ANNUAL MARINE SPECIES MONITORING REPORT

2012

FOR THE

NAVAL SURFACE WARFARE CENTER

PANAMA CITY DIVISION (NSWC PCD)

STUDY AREA

Submitted To:

Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3226

In accordance with:

21 January 2012 Letter of Authorization
for NSWC PCD Mission Activities;
50 Code of Federal Regulations Part 218, Subpart S

September 2012

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LIST OF ACRONYMS AND ABBREVIATIONS

AMNS	airborne mine neutralization system
AMR	Adaptive Management Review
BO	Biological Opinion
BSS	Beaufort Sea State
CFR	Code of Federal Regulations
CNO	Chief of Naval Operations
DON	Department of the Navy
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FY	Fiscal Year
HFAS	High-frequency Active Sonar
hr	hour(s)
ICMP	Integrated Comprehensive Monitoring Program
ID	identification
ITA	Incidental Take Authorization
km	kilometer(s)
LMMO	liaison marine mammal observer
LO	lookout
LOA	Letter of Authorization
m	meter(s)
MFAS	Mid-frequency Active Sonar
MMO	marine mammal observer
MMPA	Marine Mammal Protection Act
N45	Environmental Readiness Division
nmi	nautical mile(s)
NMFS	National Marine Fisheries Service
NSWC PCD	Naval Surface Warfare Center Panama City Division
NUWCDIVNPT	Naval Undersea Warfare Center Division, Newport
OEIS	Overseas Environmental Impact Statement
OPAREA	Operating Area
OT	observation team
PAM	passive acoustic monitoring
RDT&E	research, development, test, and evaluation
SAG	Scientific Advisory Group
U.S.	United States
yd	yard(s)

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I. INTRODUCTION

Background

The United States (U.S.) Navy developed range-complex monitoring plans to provide marine mammal and sea turtle monitoring as required by the Final Rules issued by the National Marine Fisheries Service (NMFS) under the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA) of 1973. In order to issue an Incidental Take Authorization (ITA) for an activity, Section 101(A)(5)(A) of the MMPA states that NMFS must set forth "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 Code of Federal Regulations (CFR) Section 216.104(a)(13) note that requests for Letters of Authorization (LOAs) must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present. While the ESA does not have specific monitoring requirements, recent Biological Opinions (BOs) issued by NMFS also have included terms and conditions requiring the U.S. Navy to develop a monitoring program. In addition to range-complex monitoring plans, a monitoring plan for Naval Surface Warfare Center Panama City Division (NSWC PCD) mission activities was developed for protected marine species, primarily marine mammals and sea turtles, as part of the environmental planning and regulatory compliance process associated with a variety of research, development, test, and evaluation (RDT&E) activities. As part of the issuance of the NSWC PCD Mission Activities LOA in 2010 (NMFS 2010a), the U.S. Navy published the NSWC PCD Mission Activities Monitoring Plan (Department of the Navy [DON] 2010a).

Based on discussions with NMFS, range-complex and study-area monitoring plans were designed as collections of focused "studies" to gather data that will attempt to address the following questions, which are described more fully in the NSWC PCD Mission Activities Monitoring Plan:

1. What are the behavioral responses of marine mammals and sea turtles that are exposed to mid-frequency active sonar (MFAS)/high-frequency active sonar (HFAS) and explosives?
2. Is the U.S. Navy's suite of mitigation measures for MFAS/HFAS and explosives effective at avoiding injury and mortality of marine mammals and sea turtles?

Monitoring methods proposed for the NSWC PCD Study Area, similar to those in the range-complex monitoring plans, include a combination of research elements designed both to support study area-specific monitoring and to contribute information to a larger U.S. Navy-wide science-based program. These research elements include visual surveys from vessels or airplanes and passive acoustic monitoring (PAM), as well as U.S. Navy marine mammal observers (MMOs) aboard platforms participating in the test event. Each monitoring technique has advantages and disadvantages that vary temporally and spatially and supports one particular study objective better than another. The U.S. Navy uses a combination of techniques so that detection and observation of marine animals is maximized, and meaningful information can be derived to answer the research questions proposed above.

In addition to the NSWC PCD Mission Activities Monitoring Plan and the Fleet-funded Monitoring Plans described above, the Chief of Naval Operations (CNO) Environmental Readiness Division (N45) and the Office of Naval Research have developed coordinated Science & Technology and Research & Development programs focused on marine mammals and sound. Total investment in these programs for Fiscal Year (FY) 2012 was approximately $16 million, and continued funding at levels greater than $14 million is foreseen in subsequent years. Several significant projects relative to potential U.S. Navy operational impact to marine mammals are currently funded and ongoing within some U.S. Navy Range Complexes.

Integrated Comprehensive Monitoring Program

The Integrated Comprehensive Monitoring Program (ICMP) provides the overarching framework for coordination of the U.S. Navy Monitoring Program (DON 2009a, 2010b). It has been developed in direct response to U.S. Navy range permitting requirements established in the various MMPA Final Rules, ESA consultations (BOs), and applicable regulations. As a framework document, the ICMP applies by regulation to those activities on ranges and operating areas (OPAREAs) for which the U.S. Navy has sought and received ITAs.

