Annual Report No. 4:

Operation of the Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar Onboard the USNS ABLE (T-AGOS 20) USNS EFFECTIVE (T-AGOS 21) *and* USNS IMPECCABLE (T-AGOS 23)

Under the National Marine Fisheries Service Letters of Authorization of 13 August 2010

Department of the Navy
Chief of Naval Operations
October 2011

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ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
APA	Administrative Procedures Act
ASW	Anti-Submarine Warfare
AUTEC	Atlantic Undersea Test and Evaluation Center
BiOp	Biological Opinion
BRS	Behavioral Response Study
CFR	Code of Federal Regulations
CLFA	Compact Low Frequency Active
CNO	Chief of Naval Operations
CNP	Central North Pacific (Stock)
CW	Continuous Wave
DASN(E)	Deputy Assistant Secretary of the Navy for Environment
dB	Decibel(s)
DoC	Department of Commerce
DoN	U.S. Department of the Navy
EIS	Environmental Impact Statement
EO	(Presidential) Executive Order
ESA	Endangered Species Act
FOEIS/EIS	Final Overseas Environmental Impact Statement/Environmental Impact Statement
FM	Frequency Modulated
FR	Federal Register
FSEIS	Final Supplemental Environmental Impact Statement
ft	Feet
FY	Fiscal Year
HF	High Frequency
HF/M3	High Frequency Marine Mammal Monitoring (Sonar)
HLA	Horizontal Line Array
Hz	Hertz
IA	Inshore Archipelago (Stock)
ICP	Integrated Common Processor
IUCN	International Union for Conservation of Nature and Natural Resources
kg	Kilogram
km	Kilometer(s)
kph	Kilometer(s) per hour
kt	Knot
Lb	Pound
LF	Low Frequency
LFA	Low Frequency Active
LFS SRP	Low Frequency Sound Scientific Research Program
LOA	Letter of Authorization
LTM	Long Term Monitoring
m	Meter(s)

MAI	Marine Acoustics, Incorporated
MF	Mid-Frequency
MFA	Mid-Frequency Active
MILDET	Military Detachment
MMPA	Marine Mammal Protection Act
NDAA	National Defense Authorization Act
NEPA	National Environmental Policy Act of 1969
NGO	Non-Governmental Organization
nmi	Nautical mile(s)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NORLANT	North Atlantic
NP	North Pacific (Stock)
OBIA	Offshore Biologically Important Area(s)
OEIS	Overseas Environmental Impact Statement
OIC	Officer in Charge
ONR	Office of Naval Research
Pa	Pascal
RL	Received Level
rms	Root Mean Squared
ROD	Record of Decision
R/V	Research Vessel
SEIS	Supplemental Environmental Impact Statement
SEL	Sound Exposure Level
SERDP	Strategic Environmental Research and Development Program
SL	Source Level
SOCAL	Southern California
SONAR	SOund Navigation And Ranging
SPL	Sound Pressure Level
SURTASS	Surveillance Towed Array Sensor System
T-AGOS	Ocean Surveillance Ship
TOTO	Tongue of the Ocean
U.S.	United States
U.S.C.	United States Code
USNS	United States Naval Ship
VLA	Vertical Line Array
WNP	Western North Pacific (Stock)
µ	micro

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1.0 INTRODUCTION

Under the Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar Final Rule 50 CFR § 216.186(b) and Condition 8(b) of the annual SURTASS LFA sonar Letters of Authorization (LOAs) for the USNS ABLE (T-AGOS 20), USNS EFFECTIVE (T-AGOS 21), and USNS IMPECCABLE (T-AGOS 23), this annual report provides an unclassified summary of the classified quarterly reports of SURTASS LFA sonar operations for the period 16 August 2010 through 15 August 2011.

1.1 Purpose of this Report

As a requirement of the Regulations for the Taking of Marine Mammals Incidental to Navy Operations of SURTASS LFA Sonar, 50 CFR § 216 Subpart Q (72 *Federal Register* [FR] 46890-93), this annual report for operations of SURTASS LFA sonar systems onboard the USNS ABLE (T-AGOS 20), USNS EFFECTIVE (T-AGOS 21), and USNS IMPECCABLE (T-AGOS 23) has been prepared in accordance with the requirements of the LOAs issued by the United States Department of Commerce (DoC), National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) (APPENDIX A). The primary purpose of this annual report is to provide NMFS with an unclassified summary of the year's quarterly reports and an analysis of any Level A and/or Level B harassment takings by SURTASS LFA sonar operations. This report also provides NMFS with information necessary to demonstrate conformance to the Terms and Conditions (Paragraph 8.4) of the Biological Opinion under the Endangered Species Act (ESA) on the issuance of the LOAs (U.S. Department of Commerce [DoC], 2010).

1.2 SURTASS LFA Sonar Description

SURTASS LFA sonar is a long-range sonar system that operates in the low frequency (LF) band (100-500 Hertz [Hz]). During the period of this report, there were three SURTASS LFA sonar systems, one each onboard the USNS ABLE (T-AGOS 20), USNS EFFECTIVE (T-AGOS 21), and USNS IMPECCABLE (T-AGOS 23), operating in the northwestern Pacific Ocean and Philippine Sea. These systems have both passive and active components.

1.2.1 Passive System Component—SURTASS

The passive, or listening, part of the system is SURTASS. SURTASS detects returning echoes from submerged objects, such as threat submarines, through the use of hydrophones. These devices transform mechanical energy (received acoustic sound wave) to an electrical signal that can be analyzed by the processing system of the sonar. Advances in passive acoustic technology have led to the development of SURTASS Twin-Line (TL-29A) horizontal line array (HLA), a shallow water variant of the single line SURTASS system. TL-29A consists of a "Y" shaped array with two apertures. The array is approximately $1/5^{th}$ the length of a standard SURTASS array, or approximately 305 m (1,000 ft) long. The TL-29A delivers enhanced capabilities, such as its ability to be towed in shallow water environments in the littoral zones, to provide significant directional noise rejection, and to resolve bearing ambiguities without having to change vessel course. The SURTASS TL-29A HLA provides improved littoral capability.

The passive capability of the USNS IMPECCABLE (T-AGOS 23) was recently upgraded with the installation of the TL-29A array. The three VICTORIOUS Class vessels, which are, or will be, equipped with CLFA, will be outfitted with the newer SURTASS TL-29A passive arrays.

The SURTASS LFA sonar vessel typically maintains a speed of at least 5.6 kilometers per hour (kph) (3 knots [kt]) through the water in order to tow the HLA. The return signals, which are usually below background or ambient noise level, are then processed and evaluated to identify and classify potential underwater threats.

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1.2.2 Active System Component—LFA

The active system component, LFA, is an adjunct to the passive detection system, SURTASS, and is planned for use when passive system performance proves inadequate. LFA complements SURTASS passive operations by actively acquiring and tracking submarines when they are in quiet operating modes, measuring accurate target range, and re-acquiring lost contacts.

LFA is a set of acoustic transmitting source elements suspended by cable from under an ocean surveillance vessel. These elements, called projectors, are devices that produce the active sound pulse, or ping. The projectors transform electrical energy to mechanical energy that set up vibrations, or pressure disturbances, within the water to produce a ping.

The characteristics and operating features of LFA are provided below:

- The source is a vertical line array (VLA) of up to 18 source projectors suspended below the vessel. LFA's transmitted sonar beam is omnidirectional (i.e., a full 360 degrees) in the horizontal (nominal depth of the LFA array center is 122 m [400 ft]), with a narrow vertical beamwidth that can be steered above or below the horizontal.
- The source frequency is between 100 and 500 Hz (the LFA system's physical design does not allow for transmissions below 100 Hz). A variety of signal types can be used, including continuous wave (CW) and frequency-modulated (FM) signals. Signal bandwidth is approximately 30 Hz.
- The source level (SL) of an individual source projector is approximately 215 decibels (dB) or less. The sound field of the LFA array can never be higher than the SL of an individual projector.
- The typical LFA transmitted sonar signal is not a constant tone, but a transmission of various waveforms that vary in frequency and duration. A complete sequence of transmissions is referred to as a wavetrain (also known as a "ping"). These wavetrains last from 6 to 100 seconds, although the duration of each continuous frequency transmission is never longer than 10 seconds.
- Average duty cycle (ratio of sound "on" time to total time) is less than 20 percent. The typical duty cycle, based on historical LFA operational parameters (2003-2009) are nominally 7.5 to 10 percent.
- The time between pings is typically from 6 to 15 minutes.

1.2.3 Active System Upgrades

As future undersea warfare requirements continue to transition to littoral[1] ocean regions, the introduction of a compact active system deployable on SURTASS ships was developed. This system upgrade is known as Compact LFA, or CLFA. CLFA consists of smaller, lighter-weight source elements than the current LFA system, and is compact enough to be installed on the VICTORIOUS Class platforms (T-AGOS 19). The initial CLFA installation was completed on the USNS ABLE (T-AGOS 20) (Figure 1) in 2008 and is currently operational. CLFA has also been installed onboard the USNS EFFECTIVE (T-AGOS 21), which is currently undergoing evaluation and testing. CLFA improvements include:

- Operational frequency within the 100 to 500 Hz range, matched to shallow water environments with little loss of detection performance in deep water environments;
- Improved reliability and ease of deployment; and
- Lighter-weight design (mission weight of 64,410 kg [142,000 lb] vice 155,129 kg [324,000 lb] mission weight of LFA).

