VACAPES Range Complex Monitoring Plan
February 2009

INTRODUCTION

This Monitoring Plan for the Virginia Capes (VACAPES) Range Complex has been developed to provide marine mammal and sea turtle monitoring as required under the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA).

In order to issue an Incidental Take Authorization (ITA) for an activity, Section 101(a) (5) (a) of the MMPA states that National Marine Fisheries Service (NOAA/NMFS) must set forth "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 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 (NMFS, 2005).

While the Endangered Species Act does not have specific monitoring requirements, recent Biological Opinions issued by NOAA have included terms and conditions requiring the Navy to develop a monitoring program.

In addition to the VACAPES monitoring plan, a number of other Navy range complex monitoring plans are being 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 training activities. Goals of these monitoring plans are to assess the impacts of training activities on marine species and effectiveness of the Navy's current mitigation practices.

Navy-wide Integrated Comprehensive Monitoring Program (ICMP):

The Integrated Comprehensive Monitoring Program (ICMP) is Navy-wide and will provide the overarching structure and coordination that compiles data from range specific monitoring plans. The VACAPES plan is one component of the ICMP and many studies outlined here will also be implemented in other range complexes (Figure 1). The overall objective of the ICMP is to assimilate relevant data collected across Navy range complexes in order to answer questions pertaining to the impact of mid-frequency active sonar (MFAS) and explosives on marine mammals and sea turtles.

The primary objectives of the ICMP are to:

- Coordinate monitoring of Navy training events, particularly those involving mid-frequency active sonar (MFAS) and underwater detonations (explosives), for compliance with the terms and conditions of ESA Section 7 consultations or MMPA authorizations;
- Coordinate data collection to support estimating the number of individual marine mammals and sea turtles exposed to sound levels above current regulatory thresholds;
- Assess the efficacy of the Navy's current marine species mitigation;
- Add to the knowledge base on potential behavioral and physiological effects to marine species from mid-frequency active sonar and underwater detonations; and

- Assess the practicality and effectiveness of a number of mitigation tools and techniques (some not yet in use).

Additional Navy funded research and development (R&D) studies and ancillary research collaborations with academia and other institutions will be integrated as possible to enhance the data pool, and will be used in part to address objectives of the ICMP. Lastly, as an adaptive management strategy, the VACAPES monitoring plan will integrate elements from Navy-wide marine mammal research into the regional monitoring and data analysis proposed in this plan when new technologies and techniques become available.

VACAPES Range Complex Monitoring Plan:

The VACAPES Range Complex Monitoring Plan is one component of the overall effort the Navy is undertaking to understand its potential affects and the biological consequences of those effects to protected marine species. The VACAPES Range Complex Monitoring Plan has been designed as a collection of focused "studies" to gather data that will allow us to address the following questions which are described fully in the following sections:

1. What are the behavioral responses of marine mammals and sea turtles that are exposed to explosives at specific levels?
2. Is the Navy's suite of mitigation measures for explosives (e.g., PMAP, major exercise measures agreed to by the Navy through permitting) effective at avoiding TTS, injury, and mortality of marine mammals and sea turtles?

Marine Species Within the VACAPES Range Complex Study Area:

There are 40 marine mammal species or separate stocks with possible or confirmed occurrence in the marine waters off Maryland, Virginia, and North Carolina within the VACAPES Range Complex. There are 35 cetacean species (whales, dolphins, and porpoises), three pinniped species (sea lions, fur seals and true seals) and one sirenian species (Reviewed in DoN, 2007). In addition there are five species of threatened and endangered sea turtles.

This monitoring plan has been designed to gather data on all species of marine mammals and sea turtles that are observed in the VACAPES Range Complex. The Plan recognizes that deep diving and cryptic species of marine mammals such as beaked whales, sperm whales and minke whales, have low probability of visual detection (Barlow and Gisiner, 2006). Therefore, methods will be utilized to attempt to address this issue (e.g., passive acoustic monitoring).

Data will be collected by navy personnel, government contractors, academic institutions, or research organizations that will utilize qualified, professional marine mammal and sea turtle biologists. While annual reports will be prepared and provided to the NMFS, data collection, synthesis, and interpretation is expected to be an ongoing process over many years. It is not likely that firm conclusions can be drawn on most questions within a single year of monitoring effort due to the difficulty in achieving sufficient sample sizes for statistical analysis. The Navy will provide annual reports to NMFS HQ in fulfillment of the MMPA Letter of Authorization (LOA) requirements. The report will provide information on the amount and spatial/temporal distribution of monitoring effort as well as summaries of data collected and any preliminary results that may be available from analysis.