The ICMP is intended for use as a planning tool to focus U.S. Navy monitoring priorities pursuant to ESA and MMPA requirements. Top priority will always be given to satisfying the mandated legal requirements across all ranges. Once legal requirements are met, any additional monitoring-related research will be planned and prioritized using guidelines provided by the ICMP, consistent with availability of both funding and scientific resources. As a planning tool, the ICMP is a "living document" and will be routinely updated as needed. Initial areas of focus for improving U.S. Navy marine species monitoring in 2011/2012 focused on development of a Strategic Plan to be incorporated as a major component of the ICMP to guide investments and help refine specific monitoring actions to more effectively and efficiently address ICMP goals and objectives.

The ICMP is evaluated annually through the Adaptive Management Review (AMR) process to: (1) assess progress, (2) provide a matrix of goals for the following year, and (3) make recommendations for refinement and analysis of the monitoring and mitigation techniques. This process includes conducting an annual AMR at which the U.S. Navy and NMFS jointly consider the prior-year goals, monitoring results, and related scientific advances to determine if modifications are needed to more effectively address monitoring program goals. Modifications to the ICMP that result from AMR decisions are incorporated by an addendum or revision to the ICMP. Official ICMP updates are provided to NMFS by 31 December annually (e.g., DON 2010b).

Under the ICMP, monitoring measures prescribed in range-/project-specific monitoring plans and U.S. Navy-funded research relating to the effects of U.S. Navy testing activities on marine protected species should be designed to accomplish one or more of the following top-level goals, as currently prescribed in the most recent (i.e., 2010) ICMP update (DON 2010b):

a) An increase in our understanding of the likely occurrence of marine mammals and/or ESA-listed marine species in the vicinity of the action (i.e., presence, abundance, distribution, and/or density of species).

b) An increase in our understanding of the nature, scope, or context of the likely exposure of marine mammals and/or ESA-listed species to any of the potential stressor(s) associated with the action (e.g., sound, explosive detonation, or expended materials), through better understanding of one or more of the following: (1) the nature of the action and its surrounding environment (e.g., sound source characterization, propagation, and ambient noise levels); (2) the affected species (e.g., life history or dive patterns); (3) the likely co-occurrence of marine mammals and/or ESA-listed marine species with the action (in whole or part); and/or (4) the likely biological or behavioral context of exposure to the stressor for the marine mammal and/or ESA-listed marine species (e.g., age class of exposed animals or known pupping, calving, or feeding areas).

c) An increase in our understanding of how individual marine mammals or ESA-listed marine animals respond (behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible, e.g., at what distance or received level).

d) An increase in our understanding of how anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either: (1) the long-term fitness and survival of an individual; or (2) the population, species, or stock (e.g., through effects on annual rates of recruitment or survival).

e) An increase in our understanding of the effectiveness of mitigation and monitoring measures, including increasing the probability of detecting marine mammals (through improved technology or methodology), particularly within the safety zone (thus allowing for more effective implementation of the mitigation), to better achieve the above goals. Improved detection technology resulting from these goals will be rigorously and scientifically validated prior to being proposed for mitigation, and meet practicality considerations (e.g., engineering, logistic, fiscal).

f) A better understanding and record of the manner in which the authorized entity complies with the ITA and BO.

CNO N45 maintains and updates the ICMP, as necessary, reflecting the results of current regulatory agency rulemaking, AMRs, best available science, improved assessment methodologies, and more effective protective measures. This is done in consultation with U.S. Navy technical experts, Fleet Commanders, and Echelon II Commands as appropriate, and as part of the AMR process. The ICMP (updated in December 2010) is provided in **Appendix A**.

Report Objective

The design of the NSWC PCD Mission Activities Monitoring Plan represented part of a new U.S. Navy-wide and regional assessment, and as with any new program, there are many coordination, logistic, and technical details that continue to be refined. The scope of the range-complex monitoring plans was to lay out the background for monitoring and define initial procedures to be used in meeting certain study objectives derived from NMFS-U.S. Navy agreements.

The main objective of this report is to present information on U.S. Navy-funded marine mammal and sea turtle monitoring conducted in the NSWC PCD Study Area under the NSWC PCD Mission Activities LOA during the period from 2 August 2011 to 1 August 2012. Due to the reporting requirements that extend from August 2011 to August 2012, this report covers a time period that includes the last half of the previous year's LOA (2 August 2011 to 21 January 2012) as well as the first half of the current year's LOA (22 January 2012 to 1 August 2012). Primary focus over the first years of the monitoring program has been on establishing initial monitoring commitments, refining data-collection efforts, and overall organization and coordination of the U.S. Navy-wide monitoring program. This report will focus on summarizing collected data and providing a brief description of the major accomplishments from techniques used this year.

This report has been prepared in accordance with the requirements of the MMPA regulations (NMFS 2010b [50 C.F.R. §§ 218.184]) and the LOA for NSWC PCD Mission Activities (NMFS 2010a [Section 7]; NMFS 2011, NMFS 2012).

II. NSWC PCD MISSION ACTIVITIES

The NSWC PCD Study Area includes military warning areas W-151 (includes Panama City OPAREA), W-155 (includes Pensacola OPAREA), and W-470 (**Figure 1**), and additionally St. Andrew Bay (**Figure 2**). The NSWC PCD RDT&E activities may be conducted anywhere within the existing military warning areas and St. Andrew Bay from the mean high-water line (average high-tide mark) out to 222 kilometers (km) (120 nautical miles [nmi]) offshore.