The operational characteristics of the compact system are comparable to the existing LFA systems as presented above. Therefore, the potential environmental effects from CLFA are expected to be similar to, and not greater than, the environmental effects from the existing SURTASS LFA systems. Hence, for this analysis, the term low frequency active, or LFA, will be used to refer to both the existing LFA system and/or the compact (CLFA) system, unless otherwise specified.

References to Underwater Sound Levels

- References to underwater sound pressure level (SPL) in this document are values given in decibels (dBs), and are assumed to be standardized at 1 microPascal at 1 m (dB re 1 µPa at 1 m [rms]) for source level (SL) and dB re 1 µPa (rms) for received level (RL), unless otherwise stated (Urick, 1983; ANSI, 2006).
- References to underwater sound exposure level (SEL) in this document are measures of energy, specifically the squared instantaneous pressure integrated over time and expressed as an equivalent one-second in duration signal, unless otherwise stated; the appropriate units for SEL are dB re 1 µPa²-sec (Urick, 1983; ANSI, 2006; Southall et al., 2007).

[1] The term "littoral" is one of the most misunderstood terms used in naval warfare. Based on a dictionary definition, the adjective "littoral" indicates that something pertains to or exists on the shore. In noun form, the word means a shore or coastal region.

The Navy's meaning differs because it is based on tactical, not geographic, perspective relating to the overall coastal operations including all assets supporting a particular operation regardless of how close, or far, from the shore they may be operating. The Navy defines littoral as the region that horizontally encompasses the land/water mass interface from fifty (50) statute miles (80 kilometers [km]) ashore to two hundred (200) nautical miles (nmi) (370 km) at sea; extends vertically from the bottom of the ocean to the top of the atmosphere and from the land surface to the top of the atmosphere (Naval Oceanographic Office, 1999).

1.2.4 Integrated Common Processor

SURTASS is also being upgraded with the Integrated Common Processor (ICP) that will result in increased operator proficiency, increased functionality and savings in logistics support and software maintenance. The ICP has been, or is scheduled to be, installed on the SURTASS LFA/CLFA sonar vessels. The ICP uses enhanced signal processing and automation to get accurate, actionable information on undersea threats to operational decision makers. The capability of passive acoustic sensors is also benefiting from increased processing power in computers and by networking, which is incorporating data from a variety of acoustic and non-acoustic sensors, and sources to construct a more complete battlefield picture (Friedman, 2007).

Figure 1. USNS ABLE (T-AGOS 20) Ocean Surveillance Ship

1.3 The Critical Need for SURTASS LFA Sonar

The Navy's primary mission is to maintain, train, equip, and operate combat-ready naval forces capable of accomplishing American strategic objectives, deterring maritime aggression, and assuring freedom of navigation in ocean areas. The Secretary of the Navy and Chief of Naval Operations (CNO) have continually validated that Anti-Submarine Warfare (ASW) is a critical part of that mission – a mission that requires unfettered access to both the high seas and littorals. In order to be prepared for all potential threats, the Navy must maintain ASW core competency through continual training and operations in open-ocean and littoral environments.

Excerpts from Declaration of Rear Admiral John M. Bird, U.S. Navy To the United States District Court Northern District of California **15 November 2007**
SURTASS LFA (sonar) has enabled the Navy to meet the clearly defined, real-world national security need for improved ASW capability by allowing Navy Fleet units to reliably detect quieter and harder-to-find submarines at long range, before they get within their effective weapons range and can launch missiles or torpedoes against our ships or missiles against land targets, foreign or domestic. The operative word here is has. SURTASS LFA is a combat-ready system. But in order to protect U.S. and allied fleet assets, and merchant shipping, the operation of SURTASS LFA sonar and the training of our personnel must continue uninterrupted.

The challenges faced by the U.S. Navy today are very different from those faced at the end of the Cold War nearly two decades ago. Since the early 1990s, U.S. Navy ASW strategy has had to shift from a known Soviet adversary to "uncertain potential adversaries with area-denial strategies designed to inflict unacceptable losses" (Benedict, 2005). The wide proliferation of diesel-electric submarines, a Chinese undersea force that is growing in size and tactical capability, and a resurgent Russian submarine service mean that U.S. ASW capability must meet more technologically-capable threats in a wider range of ocean environments (Benedict, 2005; U.S. Office of Naval Intelligence, 2009a and 2009b). Due to the advancement and use of quieting technologies in diesel-electric and nuclear submarines, undersea threats are becoming increasingly difficult to locate using the passive acoustic technologies that were effective during the Cold War. The range at which U.S. ASW assets are able to identify submarine threats is decreasing and at the same time improvements in torpedo design are extending the effective weapons range of those same threats (Benedict, 2005).

To meet this long range submarine detection need, the U.S. Navy has investigated the use of a broad spectrum of acoustic and non-acoustic technologies. Of the technologies evaluated, low frequency active sonar is the only system capable of meeting the U.S. Navy's long-range ASW detection needs in a variety of weather conditions during the day and night. SURTASS LFA sonar is providing a quantifiable improvement in the Navy's undersea detection capabilities and therefore markedly improving the survivability of U.S. Naval forces in hostile ASW scenarios.

SURTASS LFA sonar meets the need of the U.S. Navy for improved long-range submarine detection capability, which is essential to providing U.S. forces the time necessary to react to and defend against potential undersea threats. It is critical that U.S. forces be able to identify threats while remaining at a safe distance beyond a submarine's effective weapon's range (Davies, 2007).

1.4 Initial Regulatory Compliance and Litigation History

Prior to NMFS promulgating the current (2007) Final Rule (72 FR 46846-93) (NOAA, 2007c) and LOAs, there were a number of key regulatory and litigation events that influenced these regulations.

1.4.1 National Environmental Policy Act (NEPA)

The NEPA process for SURTASS LFA sonar began on 18 July 1996, when the Navy published its Notice of Intent (NOI) in the *Federal Register* (67 FR 37452) (DoN, 1996) to prepare an overseas environmental impact statement/environmental impact statement (OEIS/EIS) for SURTASS LFA sonar under Presidential Executive Order (EO) 12114 Environmental Effects Abroad of Major Federal Actions and the National Environmental Policy Act (NEPA). With NMFS as a cooperating agency, the SURTASS LFA sonar Final Overseas Environmental Impact Statement/Environmental Impact Statement (FOEIS/EIS) was completed in January 2001 (U.S. Department of the Navy, 2001). The Record of Decision (ROD) was signed by the Deputy Assistant Secretary of the Navy for Environment (DASN(E)) on 16 July 2002 (67 FR 48145) (DoN, 2002). During the NEPA analysis the Navy recognized there were scientific data gaps concerning the potential for moderate-to-low exposure levels to affect cetacean hearing ability or modify biologically important behavior. As a result of this limitation, the Navy sponsored independent, scientific field research referred to as the Low Frequency Sound Scientific Research Program (LFS SRP). This ground-breaking research program found that the potential for SURTASS LFA sonar to cause these effects was minimal (DoN, 2001).

1.4.2 Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA)

Based on the scientific analyses detailed in the Navy LOA application and further supported by information and data contained in the Navy's FOEIS/EIS (DoN, 2001), NMFS determined that the operations of SURTASS LFA sonar would employ means of effecting the least practicable adverse impact on the species or stock, that would result in the incidental harassment of only small numbers of marine mammals, have no more than a negligible impact on the affected marine mammal stocks or habitats, and would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence uses. Consequently, NMFS issued the initial LOA (NOAA, 2002a) under the MMPA Final Rule (50 CFR Part 216 Subpart Q) (NOAA, 2002b) for the operation of SURTASS LFA sonar on research vessel (R/V) *Cory Chouest*. The ESA section 7 consultation on the issuance of the above MMPA Final Rule and the associated LOAs found that NMFS' action was not likely to jeopardize the continued existence of threatened or endangered species under NMFS' jurisdiction or destroy or adversely modify critical habitat that has been designated for those species. The first biological opinion (BiOp) issued by NMFS was a 5-year programmatic document on the MMPA rule making (NMFS, 2002a). It was followed by the annual BiOp for the LOAs (NMFS, 2002b). After the initial LOA was issued in 2002, the Navy requested annual renewals in accordance with 50 CFR §216.189 for the remaining four years of the 2002 Final Rule for the R/V *Cory Chouest* and USNS IMPECCABLE. NMFS subsequently issued the LOAs (NOAA, 2003a, 2004, 2005, and 2006a).