MONITORING PLAN

The monitoring methods proposed for use during training events in VACAPES Range Complex include a combination of individual elements designed to allow a comprehensive assessment to be conducted. These elements include:

- Vessel and aerial surveys
- Passive acoustic monitoring
- Marine mammal observers on Navy platforms

The types of explosive events that occur within the VACAPES Range Complex include: underwater detonations associated with Mine Exercises (MINEX), Surface-to-Surface Firing Exercises (FIREX specifically with platforms using 5" shells), Surface-to-Surface Missile Exercises (MISSILEX), and Bombing Exercises (BOMBEX).

The proposed effort for conducting the VACAPES Range Complex monitoring is shown in **Table 1**. While the effort presented in **Table 1** represents the most realistic prediction of the amount of monitoring that can be accomplished per year, there may be instances within any given year where exercise schedules shift, survey crew availability becomes limited, or extreme weather precludes effective sampling. In case of monitoring delay based on these conditions, monitoring effort will be re-scheduled at the next available opportunity. In the event that a particular target exercise is not available within the remainder of a particular year, monitoring may have to be made up in a following year.

Data collection will begin after April 2009, after the VACAPES LOA is issued and the monitoring plan is finalized (See **Table 1** for year by year implementation schedule). Data will also be collected from other range complex monitoring plans (i.e. Southern California (SOCAL) and Hawaii Range Complex) and compiled in order to compare and analyze data from all the individual Navy monitoring efforts. All available data will be included in Navy's annual report for VACAPES to NMFS including an evaluation of the effectiveness of any given element within the VACAPES Range Complex monitoring program. All subsequent analysis shall be completed in time for Navy's five year report to NMFS.

STUDY 1

What are the behavioral responses of marine mammals and sea turtles that are exposed to explosives?

In order to address this question, there is a need to observe marine mammals and sea turtles not only at the surface, but to the extent possible in the water column. While shipboard surveys are preferable in many ways (slow speed, offshore survey ability and duration, close approaches), they do not allow for observation of animals that are below the ocean surface as do aerial surveys. Therefore, for this study, a combination of aerial and vessel surveys may be used. Current mitigation measures by Navy exercise participants include monitoring the exclusion zone (size depends on the type and size of the explosives being used) prior to detonation and post detonation.

Methods

Visual Surveys:

The requirements to conduct this study are: 1) the ability to conduct aerial or shipboard surveys in the vicinity of the detonation point; and 2) training events that occur close enough to shore that re-fueling does not become an issue with the aerial survey team.

Given that there may be significant annual variability in which events occur more frequently within VACAPES, the Navy proposes to visually survey 2 events per year. The primary goal will be to survey two different types of explosive events with one of them being a multiple detonation event. Due to logistics and safety reasons this may not be possible; nevertheless the Navy is committed to monitoring 2 events per year.

For specified training events, aerial or vessel surveys will be used 1-2 days prior to, during if safely possible, and 1-5 days post detonation. The variation in the number of days after allows for the detection of animals that gradually return to an area, if they indeed do change their distribution in response to underwater detonation events.

Surveys will include any specified exclusion zone around a particular detonation point plus 2000 yards beyond the exclusion zone. For vessel based surveys a passive acoustic system (hydrophone or towed array) could be used to determine if marine mammals are in the area before and/or after a detonation event. Depending on animals sighted, it may be possible to conduct focal surveys of animals outside of the exclusion zone (detonations could be delayed if marine mammals or sea turtles are observed within the exclusion zone) to record behavioral responses to the detonations.

When conducting a particular survey, the survey team will collect: 1) species identification and group size; 2) location and relative distance from the detonation site; 3) the behavior of marine mammals and sea turtles including standard environmental and oceanographic parameters; 4) date, time and visual conditions associated with each observation; 5) direction of travel relative to the detonation site; and 6) duration of the observation. Animal sightings and relative distance from a particular detonation site will be used post-survey to determine potential received energy and pressure (dB re 1 micro Pa-sec and pounds per square inch). This data will be used, post-survey, to estimate the number of marine mammals and sea turtles exposed to different received levels (energy and pressure based on distance to the source, bathymetry, oceanographic conditions and the type and size of detonation) and their corresponding behavior.