Thirty species of marine mammals potentially occur in the NSWC PCD Study Area. These species include whales, dolphins, and the manatee. Twenty-four species regularly occur here and were evaluated in the NSWC PCD Mission Activities Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) (DON 2009b). All marine mammals are afforded protection under the MMPA. Of the 24 common marine mammal species, the sperm whale (*Physeter macrocephalus*) and the West Indian manatee (*Trichechus manatus*) are also protected under the ESA. Additionally, five species of threatened or endangered sea turtles can be found in the NSWC PCD Study Area: leatherback turtle (*Dermochelys coriacea*); loggerhead turtle (*Caretta caretta*); green turtle (*Chelonia mydas*); hawksbill turtle (*Eretmochelys imbricata*); and Kemp's ridley turtle (*Lepidochelys kempii*). The distribution and habitat preferences of these protected marine species are reviewed in the U.S. Navy's Marine Resources Assessment for the Gulf of Mexico (DON 2007).

NSWC PCD Mission Activities Monitoring Plan Accomplishments

NSWC PCD Study Questions Overview

The goal of the NSWC PCD Mission Activities Monitoring Plan is to implement field methods chosen to address the long-term monitoring objectives outlined on page 4 of this document. In the NSWC PCD Mission Activities Monitoring Plan (DON 2010a; **Appendix B**), the U.S. Navy proposed to implement a variety of field methods to gather monitoring data on marine mammals and sea turtles in the NSWC PCD Study Area. Specifically, the U.S. Navy proposed to use visual surveys (aerial or vessel); to deploy PAM devices when possible; and to put MMOs aboard U.S. Navy vessels to meet its goals for the NSWC PCD Monitoring Program for RDT&E activities that involve underwater explosive detonations, projectile firing, and sonar testing. Studies were specifically designed to address the questions outlined on pages 2 and 3 of this document**. Table 1** shows the FY 2012 monitoring objectives agreed upon by NMFS and the U.S. Navy from the NSWC PCD Mission Activities Monitoring Plan (DON 2010a; **Appendix B**).

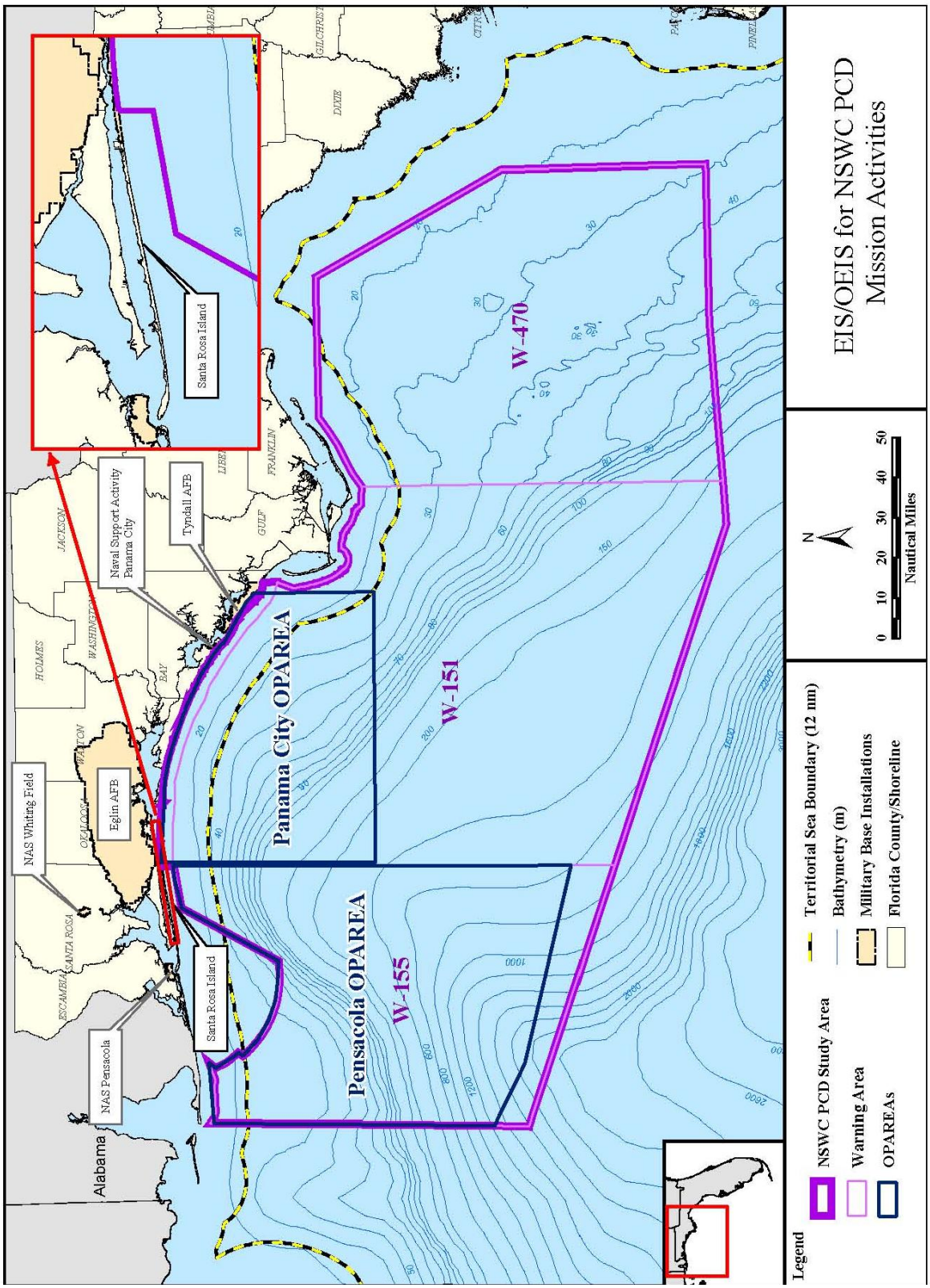

Figure 1. NSWC PCD Study Area: Gulf of Mexico.