1.4.3 National Defense Authorization Act (NDAA)

On November 24, 2003 the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2004 (NDAA FY04) (Public Law 108-136) was passed by Congress. Included in this law were amendments to the MMPA (16 U.S.C. 1361 *et seq.*) that apply where a "military readiness activity" is concerned. Of special importance for SURTASS LFA sonar take authorization, the

NDAA amended Section 101(a)(5) of the MMPA, which governs the taking of marine mammals incidental to otherwise lawful activities. The term "military readiness activity" is defined in Public Law 107-314 (16 U.S.C. § 703 note) to include all training and operations of the Armed Forces that relate to combat; and the adequate and realistic testing of military equipment, vehicles, weapons and sensors for proper operation and suitability for combat use. NMFS and the Navy determined that the Navy' SURTASS LFA sonar testing, training, and operations that are the subject of NMFS's Final Rule constituted military readiness activities because those activities constitute "training and operations of the Armed Forces that relate to combat" and constitute "adequate and realistic testing of military equipment, vehicles, weapons and sensors for proper operation and suitability for combat use."

Changes to the MMPA set forth in the NDAA FY04 amended the act in three ways. First, it focused the definition of harassment on biologically significant effects. Second, it removed references to small numbers and specific geographic regions as applied to incidental take authorizations. Third, it provided for a national defense exemption. SURTASS LFA sonar has never been deployed under this national defense exemption.

1.4.4 Initial Litigation

On 7 August 2002, several non-governmental organizations (NGO) filed suit against the Navy and NMFS over SURTASS LFA sonar use and permitting. The Court recognized the Navy's National Security requirements for operations to continue as the case proceeded. On 15 November 2002, the Court issued a tailored Preliminary Injunction for operations of SURTASS LFA sonar in a stipulated area in the northwest Pacific Ocean/Philippine Sea, and south and east of Japan. On 25 January 2003, the R/V *Cory Chouest*, having met all environmental compliance requirements, commenced testing and training in the northwest Pacific Ocean under this tailored Preliminary Injunction.

The Court issued a ruling on the parties' motions for summary judgment in the SURTASS LFA sonar litigation on 26 August 2003. The Court found deficiencies in the Navy's and NMFS' compliance under NEPA, ESA, and MMPA. The Court, however, indicated that a total ban of employment of SURTASS LFA sonar would pose a hardship on the Navy's ability to protect national security by ensuring military preparedness and the safety of those serving in the military from hostile submarines. Based on Court-directed mediation between the parties, the Court issued a tailored Permanent Injunction on 14 October 2003, allowing SURTASS LFA sonar operations from both R/V *Cory Chouest* and USNS IMPECCABLE (T-AGOS 23) in stipulated areas in the northwest Pacific Ocean/Philippine Sea, Sea of Japan, East China Sea, and South China Sea with certain year-round and seasonal restrictions. On 7 July 2005, the Court amended the injunction to expand the potential areas of operation based on real-world contingencies, as shown in Figure 2.

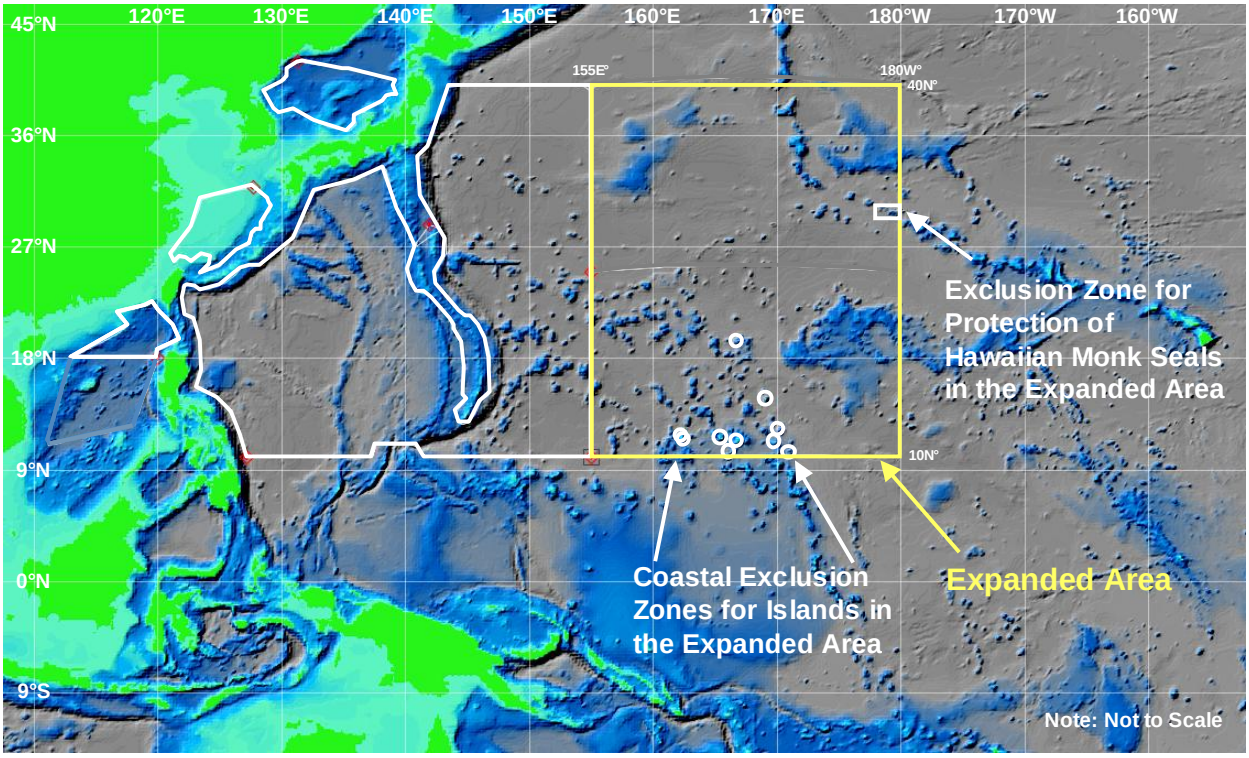

Figure 2. SURTASS LFA Sonar Operations Areas Permitted under Stipulation Regarding Permanent Injunction as Amended on 7 July 2005

1.5 Current Regulatory Compliance and Litigation

In response to U.S. District Court ruling on the motion for preliminary injunction, the Deputy Assistant Secretary of the Navy for Environment (DASN(E)) decided that the purposes of NEPA would be served by supplemental analysis of employing SURTASS LFA sonar systems. On 11 April 2003, DASN(E) directed the Navy to prepare a supplemental EIS (SEIS) to address concerns identified by the Court to provide additional information regarding the environment that could potentially be affected by SURTASS LFA sonar systems and additional information related to mitigation. On 26 September 2003, NMFS agreed to be a cooperating agency in the preparation and review of the SEIS. The information developed from this analysis was used to support the Navy's application for the second five-year rule under MMPA (DoN, 2006a) and the biological assessment for Section 7 consultation under the ESA (DoN, 2006b).

Under the Court's opinion, NMFS was found to have improperly conflated its negligible impact determinations with small numbers requirements. As a result of the NDAA FY04 amendments to the MMPA eliminating this issue, the Court vacated and dismissed the MMPA small numbers and specific geographic regions claims on 2 December 2004.

1.5.1 Supplemental Environmental Impact Statement

The Final Supplemental Environmental Impact Statement (FSEIS), which included detailed responses to all comments received, was completed in May 2007 (DoN, 2007a). The purpose of the first SURTASS LFA Sonar SEIS was to:

- Address concerns of the U.S. District Court for the Northern District of California in its 26 August 2003 Opinion and Order in relation to compliance with NEPA, ESA, and MMPA[2];
- Provide information necessary to apply for a new five-year Rule that would allow incidental takes under the MMPA when the current Rule expired in 2007, taking into account legislative changes to the MMPA and the need to employ up to four SURTASS LFA sonar systems;
- Analyze potential impacts for LFA system upgrades; and
- Provide additional information and analyses pertinent to the proposed action.

The FSEIS evaluated the potential environmental effects of employment of up to four SURTASS LFA sonar systems in the oceanic areas of the world less Arctic and Antarctic regions. Based on current operational requirements, exercises using these sonar systems would occur in the Pacific, Atlantic, and Indian Oceans, and the Mediterranean Sea. To reduce adverse effects on the marine environment, areas would be excluded as necessary to prevent 180-dB sound pressure level (SPL) or greater within specific geographic range of land, in offshore biologically important areas during biologically important seasons, and in areas necessary to prevent greater than 145-dB SPL at known recreational and commercial dive sites.

1.5.2 Current MMPA and ESA Authorizations

On 12 May 2006, the Navy submitted an Application to NMFS requesting an authorization under Section 101 (a)(5)(A) of the MMPA for the taking of marine mammals by Level A and Level B harassment incidental to the deployment of SURTASS LFA sonar systems for military readiness activities, to include routine training, testing, and military operations (DoN, 2006a). The activities were associated with the employment of up to four SURTASS LFA sonar systems for a period of five years (16 August 2007 to 15 August 2012).

The Navy submitted a biological assessment for the employment of SURTASS LFA sonar on 9 June 2006, requesting that NMFS review the document (DoN, 2006b). The Navy further requested a BiOp/incidental take statement (ITS) under Section 7 of the ESA for a period of five years (16 August 2007 to 15 August 2012).

