	<i>Source</i>	<i>Far-field</i>	<i>Source</i>	<i>Far-field</i>
<b><i>Old Fuel Pier and Temporary Mooring Dolphin Demolition</i></b>				
66-inch caissons (Diamond saw cutting)	X	N/A	N/A	N/A
Concrete piles <sup>1</sup> (Pile clipping)	N/A	X	N/A	N/A
30-inch steel piles (Plasma torch cutting)	N/A	N/A	N/A	N/A
<b><i>NMAWC Construction and Demolition</i></b>				
16-inch concrete piles (Vibratory extraction/driving)	X	X	X	X
16-inch concrete piles (Impact driving)	X	X	X	X
16-inch concrete piles (Jetting pile extraction)	X	X	N/A	N/A
16-inch concrete piles (Pile dead-pull)	N/A	N/A	N/A	N/A

Notes: N/A: Not applicable (No data recorded);

<sup>1</sup>Far-field acoustic data will only be collected during pile clipping of 24-in piles. Source data was previously recorded during IHA #3 (NAVFAC SW 2015) and IHA #4 (NAVFAC SW 2016b) and was deemed as sufficient.

Vessel-based platforms will be utilized opportunistically to allow for acoustic measurements to be collected at multiple locations based on the type and location of in-water construction activities. The exact locations will vary depending on whether impact or vibratory driving or removal is occurring. The number, locations, and methods of deployment will vary based on the targeted isopleths, measured results, and local knowledge of suitable locations that avoid conflict with Naval or civilian activities.

Hydrophone positions will be adjusted relative to the pile driving location to accommodate the projected distances to regulatory thresholds. Additional systems will be deployed from piers, barges, or anchored vessels at various locations along the predicted outer limits of the injury and behavioral ZOIs for pile installation or demolition.

Vessels will serve as marine species monitoring platforms for monitoring of removal activities, when pier or land-based observation is not sufficient to obtain an effective vantage point. If acoustic monitoring is completed for a specific event, vessels will remain on-site for the duration of the marine mammal monitoring effort. During all vessel-based recordings, the vessel will be anchored and the engine off. Recordings will be made for the duration of each individual pile. GPS positions will be logged for each recording position.

For acoustic recording sessions, reporting of SPLs and required reporting metrics will be based on post-processed data at the appropriate frequency range. Use of the USLM will be used to display an approximate real-time output of the sound pressure levels received by the hydrophone or microphone and validate Level A/B threshold distances.

In summary, acoustic monitoring includes the following components:

- Each hydrophone (underwater) and microphone (airborne) will be calibrated, if applicable, at the start of the monitoring time frame, and all applicable systems will be checked at the beginning of each day of monitoring activity;
- Environmental data will be collected including, but not limited to: wind speed and direction, air temperature, humidity, surface water temperature, water depth, wave height, weather conditions and other factors that could contribute to influencing the airborne and underwater sound levels (e.g., aircraft, boats, etc.); and
- The monitoring coordinator will supply the acoustics specialist with the start and stop times for the activity, hammer model and size, hammer energy settings, and any changes to those settings during the piles being monitored.

Hydro-acoustic specific:

- For underwater recordings, SLM systems will follow methods in accordance with NMFS most recent guidance (NMFS 2012) for the collection of source levels;
- For each monitored location, a hydrophone will be deployed at mid-depth to evaluate site specific attenuation and propagation characteristics;
- Hydro-acoustic monitoring will occur near the predicted ZOIs for Level A/B harassment ZOIs sufficient to document ZOI distances. Hydro-acoustic monitoring will be conducted for removal activities using diamond saw cutting of 66-inch caissons adjacent to the new fuel pier. The resulting data set will be analyzed to examine and confirm SPLs and rates of transmission loss for each separate in-water construction activity that was not sufficiently validated during previous IHA periods. With NMFS' concurrence, these metrics will, if needed, be used to recalculate the distances to the Level A and Level B isopleths, and to make corresponding adjustments in marine mammal monitoring of these zones;
- Hydrophones will be located to best assess the Level A/B ZOIs using a static line deployed from a pier or stationary (temporarily moored) or drifting vessel. Locations of acoustic recordings will be collected via GPS. A depth sounder and/or weighted tape measure will be used to determine the depth of the water at the hydrophone deployment site. The hydrophone will be attached to a weighted nylon cord to maintain a constant depth;
- The SPLs will be monitored in real-time by observing the rms variable on the USLM during each pile driving event. Acoustic data recordings will be post-processed to determine maximum SPLs. Sound levels will be measured in Pascals which are easily converted to dB; and