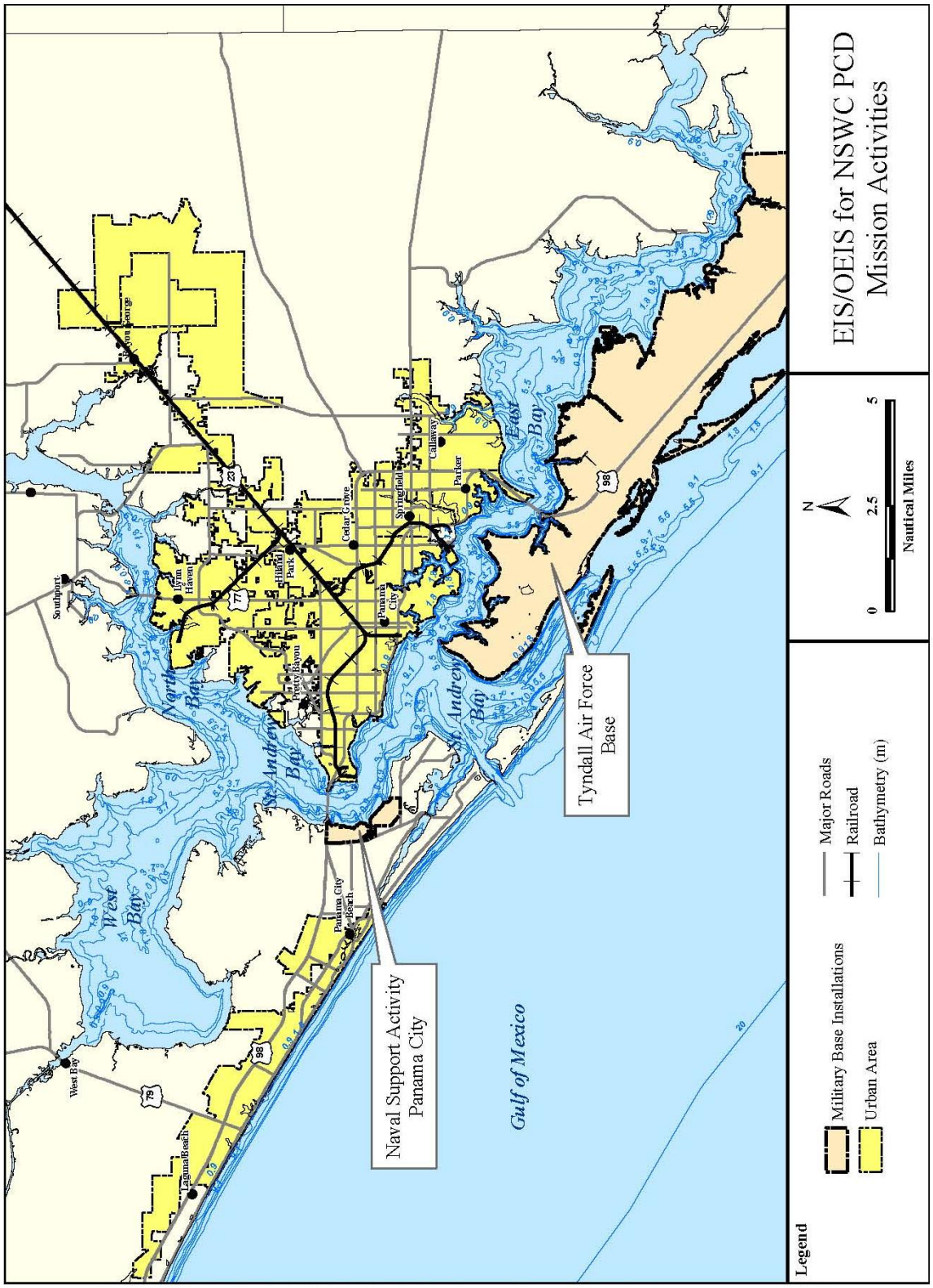

Figure 2. NSWC PCD Study Area: Nearshore and St. Andrew Bay.

Table 1. Monitoring Commitments under NSWC PCD Final Rule, LOA, and BO for FY 2011-2014.

	Monitoring Commitments	FY 2012 Status
STUDY 1 (behavioral responses)		
Aerial or Vessel Surveys	2 sonar activities and 2 explosive events per year	Completed 2 sonar events; completed 2 explosives events
Marine Mammal Observers (MMOs)	1 explosive event per year	Completed 4 explosives events
STUDY 2 (mitigation effectiveness)		
MMO/Lookout Comparison	1 explosive event per year	MMOs conducted 4 explosives events
Vessel or Aerial Surveys Before And After Test Events	2 sonar activities and 2 explosive events per year	Completed 2 sonar events; completed 2 explosives events

III. NSWC PCD MONITORING ACCOMPLISHMENTS FOR THE REPORTING PERIOD

During the 2 August 2011–1 August 2012 reporting period, NSWC PCD implemented the Mission Activities Monitoring Plan as part of the second full year of monitoring since the January 2010 promulgation of the NSWC PCD Mission Activities LOA. Major accomplishments from the 2011-2012 compliance monitoring in the NSWC PCD Study Area included the completion of aerial surveys before, during, and after two sonar test events; one aerial survey before, during, and after one live-inert detonation test event; and one vessel survey before, during, and after one live-inert detonation test event. NSWC PCD also incorporated MMOs into the AN/AQS-20 sonar test events from January 2012 to August 2012.