On 28 September 2006, NMFS published a Notice of Receipt of Application and a request for public comments on the Navy's application for authorization to take marine mammals incidental to the operation of SURTASS LFA sonar systems (NOAA, 2006b). The public comment period closed on 30 October 2006. These comments were considered in the development of the Proposed and Final Rules. A Proposed Rule for the renewal of the regulations governing

[2] On 2 December 2004, the Court vacated and dismissed the MMPA claims based on the National Defense Authorization Act Fiscal Year 2004 (NDAA FY04) amendments to the MMPA.

SURTASS LFA sonar MMPA authorization was published on 9 July 2007 (NOAA, 2007b) with a 15-day public comment period. NMFS filed the Final Rule on 15 August 2007 and published on 21 August 2007 (NOAA, 2007c). The initial LOAs under the 2007 Rule were issued by NMFS to the Chief of Naval Operations (N872A) for the R/V *Cory Chouest* and the USNS IMPECCABLE for the period 16 August 2007 to 15 August 2008 (NOAA, 2007a).

NMFS issued, on 14 August 2007, its BiOp on the effects of NMFS' Permits, Conservation and Education Division's proposal to promulgate regulations allowing NMFS to authorize the taking of marine mammals incidental to the Navy's employment of SURTASS LFA sonar in accordance with Section 7 of the ESA, as amended (16 U.S.C. 1531 et seq.) (NMFS, 2007a). On 15 August 2007 (as amended on 17 August 2007), NMFS issued its BiOp/ITS on the effects of the proposed LOAs (effective 16 August 2007 to 15 August 2008) to take marine mammals incidental to the Navy's employment of SURTASS LFA sonar in accordance with Section 7 of the ESA, as amended (16 U.S.C. 1531 et seq.) (NMFS, 2007b, 2007c). The opinions concluded that the proposed LOAs and any takes associated with activities authorized under those regulations were not likely to jeopardize threatened or endangered species in the action area, and that the proposed action was not likely to destroy or adversely modify designated critical habitats.

1.5.3 Recent Litigation

On 17 September 2007, a number of plaintiffs filed a lawsuit challenging actions by the Navy and NMFS regarding compliance with NEPA, MMPA, ESA, and the Administrative Procedure Act (APA) for the operation of SURTASS LFA sonar.

On 6 February 2008, the Court issued its Opinion and Order granting in part Plaintiffs' motion for a Preliminary Injunction and required the parties to meet and confer on the precise terms of the Preliminary Injunction. Mediation sessions were held on 26 March 2008 and 27 May 2008 at the U.S. District Court, Northern District of California, in San Francisco, CA.

During the mediation on 26 March 2008, agreement was reached that SURTASS LFA sonar would operate in the northwestern Pacific areas stipulated in the 2003 permanent injunction, as amended in 2005, with the following modifications (Figure 3):

- Stipulated LFA Operational Agreement permitting SURTASS LFA sonar operations up to, but not within, 22 km (12 nmi) from the coast when necessary to continue tracking an existing underwater contact, or when operationally necessary to detect a new underwater contact to maximize opportunities for detection.
- Additional terms include assuring the LFA sound field does not exceed received levels of 180 dB re 1 µPa (rms) at a distance of less than 33 km (18 nmi) from:
    - Islands of the Luzon Strait, including the Bashi Channel; and
    - Eastern coastlines of the islands of the Ryukyu Island Chain.

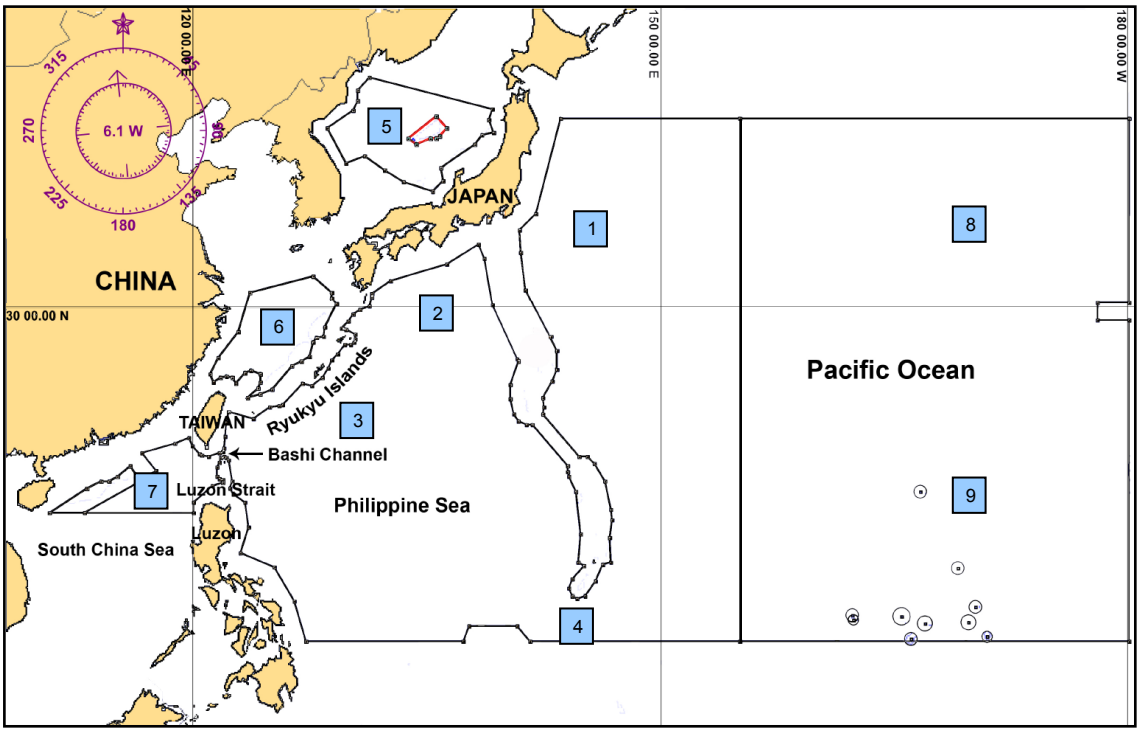

Figure 3. SURTASS LFA Sonar Western Pacific Operations Areas

During the mediation on 27 May 2008, agreement was reached on overall settlement of the litigation, which included the agreement that SURTASS LFA sonar could operate in the Hawaii operating areas (Figure 4). The settlement also permitted SURTASS LFA sonar operations up to 22 km (12 nmi) from the coast when necessary to continue tracking an existing underwater contact, or when operationally necessary to detect a new underwater contact to maximize opportunities for detection within the Hawaii operating areas.

On 12 August 2008, the Court approved the settlement and, on 29 August 2008, the Court signed the Stipulated Voluntary Dismissal with Prejudice, which effectively ended the litigation APPENDIX B). The LOAs issued by NMFS to the USNS ABLE, USNS IMPECCABLE, USS EFFECTIVE, and USNS VICTORIOUS for the remainder of the current Rule are and will be based on the expanded operating areas described above.

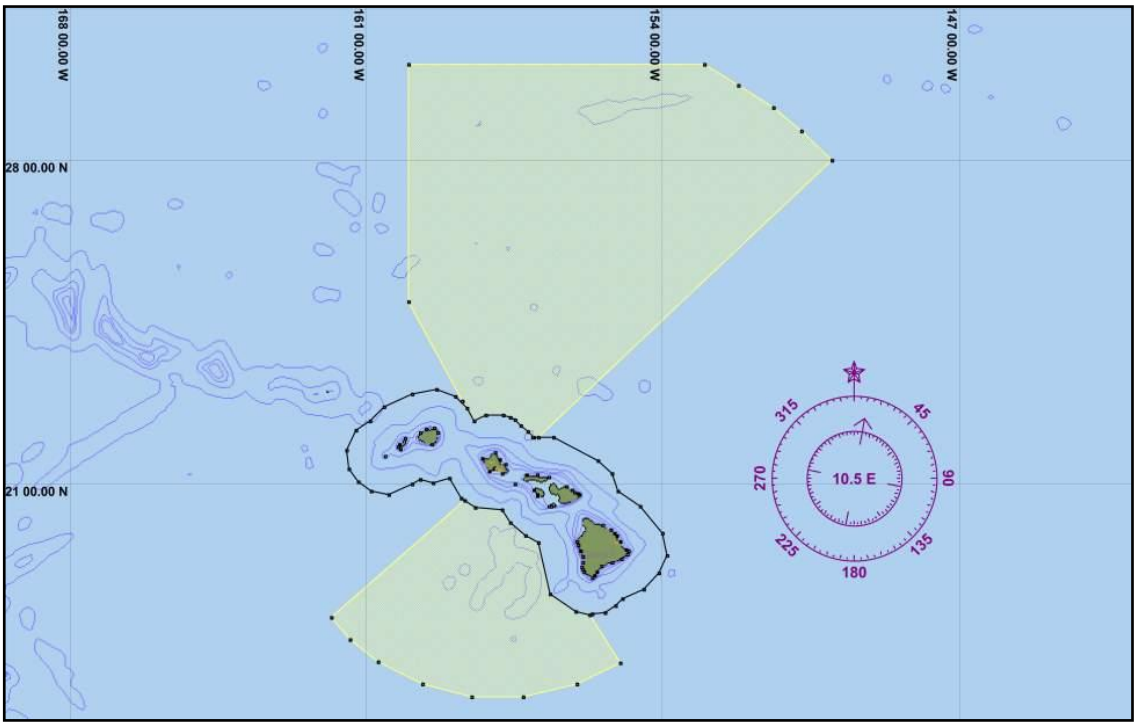

Figure 4. SURTASS LFA Sonar Hawaii Operating Areas

2.0 MITIGATION MEASURES

Under the current rule (NOAA, 2007c), NMFS issued one-year LOAs for the period 16 August 2010 to 15 August 2011 to the Navy for the USNS ABLE, USNS EFFECTIVE, and USNS IMPECCABLE for an estimated total of 22 nominal active sonar missions (16 missions in the northwestern Pacific Ocean and 6 missions in the Hawaii Operating Areas) between the two ships (or equivalent shorter missions) not to exceed 432 hours of transmit time per vessel during the annual period of effectiveness of each of these LOAs (APPENDIX A).