- Ambient underwater conditions will not be measured as part of this phase of the new fuel pier construction. Data from the previous three data collection cycles (IHA #1 [2013/2014], IHA #2 [2014/2015], and IHA #3 [2015/2016]), is sufficient to show that ambient conditions in San Diego Bay exceed the 120 dB rms regulatory threshold.

Airborne specific:

- For airborne recordings, to the extent that logistics and security allow, reference recordings will be collected at approximately 15 m (50 ft) from the source via a sound meter with integrated microphone (LD 831 SLM). Other distances may be utilized to obtain better data if the signal cannot be clearly isolated due to other sound sources (i.e., barges or generators); and
- Airborne levels will be recorded as unweighted in dB.

#### **4.2.1.1 Acoustic Monitoring Locations**

During 2017/2018 production pile driving, monitoring locations will initially be based on acoustic data analyzed for the greatest SPLs documented during previous production pile driving and demolition efforts. For all acoustic monitoring, data collection locations are based on the best professional judgment of the AT to obtain the necessary data. The measured Level A/B (injury/behavioral) thresholds presented in Table 2-4 are based on data collected from previous IHA years. Details of the acoustic data collection are provided below.

#### **4.2.1.2 Fuel Pier Demolition Acoustic Monitoring**

##### **66-Inch Concrete-Filled Steel Caisson (Diamond Saw Cutting)**

- The Navy will conduct acoustic monitoring at source on the removal of 66-inch caissons with a diamond belt saw, further validating the Level B ZOI (120 dB rms). This action will verify the SPL's are not higher than data collected on 84-inch caissons during IHA #4;
- The USLM will be used to collect real-time data to validate and adjust ZOIs, as needed;
- Placement of the hydrophones will be adjusted to minimize obstructions from construction materials or equipment;
- Airborne sound levels did not reach regulatory thresholds for diamond saw cutting during previous IHAs. As a result, no airborne data will be recorded for the diamond saw cutting during IHA #5; and

##### **30-Inch Steel Piles - Temporary Mooring Dolphin (Plasma Torch Cutting)**

- No underwater acoustic data will be collected during the removal of the 30-inch steel pipe piles at the temporary mooring dolphin since SPL's generated from plasma torch cutting do not exceed 120 dB rms;
- No airborne data will be collected during the removal of the temporary mooring dolphin;

#### **4.2.1.3 NMAWC Construction and Demolition Acoustic Monitoring**

##### **16-Inch Round Concrete Pile (Jetting Extraction)**

- If the contractor chooses to dead-pull the piles from the sediment, no acoustic monitoring will be performed.

- If the contractor uses a water jetting method, the Navy will conduct acoustic monitoring for removal of concrete guide piles to validate the Level A/B ZOIs;
- Initial monitored ZOIs will be based on the most conservative data from the IHA #4 monitoring report (NAVFAC SW 2017). If necessary, the ZOIs will be adjusted based on *in-situ* acoustic data collected at source at NMAWC. Based on data collected during IHA #4 (2016/2017) on 24x30 concrete pile jetting, the maximum source levels for pile installation were 160 dB rms, with an average of 155 dB rms. This data has been deemed as a sufficient starting point to calculate the Level A and B ZOIs for pile extraction (see Table 2-4);
- Placement of the hydrophones will be adjusted to minimize obstructions from construction materials or equipment.