Monitoring During Test Events

Monitoring events are one of the primary components being used to address specific monitoring questions posed in the NSWC PCD Mission Activities Monitoring Plan (**Appendix B**) and to fulfill the requirements of the NMFS-issued LOA for RDT&E activities that involve underwater detonations, sonar systems, and projectile firing. NSWC PCD conducted monitoring during two tests of the AN/AQS-20 sonar system during the reporting period. The AN/AQS-20 is an HFAS mine-hunting system. Additionally, NSWC PCD executed monitoring during two tests of the airborne mine neutralization system (AMNS), which included live-inert detonations in the NSWC PCD Study Area.

Aerial Surveys for Sonar Test Events

NSWC PCD conducted aerial monitoring surveys for two back-to-back tests of the AN/AQS-20 sonar system during the recording period. A summary of survey effort and sightings is provided in **Table 2**. Complete survey and sighting details for the test events are included in **Appendix C**. Observers searched for and subsequently recorded any observed cetacean and sea turtle species during pre-test, during-test, and post-test monitoring for both sonar events. No stranded or injured marine mammals or sea turtles were observed during either aerial monitoring effort.

- Aerial monitoring was conducted 20-26 May 2012 in good to fair sighting conditions, with all sightings made in Beaufort Sea States (BSS) from 1 to 4. The monitoring included two flights before the first AN/AQS-20 sonar system test event; one flight during the first AN/AQS-20 sonar system test event; one flight after the first AN/AQS-20 sonar system test event and before the second AN/AQS-20 sonar system test event; one flight before the second AN/AQS-20 sonar system test event; one flight during the second AN/AQS-20 sonar system test event; and one flight after the second AN/AQS-20 sonar system test event (**Appendix C**). Observers visually surveyed 2,578 km (1,392 nmi) of systematic (on-effort) trackline and 3,983 km (2,151 nmi) of total trackline (including the systematic transects, cross-legs between transects, and circling for focal follows or species identification [ID]) during 7 days for approximately 21 hours (hr) of total survey effort (combined on- and off-effort). Twenty cetacean sightings were recorded, including 10 sightings of bottlenose dolphins, 4 sightings of Atlantic spotted dolphins, and 6 sightings of unidentified dolphins. Cetacean sightings included

observations before, during, and after AN/AQS-20 sonar system test events. There were 156 sea turtle sightings, including 91 sightings of loggerhead turtles, 29 sightings of leatherback turtles, 4 sightings of Kemp's ridley turtles, and 32 sightings of unidentified hard shell turtles. Sea turtle sightings included observations before, during, and after AN/AQS-20 sonar system test events. There were also 2 sightings of hammerhead sharks (*Sphyrna* spp.), 6 sightings of unidentified sharks, and 1 sighting of an unidentified ray. Focal follows to collect behavioral data were attempted during 12 sightings including seven focal follows with bottlenose dolphins (*Tursiops truncatus*), four focal follows with Atlantic spotted dolphins (*Stenella frontalis*), and one attempted focal follow with unidentified species of dolphins.

Table 2. On-Effort Visual Aerial Survey and Marine Mammal and Sea Turtle Observation Summary for AN/AQS-20 Sonar System Tests During May 2012 in the NSWC PCD Study Area.

Date	Distance Surveyed (km [nmi])[1]	Time Surveyed (hr)[1]	Cetacean Sightings (*n*)	Total Number of Individual Cetaceans Sighted (*n*)	Sea Turtle Sightings (*n*)	Total Number of Individual Sea Turtles Sighted (*n*)
20-May-2012 (pre-test)	317 (171)	1.7	1	9	18	19
21-May-2012 (pre-test)	341 (184)	1.7	1	25	6	6
22-May-2012 (during-test)	324 (175)	1.7	4	12	26	26
23-May-2012 (post-/pre-test)	343 (185)	1.7	2	29	21	21
24-May-2012 (pre-test)	308 (166)	1.7	6	59	35	36
25-May-2012 (during-test)	633 (342)	3.2	3	5	30	30
26-May-2012 (post-test)	313 (169)	1.8	3	43	20	22
Totals	2,579 (1,392)	13.5	20	182	156	160

Note: [1]Values are rounded.

Aerial Surveys for Detonation Test Events

NSWC PCD conducted one aerial monitoring survey for tests of the AMNS system during the recording period. A summary of survey effort and sightings is provided in **Table 3**. Complete survey and sighting details for the test events are included in **Appendix D**. Observers searched for and subsequently recorded any present cetacean and sea turtle species during pre-test, during-test, and post-test monitoring for the live-inert test event. No stranded or injured marine mammals or sea turtles were observed during this aerial monitoring effort.

- Aerial monitoring was conducted 19-22 October 2011 in good to fair sighting conditions, with all sightings made in BSS from 3 to 4. The monitoring included two flights before the AMNS test event; one flight during the AMNS test event; and one flight after the

AMNS test event (**Appendix D**). Observers visually surveyed 1,768 km (955 nmi) of systematic (on-effort) trackline and 2,390 km (1,291 nmi) of total trackline (including the systematic transects, cross-legs between transects, and circling for focal follows or species identification) during 4 days for approximately 12 hours of total survey effort (combined on- and off-effort). Four cetacean sightings were recorded, including two sightings of bottlenose dolphins and two sightings of Atlantic spotted dolphins. Cetacean sightings included observations during the AMNS test event. There were 25 sea turtle sightings, including 19 sightings of loggerhead turtles and 6 sightings of unidentified hard shell turtles. Sea turtle sightings included observations during and after the AMNS test event. Focal-follow behavioral data were collected during two sightings, including one focal follow with Atlantic spotted dolphins and one focal follow with bottlenose dolphins.