Mitigation protocols and operational restrictions for the LOAs were set forth in the Record of Decision (DoN, 2007b), NOAA/NMFS Final Rule (NOAA, 2007c) and LOAs (APPENDIX A), and Court orders (APPENDIX B). These were promulgated to the Fleet commands by the CNO (N2/N6F24, formerly N872A) via executive direction messages of 13 August 2010 and 15 August 2008.

2.1 Mitigation and Monitoring Requirements

The objective of these mitigation measures is to effect the least practicable adverse impact on marine mammal species or stocks and to avoid risk of injury to marine mammals, sea turtles, and human divers. These objectives are met by:

- Ensuring that coastal waters within 22 km (12 nmi) of shore are not exposed to SURTASS LFA sonar signal received levels (RL) ≥180 dB re 1 µPa (rms) (sound pressure level [SPL])[3];
- Ensuring that no offshore biologically important areas (OBIA) are exposed to SURTASS LFA sonar signal RLs ≥180 dB re 1 µPa (rms) (SPL) during biologically important seasons;
- Minimizing exposure of marine mammals and sea turtles to SURTASS LFA sonar signal RLs below 180 dB re 1 µPa (rms) (SPL) by monitoring for their presence and suspending transmissions when one of these animals enters the LFA mitigation (safety) zone or buffer zone as shown in Figure 5; and
- Ensuring that no known recreational or commercial dive sites are subjected to SURTASS LFA sonar signal RLs >145 dB re 1 µPa (rms) (SPL).

Strict adherence to these measures will minimize impacts on marine mammal stocks and species, as well as sea turtle stocks, and recreational and commercial divers.

In the SURTASS LFA sonar 2007 Final Rule under the MMPA (72 FR 46890-93), NMFS added interim operational restrictions by the establishment of a 1-km (0.54-nmi) buffer shutdown zone:

- Outside of the 180-dB LFA mitigation zone, which may extend up to 2 km (1.1 nmi) from the vessel, depending on oceanographic conditions (50 CFR § 216.184(b)); and
- Seaward of the outer perimeter of any offshore biologically important area designated in 50 CFR § 216.184(f) (50 CFR § 216.184(e)(2)).

At this distance, SPLs will be significantly lower than 180 dB.

[3] This was further restricted by the Court as described in Chapter 3.0 and shown in Figure 3 and 4. See APPENDIX B.

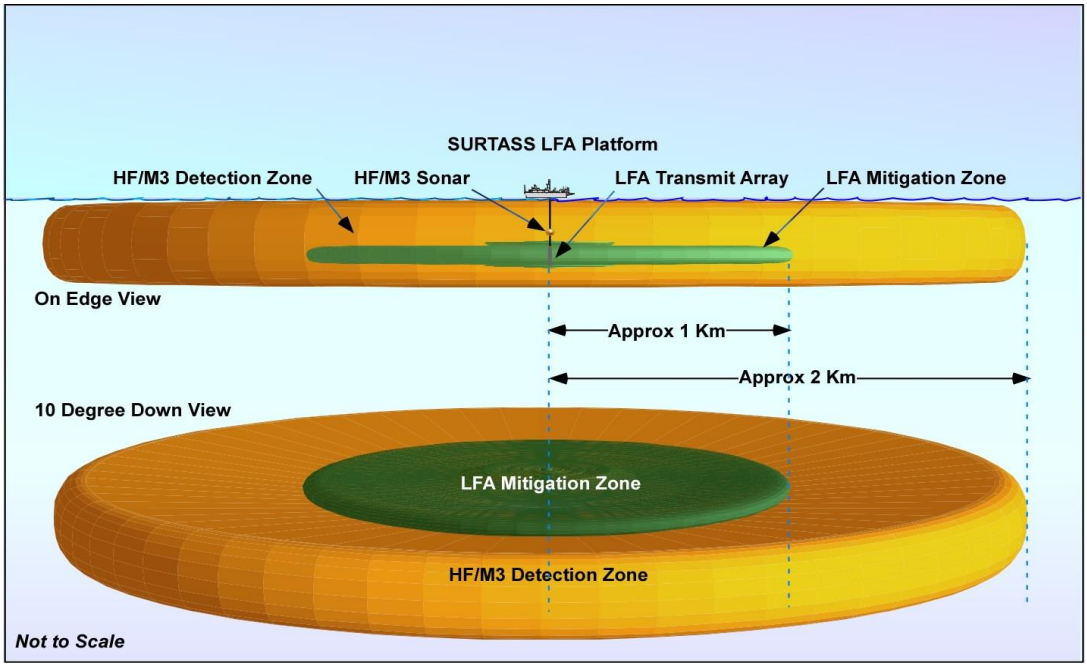

Figure 5. HF/M3 Sonar Detection and LFA Mitigation/Buffer Zones

2.1.1 Geographic Restrictions

The following geographic restrictions apply to the employment of SURTASS LFA sonar:

- SURTASS LFA sonar-generated sound field will be below RLs of 180 dB re 1 µPa (rms) (SPL) within 22 km (12 nmi) of any coastlines;[4]
- SURTASS LFA sonar-generated sound field will be below RLs of 180 dB re 1 µPa (rms) (SPL) 1 km (0.54 nmi) seaward of the outer perimeter of any offshore biologically important area designated in 50 CFR § 216.184(f);
- When in the vicinity of known recreational or commercial dive sites, SURTASS LFA sonar will be operated such that the sound fields at those sites will not exceed RLs of 145 dB re 1 µPa (rms) (SPL); and
- SURTASS LFA sonar operators will estimate LFA sound field RLs (SPL) prior to and during operations to provide the information necessary to modify operations, including the delay or suspension of transmissions, in order not to exceed RLs of 180 dB re 1 µPa (rms) and 145 dB re 1 µPa (rms) sound field criteria cited above.

2.1.1.1 Offshore Biologically Important Areas

Offshore Biologically Important Areas (OBIAs) are areas of the world's oceans outside of 22 km (12 nmi) of a coastline where marine animals of concern (those animals listed under the ESA

[4] Ibid

and/or marine mammals) congregate in high densities to carry out biologically important activities. These areas include migration corridors, breeding and calving grounds, and feeding grounds. There are ten areas designated by NMFS as offshore areas of critical biological importance for marine mammals in the 2007 Final Rule (NOAA, 2007c). These are:

- Shoreward of the 200-m (656-ft) isobath off the North American East Coast, from 28 to 50 degrees North latitude, west of 40 degrees West longitude—year-round.
- Antarctic Convergence Zone, delimited by the following: 1) 30 to 80 degrees East longitude along the 45-degree South latitude; 2) 80 to 150 degrees East longitude along the 55-degree South latitude; 3) 150 degrees East to 50 degrees West longitude along the 60-degree South latitude; and 4) 50 degrees West to 30 degrees East longitude along the 50-deg South latitude—October through March (IUCN, 1995).
- Costa Rica Dome, centered at 9 degrees N latitude and 88 degrees W longitude—year round (Longhurst, 1998; Chandler et al., 1999).
- Hawaiian Islands Humpback Whale National Marine Sanctuary - Penguin Bank, Hawaiian Archipelago, centered at 21 degrees North latitude and 157 degrees 30 minutes West longitude—November 1 through May 1. Penguin Bank boundaries extend to the 100-fathom (183 m) isobaths (15 CFR § 922.181).
- Cordell Bank National Marine Sanctuary, boundaries in accordance with 15 CFR § 922.110—year-round.
- Gulf of the Farallones National Marine Sanctuary, boundaries in accordance with 15 CFR § 922.80—year-round.
- Monterey Bay National Marine Sanctuary, boundaries in accordance with 15 CFR § 922.130—year-round.
- Olympic Coast National Marine Sanctuary, boundaries within 42.6 km (23.0 nmi) of the coast from 47 degrees 07 minutes North latitude to 48 degrees 30 minutes North latitude—December, January, March and May.
- Flower Garden Banks National Marine Sanctuary, boundaries in accordance with 15 CFR § 922.120—year-round.
- The Gully, 44 degrees 13 minutes North latitude; 59 degrees 06 minutes West longitude to 43 degrees 47 minutes N latitude; 58 degrees 35 minutes West longitude to 43 degrees 35 minutes North latitude; 58 degrees 35 minutes West longitude to 43 degrees 35 minutes North latitude; 59 degrees 08 minutes West longitude to 44 degrees 06 minutes North latitude; 59 degrees 20 minutes West longitude—year round.