#### **16-Inch Round Concrete Pile (Impact Pile Driving)**

- The Navy will conduct acoustic monitoring during installation of concrete guide piles to validate the Level A/B ZOIs;
- The USLM will be used to validate acoustic data collected during the IHA #3
- Initial monitored ZOIs will be based on data provided in the IHA #3 monitoring report (NAVFAC SW 2015) for 16-inch round poly-concrete impact pile driving, but may be refined based on new acoustic data; Based on data collected during IHA #3 (2015/2016), the maximum source levels for vibratory pile driving were 195 dB rms, with an average of 188.9 rms. All ZOIs will be adjusted, if necessary, based on *in-situ* acoustic data collected at source at NMAWC;
- One airborne sound monitoring station will be located at 15 m (50 ft) from the source. A second airborne data collection point will be positioned at varying distances from the source; and
- Placement of the hydrophones will be adjusted to minimize obstructions from construction materials or equipment.

#### **16-Inch Round Concrete Pile (Vibratory Pile Driving)**

- The Navy will conduct acoustic monitoring during installation of concrete guide piles to validate the Level A/B ZOIs;
- The USLM will be used to validate acoustic data collected during the IHA #2;
- Initial monitored ZOIs will be based on data provided in the IHA #2 monitoring report (NAVFAC SW 2015) for 30-inch steel vibratory pile driving, but may be refined based on new acoustic data; Based on data collected during IHA #2 (2014/2015), the maximum source levels for vibratory pile driving were 165 dB rms, with an average of 162.5 rms. All ZOIs will be adjusted, if necessary, based on *in-situ* acoustic data collected at source at NMAWC;
- One airborne sound monitoring station will be located at 15 m (50 ft) from the source. A second airborne data collection point will be positioned at varying distances from the source; and
- Placement of the hydrophones will be adjusted to minimize obstructions from construction materials or equipment.

## **5 ACTIVITIES ASSOCIATED WITH EACH SUBSEQUENT IHA**

The Navy will apply for subsequent IHAs, as necessary, to cover in-water construction and demolition activities scheduled for each production year (October 8 to October 7). Construction-related activities, including production pile driving for this IHA will start in October 2017. While completion of the Project is anticipated during the IHA #5 timeframe, any remaining demolition or production pile driving not completed under the current IHA would be monitored under a subsequent IHA. A subsequent IHA Application would summarize the estimated numbers and types of piles to be installed/extracted based on the progress made during the previous IHA period(s). Components associated with the construction/demolition would be evaluated and included as part of a subsequent IHA application, if applicable.

## **6 INTERAGENCY NOTIFICATION**

The Navy anticipates that the monitoring zones may be modified as a result of acoustic data obtained during the monitoring period, and to reflect other conditions related to construction/demolition activities and marine mammal species occurrence. In the event that the Navy needs to immediately modify terms of this monitoring plan (e.g., if source levels and measured isopleths differ substantially from modeled results), a NMFS representative will be promptly contacted for discussion of the requested modification.

In addition, if the Navy finds an injured, sick, or dead marine mammal, the Navy will notify NMFS as quickly as possible. The MMO who initially sighted the animal will notify the Navy Project biologist, who will inform the NBPL stranding coordinator of the injured, sick, or dead marine mammal. The NBPL stranding coordinator will then notify the NMFS west coast stranding coordinator of these sightings and a decision will be made on whether to collect the animal. If the marine mammal's condition is determined to be a direct result of the Project, additional notification would be made to NMFS headquarters (Ben Laws, 301-427-8425). The Navy will provide NMFS with a data sheet detailing 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. the MMO) has the responsibility to ensure that evidence associated with the specimen is not unnecessarily disturbed.