Brief aerial or vessel based surveys of the detonation area, taking into account local oceanographic currents, will be conducted for stranded animals over a two day period post detonation event. If any distressed, injured or stranded animals are observed, an assessment of the animal's disposition (alive, injured, dead, or degree of decomposition) will be reported

immediately to USFF for appropriate action (notification to NMFS Regional Stranding Coordinator).

All available data will be included in the Navy's annual report to NMFS. All subsequent analysis shall be completed in time for Navy's five year report to NMFS.

Passive Acoustic Monitoring:

The Navy's goal is to use a towed hydrophone array whenever shipboard surveys are being conducted. The towed array would be deployed during daylight hours for each of the days the ship is at sea.

A towed hydrophone array is towed from the boat and can detect and localize marine mammals that vocalize and would be used to supplement the ship-based systematic line-transect surveys (particularly for species such as beaked whales that are rarely seen). The ability of the array to detect marine mammals will depend on the speed of the boat, length of the array and the frequency range of the hydrophones. The array would need to detect low frequency vocalizations (< 1,000 Hz) for baleen whales (McDonald and Fox, 1999; Mellinger and Clark, 2003) and relatively high frequency (up to 30 kHz) for odontocetes such as sperm whales (Watkins, 1980). The use of two simultaneously deployed arrays can also allow more accurate localization and determination of diving patterns.

Marine Mammal Observers on Navy Platforms:

Marine mammal observers (MMOs) will be placed on a Navy platform during 1 of the exercises being monitored per year. Qualifications must include expertise in species identification of regional marine mammal and sea turtle species and experience collecting behavioral data. Experience as a NMFS marine mammal observer is preferred, but not required. Navy biologists and contracted biologists will be used; contracted MMOs must have appropriate security clearance to board Navy platforms. MMOs will not be placed aboard Navy platforms for every Navy training event or major exercise, but during specifically identified opportunities deemed appropriate for data collection efforts. Additionally, the events selected for MMO participation will take into account safety, logistics, and operational concerns.

MMOs will observe from the same height above water as the lookouts. Of note, these MMOs will not be part of the Navy's formal reporting chain of command during their data collection efforts; Navy lookouts will continue to serve as the primary reporting means within the Navy chain of command for marine mammal sightings. The only exception is that if an animal is observed within the shutdown zone that has not been observed by the lookout, the MMO will inform the lookout of the sighting for the lookout to take the appropriate action through the chain of command.

The MMOs will collect species identification, behavior, direction of travel relative to the Navy platform, and distance first observed. All MMO sighting will be conducted according to a standard operating procedure (SOP).

STUDY 2

Is the Navy's suite of mitigation measures effective at avoiding injury and mortality of marine mammals and sea turtles?

It is the Navy's position that the suites of mitigation measures for explosives are effective at avoiding exposures of marine mammals to levels of energy or pressure from explosives that would result in harm or mortality of marine mammals. Through several methods, this study will provide the scientific data needed to support that position. The Navy will: 1) conduct aerial surveys before and after two events per year to determine whether animals have been injured in the exercise area; and 2) conduct a comparison of professional marine mammal observers and Navy lookouts.

Methods

Lookout comparison*:*

Navy lookouts are provided with extensive training to detect anything in the water 360 degrees around Navy platforms. This includes marine mammals. The Navy feels strongly that despite the fact that lookouts are not biologists trained to identify marine animals to species, that Navy lookouts have the skills to reasonably detect all marine mammals and sea turtles that are visible at the surface. In order to provide the scientific data to support this position, the Navy will initiate a side-by-side comparison of Navy lookouts ability to detect marine mammals at sea with sightings made by professional marine mammal observers. It is assumed that the abilities of Navy lookouts and professional marine mammal observers will vary; therefore, it is important that data be collected from many locations, in many environmental conditions, with many different lookouts and MMOs. Therefore, as part of the overall Navy monitoring effort, some of the data will be collected within the VACAPES Range Complex. The goal is to perform the lookout comparison during 1 exercise per year.