Table 3. On-Effort Visual Aerial Survey and Marine Mammal and Sea Turtle Observation Summary for AMNS System Tests Involving Detonations During October 2011 in the NSWC PCD Study Area.

Date	Distance Surveyed (km [nmi])[1]	Time Surveyed (hr)[1]	Cetacean Sightings (*n*)	Total Number of Individual Cetaceans Sighted (*n*)	Sea Turtle Sightings (*n*)	Total Number of Individual Sea Turtles Sighted (*n*)
19-October-2011 (pre-test)	314 (170)	1.5	0	0	0	0
20-October-2011 (pre-test)	335 (181)	1.6	0	0	0	0
21-October-2011 (during-test)	621 (335)	3.3	4	76	15	16
22-October-2011 (post-test)	498 (269)	2.5	0	0	10	10
Totals	1,768 (955)	8.9	4	76	25	26

Note: [1]Values are rounded.

Vessel and Passive Acoustic Monitoring (PAM) Surveys for Detonation Test Events

NSWC PCD conducted one vessel monitoring and PAM survey for tests of the AMNS system involving detonations during the recording period. A summary of visual survey effort and sightings is provided in **Table 4** and a summary of PAM survey effort is provided in **Table 5**. Complete survey and sighting details for the test events are included in **Appendix E**. Observers searched for and subsequently recorded any present cetacean and sea turtle species during pre-test, during-test, and post-test monitoring for the live-inert test event. No stranded or injured marine mammals or sea turtles were observed during this vessel monitoring effort.

- Vessel monitoring was conducted 5-10 December 2011 in good to fair sighting conditions, with all sightings made in BSS from 1 to 4. No monitoring was conducted on 7 December 2011 due to poor weather conditions. The monitoring included 3 days before the AMNS test event; 1 day during the AMNS test event; and 1 day after the

AMNS test event (**Appendix E**). Observers visually surveyed 386 km (208 nmi) of systematic (on-effort) trackline and 471 km (254 nmi) of total trackline during 5 days for approximately 31.6 hr of total survey effort (combined on- and off-effort). Four cetacean sightings were recorded, including one sighting of bottlenose dolphins and three sightings of Atlantic spotted dolphins. Cetacean sightings included observations before the AMNS test event. There were five sea turtle sightings, including two sightings of loggerhead turtles and three sightings of unidentified hard shell turtles. Sea turtle sightings included observations before and during the AMNS test event. Focal-follow behavioral data were collected during two sightings, including one focal follow with Atlantic spotted dolphins and one focal follow with bottlenose dolphins.

- A PAM survey, using a towed hydrophone array, was also conducted 5-10 December 2011. Three acoustic detections were made on 8 December 2011 during pre-test monitoring. Acoustic detections included one detection of one lone bottlenose dolphin and two detections of Atlantic spotted dolphins. No acoustic detections were made on 5-7 December 2011 during pre-test monitoring, on 9 December 2011 during the AMNS test event, or on 10 December 2011 during post-test monitoring (**Table 5**).

Table 4. On-Effort Visual Vessel Survey and Marine Mammal Observation Summary for AMNS System Tests Involving Detonations During December 2011 in the NSWC PCD Study Area.

Date	Distance Surveyed (km [nmi])[1]	Time Surveyed (hr)[1]	Cetacean Sightings (*n*)	Total Number of Individual Cetaceans Sighted (*n*)	Sea Turtle Sightings (*n*)	Total Number of Individual Sea Turtles Sighted (*n*)
5-December-2011 (pre-test)	73 (39)	5.1	1	4	0	0
6-December-2011 (pre-test)	158 (85)	10.1	0	0	3	3
7-December-2011 (cancelled due to inclement weather)	0 (0)	0	0	0	0	0
8-December-2011 (pre-test)	39 (21)	2.7	3	29	0	0
9-December-2011 (during-test)	116 (63)	8.0	0	0	2	2
10-December-2011(post-test)	0 (0)	0	0	0	0	0
Totals	386 (208)	25.9	4	33	5	5

Note: [1]Values are rounded.

Table 5. On-Effort PAM Survey and Marine Mammal Observation Summary for AMNS System Tests Involving Detonations During December 2011 in the NSWC PCD Study Area.

Date	Distance Surveyed[1, 3] (km [nmi])	Time Surveyed[2, 3] (hr)	Cetacean Detections (*n*)
5-December-2011 (pre-test)	68 (36)	4.6	0
6-December-2011 (pre-test)	137 (74)	9.3	0
7-December-2011 (cancelled due to inclement weather)	0 (0)	0	0
8-December-2011 (pre-test)	48 (26)	3.2	3
9-December-2011 (during-test)	111 (60)	7.5	0
10-December-2011(post-test)	73 (39)	4.9	0

Notes:

[1]Total Survey Minutes reflect all minutes within and outside of the AMNS survey area and include all minutes while the hydrophone array was monitored.

[2]Transect lines were only 6-11 km (3-6 nmi) long. Therefore, these numbers reflect the vessel going back and forth in a small box. Average vessel speed was 15 km/hr (8 knots). These numbers reflect that average.