None of these areas were within the authorized operational areas for SURTASS LFA sonar during the period of this report.

2.1.1.2 Recreational and Commercial Dive Sites

SURTASS LFA sonar operations are constrained in the vicinity of known recreational and commercial dive sites to ensure that the sound field at such sites does not exceed RLs of 145 dB re 1 µPa (rms) (SPL). Recreational dive sites are generally defined as coastal areas from the shoreline out to the 40-m (130-ft) depth contour, which are frequented by recreational divers; but it is recognized that there are other sites that may be outside this boundary.

2.1.1.3 Sound Field Modeling

SURTASS LFA sonar operators estimate the LFA sound field RLs (SPL) prior to and during operations to provide the information necessary to modify operations, including the delay or suspension of transmissions, in order not to exceed the 180-dB and 145-dB RL sound field criteria cited above. Sound field limits are estimated using near-real-time environmental data and underwater acoustic performance prediction models. These models are an integral part of the SURTASS LFA sonar processing system. The acoustic models help determine the sound field by predicting the SPLs, or RLs, at various distances from the SURTASS LFA sonar source location. Acoustic model updates are nominally made every 12 hours or more frequently when meteorological or oceanographic conditions change.

If the sound field criteria listed above were exceeded, the sonar operator would notify the Officer in Charge (OIC) of the Military Detachment (MILDET), who would order the delay or suspension of transmissions. If it were predicted that the SPLs would exceed the criteria within the next 12 hours, the OIC would also be notified in order to take the necessary action to ensure that the sound field criteria would not be exceeded.

2.1.2 Monitoring to Prevent Injury to Marine Animals

The following monitoring to prevent injury to marine animals is required by the ROD (DoN, 2007b), the 2007 Rule (50 CFR § 216.185) (NOAA, 2007c), and LOA condition 7 (APPENDIX A) when employing SURTASS LFA sonar:

- **Visual monitoring** for marine mammals and sea turtles from the vessel bridge during daylight hours by personnel trained to detect and identify marine mammals and sea turtles;
- **Passive acoustic monitoring** using the passive low frequency (LF) SURTASS array to listen for sounds generated by marine mammals as an indicator of their presence; and
- **Active acoustic monitoring** using the High Frequency Marine Mammal Monitoring (HF/M3) sonar, which is a Navy-developed, enhanced high frequency (HF) commercial sonar, to detect, locate, and track marine mammals and, to some extent, sea turtles, that may pass close enough to the SURTASS LFA sonar's transmit array to enter the LFA mitigation and buffer zones.

Monitoring will commence at least 30 minutes before the first SURTASS LFA sonar transmissions (30 minutes before sunrise for visual monitoring); continue between transmission pings; and continue for at least 15 minutes after the completion of SURTASS LFA sonar transmissions (30 minutes after sunset for visual), or if marine mammals are showing abnormal behavioral patterns, for a period of time until those patterns return to normal or the conditions prevent continued observations.

2.1.2.1 Visual Monitoring

Visual monitoring includes daytime observations for marine mammals and sea turtles from the vessel. Daytime is defined as 30 minutes before sunrise until 30 minutes after sunset.

Observations are made by personnel trained in detecting and identifying marine mammals and sea turtles. The objective of these observations is to maintain a track of marine mammals and/or sea turtles observed and to ensure that none approach the source close enough to enter the LFA mitigation and buffer zones. A marine mammal/sea turtle observation log will be maintained during operations that employ SURTASS LFA sonar. The numbers and identification of marine mammals/sea turtles sighted, as well as any unusual behavior, is entered into the log. A designated ship's officer monitors the conduct of the visual watches and periodically reviews the log entries. There are two potential visual monitoring scenarios.

First, if a potentially affected marine mammal or sea turtle is sighted outside of the LFA mitigation and buffer zones, the observer notifies the OIC. The OIC then notifies the HF/M3 sonar operator to determine the range and projected track of the animal. If it is determined that the animal will pass within the LFA mitigation and buffer zones, the OIC orders the delay or suspension of SURTASS LFA sonar transmissions when the animal enters the LFA mitigation or buffer zones. The observer continues visual monitoring/recording until the animal is no longer seen.

Second, if the potentially affected animal is sighted anywhere within the LFA mitigation or buffer zones, the observer notifies the OIC, who orders the immediate delay or suspension of SURTASS LFA sonar transmissions.

All sightings are recorded in the log and provided as part of the Long Term Monitoring (LTM) Program as discussed in FOEIS/EIS Subchapter 2.4.2 (DoN, 2001) for the monitoring of potential long-term environmental effects.

2.1.2.2 Passive Acoustic Monitoring

Passive acoustic monitoring is conducted using the passive LF SURTASS towed horizontal line array (HLA) to listen for vocalizing marine mammals as an indicator of their presence. If the sound is estimated to be from a marine mammal that may be potentially affected by SURTASS LFA sonar, the technician notifies the OIC, who alerts the HF/M3 sonar operator and visual observers. If prior to or during transmissions, the OIC then orders the delay or suspension of SURTASS LFA sonar transmissions when the animal enters the LFA mitigation or buffer zones.

All contacts are recorded in the log and provided as part of the LTM Program.

2.1.2.3 Active Acoustic Monitoring

HF active acoustic monitoring uses the HF/M3 sonar to detect, locate, and track marine mammals (and possibly sea turtles) that could pass close enough to the SURTASS LFA sonar array to enter the LFA mitigation and buffer zones. Prior to full-power operations, the HF/M3 sonar power level is increased over a period of 5 minutes from a source level (SL) of 180 dB re 1 µPa @ 1 meter (rms) in 10-dB increments until full power (if required) is attained to ensure that there are no inadvertent exposures of local animals to RLs $\geq$ 180 dB from the HF/M3 sonar. There are two potential scenarios for mitigation via active acoustic monitoring.

First, if a contact is detected outside the LFA mitigation and buffer zones, the HF/M3 sonar operator determines the range and projected track of the animal. If it is determined that the animal will pass within the LFA mitigation and buffer zones, the sonar operator notifies the OIC. The OIC then orders the delay or suspension of transmissions when the animal is predicted to enter the LFA mitigation or buffer zones. Second, if a contact is detected by the HF/M3 sonar within the LFA mitigation or buffer zones, the operator notifies the OIC, who orders the immediate delay or suspension of transmissions.

All contacts are recorded in the log and provided as part of the LTM Program.

2.1.2.4 Resumption of SURTASS LFA Sonar Transmissions

SURTASS LFA sonar transmissions can commence/resume 15 minutes after there is no further detection by the HF/M3 sonar and there is no further visual observation of the animal within the LFA mitigation and buffer zones.

2.2 Summary of Mitigation

Table 1 is a summary of the mitigation, the criteria for each, and the actions required.

Table 1. Summary of Mitigation

Mitigation	Criteria	Actions
Geographic Restrictions		
22 km (12 nmi) from any coastline[5]	Sound field below 180 dB RL, based on SPL modeling.	Delay/suspend SURTASS LFA sonar operations.
1 km (0.54 nmi) seaward of outer perimeter of any offshore biologically important areas during biologically important seasons outside of 22 km (12 nmi)	Sound field below 180 dB RL, based on SPL modeling.	Delay/suspend SURTASS LFA sonar operations.
Recreational and commercial dive sites (known)	Sound field not to exceed 145 dB RL, based on SPL modeling.	Delay/suspend SURTASS LFA sonar operations.
Monitoring to Prevent Injury to Marine Mammals and Sea Turtles		
Visual Monitoring	Potentially affected species sighted near the vessel but outside of the LFA mitigation and/or buffer zones.	Notify Officer in Charge (OIC).
	Potentially affected species sighted within the LFA mitigation or buffer zones.	Delay/suspend SURTASS LFA sonar operations.
Passive Acoustic Monitoring	Potentially affected species detected.	Notify OIC.
Active Acoustic Monitoring	Contact detected and determined to have a track that would pass within the LFA mitigation or buffer zones.	Notify OIC.
	Potentially affected species detected inside of the LFA mitigation or buffer zones.	Delay/suspend SURTASS LFA sonar operations.

[5] Ibid.

3.0 COURT CONSTRAINTS FOR SURTASS LFA SONAR OPERATIONS

During the period of this report, the SURTASS LFA sonar systems onboard the USNS ABLE, USNS EFFECTIVE, and USNS IMPECCABLE were operated under the conditions of the three LOAs (APPENDIX A) and the Stipulated Settlement Agreement Order (APPENDIX B) described in Subchapter 1.5.3. The exception was that the Navy could operate the LFA sonar system within the coastal exclusion zones set forth in APPENDIX B only when necessary to continue tracking an existing underwater contact detected outside of the exclusion zone, or when necessary to detect a new underwater contact that would place the LFA sonar system within the coastal exclusion zone to maximize opportunities for detection. These restrictions remained in effect for the entire period of this annual report.