MMOs qualifications must include expertise in species identification of regional marine mammal and sea turtle species and experience collecting behavioral data. Experience as a NMFS marine mammal observer is preferred, but not required. Navy biologists and contracted biologists will be used; contracted MMOs must have appropriate security clearance to board Navy platforms. As noted above, MMOs will not be placed aboard Navy platforms for every Navy training event or major exercise, but during specifically identified opportunities deemed appropriate for data collection efforts. Additionally, the events selected for MMO participation will take into account safety, logistics, and operational concerns associated with such an endeavor. Navy lookouts will not be specially chosen.

Marine mammal observers will observe from the same height above water as the lookouts. Navy lookouts will officially be on duty and have the same responsibilities that they always do on duty (no more, no less). MMOs will not be part of the Navy's formal reporting chain of command during their data collection efforts; Navy lookouts will continue to serve as the primary reporting means within the Navy chain of command for marine mammal sightings. The only exception is that if an animal is observed within the shutdown zone that has not been observed by the lookout, the MMO will inform the lookout of the sighting for the lookout to take the appropriate action through the chain of command.

To the extent practicable, the MMO and lookouts will avoid cueing each other when they observe a marine mammal. The MMOs will collect species identification, behavior, direction of travel relative to the Navy platform, and distance first observed. All MMO sighting will be conducted according to a standard operating procedure (SOP) to allow for consolidation among data from all range complex monitoring plans. Two marine mammal observers will be aboard, and work on rotating two hour shifts to avoid fatigue.

Comparisons of the following will be made between experienced observers and the lookouts 1) Rate of detection: Comparison of the number of animals sighted per hour (or other appropriate sighting period), 2) Distance of sighting: Comparison of the distance where the sighting was first made, 3) Distance estimation: Consistency of sighting distance estimates, 4) Animal size estimation: Comparison of animal size estimation (either by actual length or by grouping – small or dolphin size, medium and large), 5) Direction of travel relative to the ship or by compass bearing, 6) Behavior categorization: Comparison of the categorized behaviors.

Aerial surveys:

An aerial survey team will conduct pre and post aerial surveys, taking local oceanographic currents into account, of the exercise area. These aerial surveys will be the same as those conducted for other VACAPES Range Complex monitoring studies. However, for this study in particular, survey data will include identification of any distressed, injured or stranded animals in the training event area. The Navy proposes to conduct this type of monitoring during 2 events per year.

Species composition of marine animals will be reported. If any distressed, injured or stranded animals are observed, an assessment of the animal's disposition (alive, injured, dead, or degree of decomposition) will be reported immediately to USFF and Commander, Second Fleet for appropriate action (notification to NMFS Regional Stranding Coordinator).

IMPLEMENTATION – ANALYSIS – REPORTING

For all field monitoring conducted in support of this plan, it will be the responsibility of any contracted researchers to obtain and maintain the appropriate permits.

Table 1 provides detail on how the VACAPES Range Complex Monitoring Plan will be implemented from fiscal year 2009 to fiscal year 2013. The implementation of this monitoring plan will not officially commence until April 2009, after the issuance of the Letter of Authorization. The monitoring plan will be implemented gradually in FY09, with full ramp up in 2010 as contracts are issued, Standard Operating Procedures (SOPs) are developed, and statisticians are consulted for input on sample size and analysis. Many of the study hours may overlap when implemented, allowing for data to be collected for more than one study simultaneously. Therefore, the hours in Table 1 represent those spent on each study, but are not necessarily an additive number of hours per method, per year. Collecting data concurrently for more than one study will only be initiated if doing so does not compromise the data integrity.

The Navy will be investing significant funding and resources towards monitoring programs and intends to conduct the research in a scientifically valid and robust manner. The Navy is committed to conducting research until these questions have been addressed to the satisfaction of both NMFS and Navy. Therefore, it is in the best interest of the Navy to choose studies wisely in each range complex that are the most likely to collect large data sets, and will enable the Navy and NMFS to answer the required questions. Some field methods may be applied throughout Navy ranges, while other methodologies may be specially selected for one or two ranges that are most likely to produce the best quality data. For example, in Hawaii, there are some baseline data on odontocetes from previous tagging (Baird et al., 2006), which can be used to provide a context for any tagging data collected during training events.

Using the ATOC and SURTASS monitoring programs as a guideline for success it is clear that the key to the success of the plan's execution and analysis is using scientific professionals that are the top of their field. It is the Navy's intention that monitoring be implemented by a team of qualified, professional marine mammal and sea turtle biologists who are experts in their field. This team of experts will include statistical analysts to analyze data and make recommendations as to when they are beginning to see a pattern in the data and/or when the study designs need to be altered for more robust data collection. This adaptive management process will provide a critical feedback loop to allow for adapting to new methods and evolving methodology. The process will be transparent to the public in the sense of yearly reporting to NMFS under the MMPA permit as well as encouraging the scientific team to publish results as they become available.