[3]Values are rounded.

NSWC PCD MMO Activities

U.S. Navy MMOs participated in 23 days of AN/AQS-20 sonar test events during RDT&E activities that extended intermittently from 12 January 2012 through 1 August 2012, and in 4 days of AMNS detonation events during RDT&E activities that occurred on 21 October 2011, 28 October 2011, 2 November 2011, and 9 December 2011. MMOs conducted visual observations from the bridges of the vessels conducting sonar tests involving the AN/AQS-20 system and conducting detonations in conjunction with AMNS tests. Effort and environmental information was only collected when MMOs began observing (i.e., "on-effort"). The MMOs spent nearly 63 hours searching for marine species during the sonar and detonation events. The number of observers during the on-effort hours depended on the vessel size used to support the test event. AN/AQS-20 sonar activities on the Research Vessels Athena I and Athena II incorporated two MMOs, while mine countermeasure operations used a small support craft, and only one MMO was required. During detonation events, two MMOs were stationed on the Athena I and one MMO was stationed on each of the smaller participating vessels. The naval MMO effort comprised a total of just over 90 hours (hr) of shipboard monitoring for marine protected species. For each day at sea, approximately 2 to 7 hr were spent on-effort. **Table 6** summarizes U.S. Navy MMO sighting data from the test events, while **Appendix F** provides further details on those recorded sightings.

Table 6. U.S. Navy MMO Sighting Data from Sonar and Detonation Test Events in the NSWC PCD Study Area.

Species	Number of MMO Sightings	Group Size
Atlantic spotted dolphin (*Stenella frontalis*)	10	1-12
Bottlenose dolphin (*Tursiops truncatus*)	2	3-20
Unidentified dolphin species	6	1-3
Green turtle (*Chelonia mydas*)	1	1
Leatherback turtle (*Dermochelys coricea*)	1	1
Loggerhead turtle (*Caretta caretta*)	2	1
Unidentified hard shell turtle	9	1
Total	**31**	

Note: *Detailed sighting information is included in **Appendix F**

Navy Lookout Effectiveness Study

The U.S. Navy undertakes monitoring of marine mammals and sea turtles during RDT&E events and has mitigation procedures designed to minimize risk to these animals. One key component of this monitoring and mitigation is the shipboard lookouts (LOs, also known as watchstanders), who are part of the standard operating procedure that ships use to detect marine species within a specific area around the ship during events. The LOs are an element of monitoring requirements specified by NMFS in the LOAs. The goal is to detect mammals entering standoff ranges of 183, 457, and 914 meters (m) (200, 500 and 1,000 yards [yds]) around the vessel, which correspond to horizontal distances at which various mitigation actions should be performed. In addition to LOs, personnel on the bridge search visually during RDT&E events. We refer to all of these observers together as the observation team (OT). The aim of the study by the U.S. Navy is to determine the OT effectiveness in terms of detecting and identifying marine mammals. The goals are to determine the probability of an animal entering a defined range of the vessel without being observed by the OT and to determine the accuracy of the OT in determining species type (whale or dolphin), group size, and position. To achieve this, experienced MMOs search and collect information on marine mammals that both they and the OT detect.

A summary of the work conducted by the U.S. Navy-wide ICMP on effectiveness and in which NSWC PCD anticipates participating as part of the requirements during proposed detonations is provided in the following paragraphs. Work was previously conducted to design and test a protocol for determining the effectiveness of the LOs in visually detecting marine mammals. The field protocol for the experiments was developed in consultation with members of the Naval Undersea Warfare Center Division, Newport (NUWCDIVNPT); U.S. Fleet Forces; Naval Facilities Engineering Command; Commander, U.S. Pacific Fleet; and NMFS. The basic concept is that trained MMOs are situated onboard a vessel during daylight at-sea RDT&E

events, in locations where they can watch for marine mammals and communicate with one another, but not cue the LO. The MMOs then conduct opportunistic trials, where they detect a surfacing of a marine mammal at a measured location, and record whether that surfacing was also detected (a successful trial) or not (an unsuccessful trial) by the LO.

It was found to be necessary to have an additional "liaison" MMO (LMMO) stationed with the LO, and in communication with the other MMOs, to help report when and where LOs detected surfacings. It was also necessary to have an additional team member tasked solely with data recording. In addition to recording surfacing events, MMOs attempted to keep track of which surfacings belonged to the same school or animals. The revised protocol (Burt and Thomas 2010; **Appendix G**) was applied to one further at-sea exercise (off Southern California), making four datasets in total.

In parallel with field protocol development, methods have been developed for using the data generated by these experiments to estimate the probability of animals entering the stand-off range undetected. Intermittent availability models are necessary because many marine mammals remain below the surface for significant periods during dives. The extended methods only use information about the location of LO detections. The methods could conceivably be extended further to incorporate additional information from the MMO/LO trials.

During this reporting period a new analysis method has been developed and tested that allows estimation of the probability of animals approaching to within a specified stand-off range without being detected (the "sneak-up probability"). The method is flexible in allowing for a variety of animal surfacing behaviors: "clustered instantaneous," where animal surfacings last just for an instant, but where these surfacings are clustered together in time, interspersed between extended periods underwater; "intermittent," where animals are at the surface for longer periods between dives; and "continuous," where one or more member of each animal group is always at the surface. The method models detection probability in two dimensions (forward of and perpendicular to the vessel), and can model both LO and MMO detections, although it is also possible to focus just on the LO detection probabilities. This method has been tested on simulated data and found to perform satisfactorily for large sample sizes, however the sample size of real data collected from trials to date is insufficient for reliable inferences to be drawn at this time.