Details of the authorized areas of operation are shown in Figures 3 and 4.

4.0 SUMMARY OF SURTASS LFA SONAR OPERATIONS FOR FOURTH YEAR ANNUAL REPORT

Under 50 CFR § 216.186(b) and LOA Condition 8(b), this annual report consists of an unclassified summary of the quarterly reports under the fourth year LOAs for the USNS ABLE, USNS EFFECTIVE, and USNS IMPECCABLE for the period of 16 August 2009 through 15 August 2010.

4.1 SURTASS LFA Sonar Operations for Fourth Annual Report

Three SURTASS LFA sonar systems operated under the LOAs issued by NMFS for the period 16 August 2010 to 15 August 2011 (APPENDIX A). The SURTASS LFA sonar systems onboard USNS ABLE and USNS IMPECCABLE operated in the northwestern Pacific Ocean, South China Sea, and Philippine Sea. The USNS EFFECTIVE commenced at-sea testing in the summer of 2011 in the North Philippine Sea. This report includes eight missions by the USNS ABLE, one mission by the USNS EFFECTIVE, and seven missions by the USNS IMPECCABLE.

4.1.1 USNS ABLE Missions

The USNS ABLE conducted eight missions covering a period of 35.75 days with 31.96 hours of transmissions by the CLFA array, and included operation of the HF/M3 sonar and compliance with other applicable mitigation requirements. These missions occurred in the north and west Philippine Sea, waters off Guam in the Philippine Sea, and South China Sea during the period of the LOA.

4.1.2 USNS EFFECTIVE Mission

The USNS EFFECTIVE commenced at-sea testing in the summer of 2011 conducting one mission covering a period of 4.98 days with 10.29 hours of transmissions by the CLFA array. This mission included operation of the HF/M3 sonar and compliance with other applicable mitigation requirements. This mission occurred in the north Philippine Sea during the period of the LOA.

4.1.3 USNS IMPECCABLE Missions

The USNS IMPECCABLE conducted 7 missions covering a period of 21.61 days with 21.74 hours of transmissions by the LFA array, and included operation of the HF/M3 sonar and compliance with other applicable mitigation requirements. These missions occurred in the north and west Philippine Sea and in the South China Sea during the period of the LOA.

4.2 Estimates of Marine Mammal Stocks Potentially Affected

In its annual LOA applications, the Navy provides estimates of the percentage of marine mammal stocks that could potentially be affected in the biogeographic regions of proposed SURTASS LFA sonar operations for the 12-month period of the LOA(s). In this annual report,

the Navy provides a post-operational assessment of whether incidental harassment occurred within the LFA 180-dB mitigation zone and estimates of the percentages of marine mammal stocks possibly harassed incidentally using predictive modeling based on dates/times/location of operations, system characteristics, oceanographic/environmental conditions, and animal demographics. The basis for the methodology used for the acoustic modeling to analyze risk and produce the incidental harassment estimates was the scientific analysis process used in the SURTASS LFA sonar Final OEIS/EIS (DoN, 2001) and detailed in the Subchapter 4.4 of the SURTASS LFA sonar Final SEIS (DoN, 2007a).

During the period of the LOAs (16 August 2010 to 15 August 2011), SURTASS LFA sonar operational missions were conducted in areas generally defined as Sites 2, 3, 4, and 7 (Figure 3) in the LOA application (DoN, 2010a) and the Kuroshio Current (53), North Pacific Tropical Gyre East (56), Western Pacific Warm Pool (63), and Archipelagic Deep Basin Provinces as defined in the Final Rule (50 CFR § 216.180(a)) and Condition 3(b) of the LOAs (APPENDIX A).

4.2.1 Pre-Operational Estimates of Marine Mammal Stocks Potentially Affected

Overall planning for operations during the LOA periods was based on the determination of the best operational sites and seasons that would have the least potential for impacts on marine mammals while meeting the Navy's operational requirements. Potential mission sites within each mission area were then analyzed with regard to spatial and temporal factors, and operational requirements for SURTASS LFA sonar. The general ocean areas for the pre-operational estimates were within the Philippine Sea, northwestern Pacific Ocean, Sea of Japan, East China Sea, South China Sea, and Hawaii Operating Areas. Marine mammal density and stock/abundance estimates were then derived for the proposed mission sites in the LOA application (DoN, 2010a).

Analyses for pre-operational estimates were performed at nominal potential operational sites, encompassing four seasons, which provide a conservative estimate of the potential for effects on marine mammal stocks in those provinces where operations were proposed in the Navy's LOA application (DoN, 2010a). These estimates were based on 22 missions of 7 days each (16 missions in the northwest Pacific Ocean and 6 missions in the Hawaii Operating Areas).

During the period of this report, the Navy had active operations of SURTASS LFA sonar in the north and west Philippine Sea (Sites 2 and 3), waters off of Guam (Site 4), and the South China Sea (Site 7). Tables 2 through 5 provide pre-operational risk estimates for marine mammal stocks for Sites 2, 3, 4, and 7 as presented in the Navy's application for LOAs (DoN, 2010a). These values supported the conclusion that these pre-operational risk estimates for marine mammal stocks were below—for most cases, well below—the criteria delineated by NMFS in LOA Condition 6(g) and the Final Rule (72 FR 46886). Upon completion of the missions under the requested authorization, these estimates were refined and submitted to NMFS under the quarterly reporting requirements of the Final Rule (50 CFR § 216.186(a)) and the condition 8(a) of the LOAs.

4.2.2 Post-Operational Estimates of Marine Mammal Stocks Potentially Affected

SURTASS LFA sonar operations during the period of this annual report comprised 16 missions totaling 63.63 days of operations with 63.99 hours of active transmissions by the LFA arrays. Operations occurred in the north and west Philippine Sea (Sites 2 and 3), waters off Guam (Site 4), and the South China Sea (Site 7) as shown in Figure 3. Post-operational estimates were based on the actual operating hours whereas the pre-operational estimates were based on projected operations over the course of each annual LOA.

Tables 6 through 9 provide post-operational estimates of the percentage of marine mammal stocks affected by the 63.63 days of SURTASS LFA sonar operations both within and outside the 180-dB mitigation zone. The same methodology was utilized as that used for the pre-operational analysis discussed above, except that the durations of each mission were based on actual transmission times and oceanographic environmental conditions were based on the date/time/location of the actual operations.

APPENDIX C provides updated information on how the density and stock/abundance estimates were derived for the operational areas utilized during the period of this report. These data were derived from best available published source documentation, and provided general area information for mission areas, with species-specific information on the animals that could potentially occur in those areas, including estimates for their stock/abundance and density. Animal demographics (stocks and densities) are based on current literature reviews of the western Pacific Ocean, Philippine Sea, and South China Sea as cited in APPENDIX C.

4.2.3 Summary of Results

The percentage of marine mammal stocks estimated to be exposed between 120 and 180 dB for both pre- and post-operational estimates are shown in Tables 2 through 9. Table 9 provides the fourth year LOA total post-operational estimates for the three vessels for each marine mammal stock potentially affected. The maximum percent affected between 120 and 180 dB (RL) was 3.62 percent for the western north Pacific stock of humpback whale. The next highest values were the western north Pacific stocks of short-finned pilot whale, Risso's dolphin, false killer whale, and minke whale at 2.38 percent, 2.28 percent, 2.21 percent, and 2.02 percent respectively. All other incidental take estimates are lower. The post-operational estimates are, therefore, considerably below the 12 percent for any marine mammal stock, the maximum percentage for incidental harassment by SURTASS LFA sonar authorized in LOA Condition 6(g) and the Final Rule (72 FR 46886).

The post-operational incidental harassment estimates in Tables 6 through 9 show that there were no marine mammal exposures to received levels at or above 180 dB. These results are supported by the results from the visual, passive acoustic and active acoustic monitoring efforts discussed in Subchapter 4.3. In addition, a review of stranding data for the period did not indicate any stranding events associated with the times and locations of SURTASS LFA sonar operations. Additionally, there were no apparent avoidance reactions or acute effects of threatened or endangered species in response to exposure from SURTASS LFA sonar transmissions.