New technology and techniques will be incorporated as part of the Navy's adaptive management strategy. Adaptive measures and feedback from the experts will allow flexibility within a given year and/or within years so as to best achieve monitoring plan goals and take into consideration shifting demands, inclement weather and other unforeseen events. For example, flexibility is built in to monitor an alternate but equal training exercise within the year and/or in a following year in the instance an operational schedule changes, is delayed or cancelled. This flexibility ensures monitoring will occur under the best of circumstances and conditions.

Integrated Comprehensive Monitoring Program (ICMP):

The ICMP is currently in development by the Navy, with Chief of Naval Operations Environmental Readiness Division (CNO-N45) having the lead. The program does not duplicate the monitoring plans for individual areas (e.g. AFAST, HRC, SOCAL, VACAPES); instead it is intended to provide the overarching coordination that will support compilation of data from both range-specific monitoring plans as well as Navy funded research and development (R&D) studies. The ICMP will coordinate the monitoring programs progress towards meeting its goals and develop a data management plan. A program review board is also being considered to provide additional guidance. The ICMP will be evaluated annually to provide a matrix for progress and goals for the following year, and will make recommendations on adaptive management for refinement and analysis of the monitoring methods.

Due to the complexity of the ICMP and large number of U.S. Navy Range Complexes and training events, the Navy is considering the dedication of a Program Manager to oversee the ICMP. Specific qualifications, roles and responsibilities are yet to be determined but may include the oversight and coordination of all range-complex monitoring plans.

Reporting:

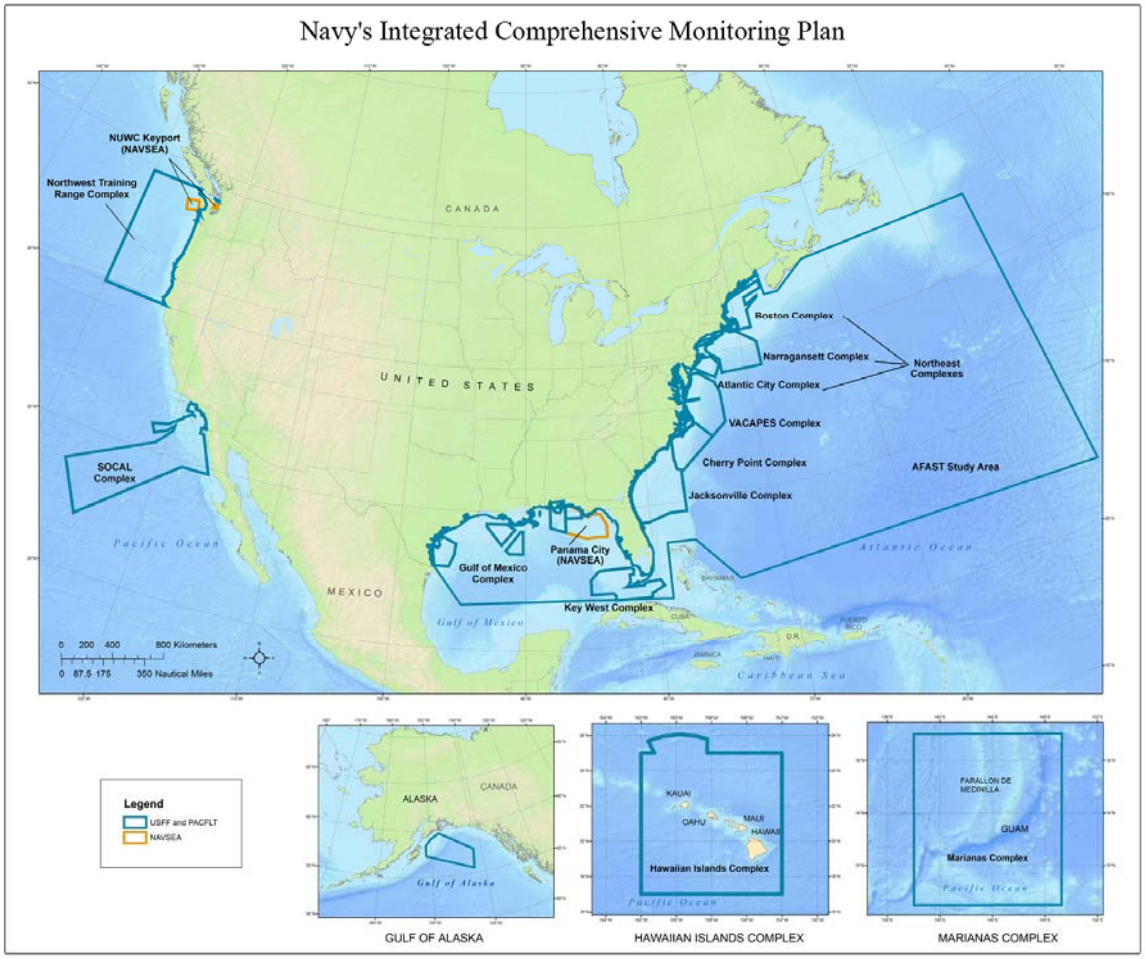
The Navy will provide monitoring reports to NMFS HQ in fulfillment of the MMPA Letter of Authorization (LOA) requirements. The reports will provide information on the amount and spatial/temporal distribution of monitoring effort as well as summaries of data collected and any preliminary results that may be available from analysis. All subsequent analysis shall be completed in time for Navy's five year report to NMFS.