Recommendations for future data-collection efforts are to focus on a single vessel type and an area where the number of trials-per-cruise is likely to be maximized. Resources would be devoted to extending the intermittent-availability models so that they use both the locations of observed animals and the outcomes of the MMO trials, thereby unifying the models developed to date for instantaneous and intermittent availability.

Major accomplishments related to this project to date include initial development of data-collection protocols and analytic methods, performance of data-collection trials, completion of a proof-of-concept for detection functions, consultation with NMFS technical staff for input on analysis methods, and investment in continued refinement of the analytic methods and focus on additional data collection in 2011/2012.

IV. ADAPTIVE MANAGEMENT RECOMMENDATIONS

Adaptive management is an iterative process of optimal decision-making in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring and feedback. Within the natural resource management community, adaptive management involves ongoing, real-time learning and knowledge creation, both in a substantive sense and in terms of the adaptive process itself. Adaptive management focuses on learning and adapting, through partnerships of managers, scientists, and other stakeholders. Adaptive management helps managers maintain flexibility in their decisions, knowing that uncertainties exist, and provides managers the latitude to change direction so as to improve understanding of ecological systems to achieve management objectives. Taking action to improve progress toward desired outcomes is another function of adaptive management.

A 2010 U.S. Navy-sponsored monitoring meeting in Arlington, Virginia initiated a process to critically evaluate the current U.S. Navy monitoring plans and begin development of revisions/updates to both existing region-specific plans and the ICMP. Discussions at that meeting, and at the U.S. Navy/NMFS annual adaptive management meeting in October 2010, established a way forward for continued refinement of the U.S. Navy's monitoring program. This process included establishing a Scientific Advisory Group (SAG) composed of leading marine mammal scientists, with the initial task of developing recommendations that would serve as the basis for a Strategic Plan for U.S. Navy monitoring. The Strategic Plan (in development) is intended to be a primary component of the ICMP and to provide a "vision" for U.S. Navy monitoring across geographic regions—serving as guidance for determining how to most efficiently and effectively invest the marine species monitoring resources to both address ICMP top-level goals and satisfy MMPA (LOA) regulatory requirements. The objectives of the Strategic Plan will be to continue evolution of U.S. Navy marine-species monitoring toward a single integrated program, incorporating SAG recommendations, and to establish a more transparent framework for soliciting, evaluating, and implementing monitoring work across Fleet Range Complexes. The Strategic Plan is currently being developed in coordination with input from NMFS Headquarters and the Marine Mammal Commission and will establish the process for soliciting, reviewing, and selecting the most appropriate monitoring projects in which to invest in across the U.S. Navy. It is anticipated that some current efforts will continue, but the level of effort and investment may be allocated differently across U.S. Navy ranges and study areas.

Originally, five study questions were developed between NMFS and the U.S. Navy as guidance for developing monitoring plans, and all existing range-specific monitoring plans attempted to address each of these study questions. However, the state of knowledge for the various U.S. Navy Range Complexes is not equal, and many factors, including level of existing information, amount of training activity, accessibility, and available logistics resources, all contribute to the ability to perform particular monitoring activities. In addition, the U.S. Navy monitoring program has historically been compartmentalized by Range Complex and focused on effort-based metrics (survey days, trackline covered, etc.).

The U.S. Navy officially established the SAG in 2011 with the initial task of evaluating current monitoring approaches under the ICMP and existing LOAs to develop objective scientific

recommendations that would form the basis for the Strategic Plan. While recommendations were fairly broad and not prescriptive from a range complex/study area perspective, the SAG provided specific programmatic recommendations that serve as guiding principles for the Strategic Plan development. The SAG provided three general recommendations that apply broadly across the U.S. Navy's monitoring program and are relevant to the NSWC PCD Mission Activities Monitoring Plan:

- Dispensing with the previous broad "study questions" and instead working within a conceptual framework of knowledge, from basic information on the occurrence of species within each range complex/study area, to more specific matters of exposure, response, and consequences.
- Striving to move away from a "box-checking" mentality and towards design of monitoring studies according to scientific objectives rather than cataloging effort expended.
- Approaching the U.S. Navy Marine Species Monitoring Program holistically and selecting projects that offer the best opportunity to advance understanding of the issues, as opposed to establishing range- and study area-specific requirements.

In June 2011, the U.S. Navy hosted a Marine Mammal Monitoring Workshop with guidance and support from NMFS, which included scientific experts and representatives of environmental non-governmental organizations (NGOs). The purpose of the workshop was to present a consolidated overview of monitoring activities accomplished in 2009 and 2010 pursuant to the MMPA Final Rules currently in place, including outcomes of selected monitoring-related research and lessons learned, and to seek feedback on future directions. A significant outcome of this workshop was to continue consolidating monitoring efforts from individual range complex and study-area plans and to develop a single Strategic Plan for U.S. Navy Monitoring that will improve the return on investment by focusing specific objectives and projects where they can most efficiently and effectively be addressed throughout the U.S. Navy Range Complexes and Study Areas. The Strategic Plan is currently in development, and will be incorporated as a primary component of the ICMP.

At this time, no changes have been planned for NSWC PCD Marine Species Monitoring. The efforts will continue to be carried out as identified in **Table 1** of this document.

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