## **7 REPORTING**

A draft report will be submitted to NMFS within 45 calendar days of the completion of acoustic measurements and marine mammal monitoring. The results will be summarized in graphical and tabular formats and include summary metrics, as applicable. 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:
  - Date and time of activities.
  - Water conditions (e.g., sea-state, tidal state).
  - Weather conditions (e.g., percent cover, visibility).
- Specific pile data for acoustically monitored piles:
  - Description of the activities being conducted.
    - Size and type of piles.
    - The machinery used for installation or removal.
  - The power settings of the machinery used for installation or removal
- Specific acoustic monitoring information:
  - A description of the monitoring equipment.
  - The distance between hydrophone(s) and pile.
  - The depth of the hydrophone(s).
  - The physical characteristics of the bottom substrate where the piles were driven or extracted (if possible).
  - Acoustic data (per Section 4 above) for each monitored pile and activity.
- Pre-activity observational survey-specific data:
  - Dates and time survey is initiated and terminated.
  - Description of any observable marine mammal behavior 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 during monitoring.
  - 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 extraction 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 safety zones.
- A refined take estimate based on the number of marine mammals observed during the course of construction.

## **8 REFERENCES**

- NAVFAC SW. 2014. Naval Base Point Loma Fleet Logistics Center Fuel Pier Replacement Project: Acoustic, Marine Mammal, Green Sea Turtle, and California Least Tern Monitoring Report.
- \_\_\_\_\_. 2015. Naval Base Point Loma Fleet Logistics Center Fuel Pier Replacement Project: Acoustic, Marine Mammal, Green Sea Turtle, and California Least Tern Monitoring Report.
- \_\_\_\_\_. 2016a. Naval Base Point Loma Fleet Logistics Center Fuel Pier Replacement Project: Acoustic, Marine Mammal, Green Sea Turtle, and California Least Tern Monitoring Report.
- \_\_\_\_\_. 2016b. Naval Base Point Loma Fleet Logistics Center Fuel Pier Replacement Project: Acoustic, Marine Mammal, Green Sea Turtle, and California Least Tern Monitoring Report, Addendum.
- \_\_\_\_\_. 2017. Naval Base Point Loma Fleet Logistics Center Fuel Pier Replacement Project: Acoustic, Marine Mammal, Green Sea Turtle, and California Least Tern Monitoring Report. NMFS (National Marine Fisheries Service). 2012. Memorandum from NMFS Northwest Region and Northwest Fisheries Science Center to Interested Parties. Subject: Guidance Document: Data Collection Methods to Characterize Impact and Vibratory Pile Driving Source Levels Relevant to Marine Mammals. 31 January.
- \_\_\_\_\_. 2016. Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-55, 178 p.
- United States Navy (Navy). 2012. Incidental Harassment Authorization Application for the Navy's Fuel Pier Replacement Project at Naval Base Point Loma. Submitted to Office of Protected Resources, National Marine Fisheries Service, National Oceanographic and Atmospheric Administration. Update 1 – December 2012.
- \_\_\_\_\_. 2013a. Final Environmental Assessment, Naval Base Point Loma (NBPL) Fuel Pier Replacement and Dredging (P-151/DESC1306) San Diego, CA. Prepared by NAVFAC, June.
- \_\_\_\_\_. 2013b. Incidental Harassment Authorization Application for the Navy's Fuel Pier Replacement Project at Naval Base Point Loma. Submitted to Office of Protected Resources, National Marine Fisheries Service, National Oceanographic and Atmospheric Administration.
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Resources, National Marine Fisheries Service, National Oceanographic and Atmospheric Administration. June 2014.

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\_\_\_\_\_. 2016. Incidental Harassment Authorization Application for the Navy's Fuel Pier Replacement Project at Naval Base Point Loma. Submitted to Office of Protected Resources, National Marine Fisheries Service, National Oceanographic and Atmospheric Administration. August 2016.

\_\_\_\_\_. 2017. Incidental Harassment Authorization Application for the Navy's Fuel Pier Replacement Project at Naval Base Point Loma. Submitted to Office of Protected Resources, National Marine Fisheries Service, National Oceanographic and Atmospheric Administration. June 2017.