Data collected from the VACAPES monitoring plan will be added to a Navy wide analysis of monitoring from other permitted Navy range complexes via the ICMP. All available data will be included in Navy's annual report and individual exercise reports as detailed in the requirements specified in the NMFS MMPA LOA. All subsequent analysis shall be completed in time for Navy's five year report to NMFS. The Navy's reports will provide information on the amount and spatial/temporal distribution of monitoring effort as well as summaries of data collected and any preliminary results that may be available from analysis. All data will be considered pre-decisional during the course of the research studies to protect from premature conclusions being drawn. While data will be prepared and analyzed over the course of the five years of the LOA, under no circumstances will conclusions be represented before the studies are completed. Final conclusions cannot be published nor information released outside of their organization without the written consent of the Secretary of the Navy or their designee.

Table 1. Summary of studies planned each year within the VACAPES Range Complex.

STUDY 1 (behavioral responses)						
	FY08	**FY09**	**FY10**	**FY11**	**FY12**	**FY13**
Aerial or Vessel surveys	Award monitoring contract, develop SOP, obtain permits	2 explosive events per year	2 explosive events per year	2 explosive events per year	2 explosive events per year	2 explosive events per year
Marine Mammal Observers	Opportunistic as staff and SOP developed	1 explosive event per year	1 explosive event per year	1 explosive event per year	1 explosive event per year	1 explosive event per year
STUDY 2 (mitigation effectiveness)						
	FY08	**FY09**	**FY10**	**FY11**	**FY12**	**FY13**
Marine mammal observers/lookout comparison	Opportunistic as staff and SOP developed	1 explosive event per year	1 explosive event per year	1 explosive event per year	1 explosive event per year	1 explosive event per year
Vessel or Aerial surveys before and after training events	Award monitoring contract, develop SOP, obtain permits	2 explosive events per year	2 explosive events per year	2 explosive events per year	2 explosive events per year	2 explosive events per year

Note: Study 1 and 2 will be conducted simultaneously when possible


Navy's Integrated Comprehensive Monitoring Plan
NUWC Keyport (NAVSEA)
Northwest Training Range Complex
CANADA
UNITED STATES
MEXICO
Boston Complex
Narragansett Complex
Northeast Complexes
Atlantic City Complex
VACAPES Complex
Cherry Point Complex
AFAST Study Area
Jacksonville Complex
SOCAL Complex
Panama City (NAVSEA)
Gulf of Mexico Complex
Key West Complex
Pacific Ocean
Atlantic Ocean
Gulf of Mexico
Caribbean Sea
0 200 400 800 Kilometers
0 87.5 175 350 Nautical Miles
Legend
USFF and PACFLT
NAVSEA
ALASKA
CANADA
Gulf of Alaska
KAUAI
OAHU
MAUI
HAWAII
Hawaiian Islands Complex
FARALLON DE MEDINILLA
GUAM
Marianas Complex
GULF OF ALASKA
HAWAIIAN ISLANDS COMPLEX
MARIANAS COMPLEX

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