Table 2. Pre-Operational Estimates of Marine Mammal Stocks Potentially Affected In Site 2

North Philippine Sea—Model Site 2				
Animal	**Stock**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
Bryde's whale	WNP	20501	0.27	0.00
Minke whale	WNP "O" Stock	25049	1.62	0.00
N. Pacific right whale	***WNP***	***922***	***0.10***	***0.00***
Sperm whale	***NP***	***102112***	***0.23***	***0.00***
Kogia spp	NP	350553	0.07	0.00
Cuvier's beaked whale	NP	90725	0.55	0.00
Blainville's beaked whale	NP	8032	0.58	0.00
Ginkgo-toothed beaked whale	NP	22799	0.20	0.00
Killer whale	NP	12256	0.30	0.00
False killer whale	WNP	16668	1.61	0.00
Pygmy killer whale	WNP	30214	0.64	0.00
Melon-headed whale	WNP	36770	0.30	0.00
Short-finned pilot whale	WNP	53608	2.64	0.00
Risso's dolphin	WNP	83289	1.50	0.00
Common dolphin	WNP	3286163	0.17	0.00
Bottlenose dolphin	WNP	168791	1.02	0.00
Spinner dolphin	WNP	1015059	0.00	0.00
Pantropical spotted dolphin	WNP	438064	0.32	0.00
Striped dolphin	WNP	570038	0.58	0.00
Rough-toothed dolphin	WNP	145729	0.41	0.00
Fraser's dolphin	WNP	220789	0.18	0.00
Pacific white-sided dolphin	WNP	931000	0.13	0.00

NP—North Pacific Stock

WNP—Western North Pacific Stock

Note: Bolded and italicized species (animals) are listed under the Endangered Species Act (ESA)

Table 3. Pre-Operational Estimates of Marine Mammal Stocks Potentially Affected In Site 3

West Philippine Sea—Model Site 3				
Animal	**Stock**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
Fin whale	***NP***	***9250***	***0.25***	***0.00***
Bryde's whale	WNP	20501	0.34	0.00
Minke whale	WNP "O" Stock	25049	1.55	0.00
Humpback whale (winter only)	***WNP***	***1107***	***0.00***	***0.00***
Sperm whale	***NP***	***102112***	***0.09***	***0.00***
Kogia spp	NP	350553	0.04	0.00
Cuvier's beaked whale	NP	90725	0.03	0.00
Blainville's beaked whale	NP	8032	0.63	0.00
Ginkgo-toothed beaked whale	NP	22799	0.22	0.00
False killer whale	WNP	16668	2.05	0.00
Pygmy killer whale	WNP	30214	0.82	0.00
Melon-headed whale	WNP	36770	0.38	0.00
Short-finned pilot whale	WNP	53608	1.67	0.00
Risso's dolphin	WNP	83289	1.82	0.00
Common dolphin	WNP	3286163	0.23	0.00
Bottlenose dolphin	WNP	168791	1.24	0.00
Spinner dolphin	WNP	1015059	0.01	0.00
Pantropical spotted dolphin	WNP	438064	0.42	0.00
Striped dolphin	WNP	570038	0.39	0.00
Rough-toothed dolphin	WNP	145729	0.54	0.00
Fraser's dolphin	WNP	220789	0.24	0.00
Pacific white-sided dolphin	WNP	931000	0.35	0.00

NP—North Pacific Stock
WNP—Western North Pacific Stock

Note: Bolded and italicized species (animals) are listed under the Endangered Species Act (ESA)

Table 4. Pre-Operational Estimates of Marine Mammal Stocks Potentially Affected In Site 4

Offshore Guam—Model Site 4				
Animal	**Stock**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
Blue whale	***ENP***	***1186***	***0.64***	***0.00***
Fin whale	***ENP***	***9250***	***0.25***	***0.00***
Sei whale	***NP***	***8600***	***0.25***	***0.00***
Bryde's whale	WNP	20501	0.17	0.00
Minke whale	WNP "O" Stock	25049	0.10	0.00
Humpback whale (winter only)	***CNP***	***10103***	***5.74***	***0.00***
Sperm whale	***NP***	***102112***	***0.08***	***0.00***
Kogia spp	NP	350553	0.19	0.00
Cuvier's beaked whale	NP	90725	0.46	0.00
Blainville's beaked whale	NP	8032	0.98	0.00
Ginkgo-toothed beaked whale	NP	22799	0.15	0.00
Longman's beaked whale	CNP	1007	2.74	0.00
False killer whale	WNP	16668	0.67	0.00
Pygmy killer whale	WNP	30214	0.05	0.00
Melon-headed whale	WNP	36770	1.17	0.00
Killer whale	CNP	349	4.04	0.00
Short-finned pilot whale	WNP	53608	0.30	0.00
Risso's dolphin	WNP	83289	0.16	0.00
Common dolphin	WNP	3286163	0.01	0.00
Bottlenose dolphin	WNP	168791	0.02	0.00
Spinner dolphin	WNP	1015059	0.04	0.00
Pantropical spotted dolphin	WNP	438064	0.61	0.00
Striped dolphin	WNP	570038	0.13	0.00
Rough-toothed dolphin	WNP	145729	0.02	0.00
Fraser's dolphin	CNP	10226	4.80	0.00

NP—North Pacific Stock
ENP—Eastern North Pacific
WNP—Western North Pacific Stock
CNP—Central North Pacific Stock

Note: Bolded and italicized species (animals) are listed under the Endangered Species Act (ESA)

Table 5. Pre-Operational Estimates of Marine Mammal Stocks Potentially Affected In Site 7

South China Sea—Model Site 7				
Animal	**Stock**	**# Animals Stock**	**% Affected (w/mit) 120-180 dB**	**% Affected (w/mit) ≥ 180 dB**
Fin whale	***WNP***	***9250***	***0.07***	***0.00***
Bryde's whale	WNP	20501	0.09	0.00
Minke whale	WNP "O" Stock	25049	0.41	0.00
Gray whale (winter only)	***WNP***	***121***	***0.00***	***0.00***
N Pac Right whale	***WNP***	***922***	***0.04***	***0.00***
Sperm whale	***NP***	***102112***	***0.03***	***0.00***
Kogia spp	NP	350553	0.01	0.00
Cuvier's beaked whale	NP	90725	0.01	0.00
Blainville's beaked whale	NP	8032	0.16	0.00
Ginkgo-toothed beaked whale	NP	22799	0.06	0.00
False killer whale	IA	9777	0.38	0.00
Pygmy killer whale	WNP	30214	0.02	0.00
Melon-headed whale	WNP	36770	0.39	0.00
Short-finned pilot whale	WNP	53608	0.10	0.00
Risso's dolphin	WNP	83289	0.57	0.00
Common dolphin	WNP	3286163	0.05	0.00
Bottlenose dolphin	IA	105138	0.66	0.00
Spinner dolphin	WNP	1015059	1.21	0.00
Pantropical spotted dolphin	WNP	219032	0.25	0.00
Striped dolphin	WNP	570038	0.11	0.00
Rough-toothed dolphin	WNP	145729	0.11	0.00
Fraser's dolphin	WNP	220789	0.07	0.00

NP—North Pacific Stock
WNP—Western North Pacific Stock
IA—Inshore Archipelago Stock

Note: Bolded and italicized species (animals) are listed under the Endangered Species Act (ESA)

Table 6. Post-Operational Estimated of Marine Mammal Stocks Potentially Affected - Totals for USNS ABLE 4th Year LOA

LOA 4—USNS ABLE								
Animal	**Stock**	**# Animals in Stock**	**% Affected (w/mit) 120 – 180 dB**					**% Affected (w/mit) ≥ 180 dB**
			Q1	**Q2**	**Q3**	**Q4**	**AN**	**Annual Total**
Blue whale	***Eastern N. Pacific***	***1186***	***0.14***	***--***	***--***	***--***	***0.14***	***0.00***
Fin whale	***N. Pacific***	***9250***	***0.10***	***0.05***	***--***	***--***	***0.15***	***0.00***
Sei whale	***N. Pacific***	***8600***	***0.06***	***--***	***--***	***--***	***0.06***	***0.00***
Bryde's whale	Western N. Pacific	20501	0.11	0.08	0.06	--	0.25	0.00
Minke whale	Western N. Pacific	25049	0.32	0.32	0.29	--	0.93	0.00
N. Pac right whale (Oct-May)	***Western N. Pacific***	***922***	***--***	***0.01***	***0.02***	***--***	***0.03***	***0.00***
Humpback whale (winter only)	***Western N. Pacific***	***1107***	***0.00***	***1.40***	***0.44***	***--***	***1.84***	***0.00***
Humpback whale (Oct-May)	***Central N. Pacific***	***10103***	***0.00***	***--***	***--***	***--***	***0.00***	***0.00***
Gray whale (winter only)	***Western N. Pacific***	***121***	***--***	***0.04***	***0.08***	***--***	***0.12***	***0.00***
Sperm whale	***N. Pacific***	***102112***	***0.04***	***0.01***	***0.02***	***--***	***0.07***	***0.00***
Kogia	N. Pacific	350553	0.05	0.01	0.00	--	0.06	0.00
Cuvier's beaked whale	N. Pacific	90725	0.11	0.01	0.03	--	0.15	0.00
Blainville's beaked whale	N. Pacific	8032	0.34	0.13	0.11	--	0.58	0.00
Ginkgo-toothed beaked whale	N. Pacific	22799	0.07	0.05	0.04	--	0.16	0.00
Longman's beaked whale	Central N. Pacific	1007	0.61	--	--	--	0.61	0.00
Killer whale	Central N. Pacific	349	0.90	--	0.02	--	0.92	0.00
False killer whale	Western N. Pacific	16668	0.55	0.34	0.19	--	1.08	0.00
False killer whale	Inshore Archipelago	9777	--	0.07	0.12	--	0.19	0.00
Pygmy killer whale	Western N. Pacific	30214	0.17	0.13	0.07	--	0.37	0.00
Melon-headed whale	Western N. Pacific	36770	0. 33	0.13	0.16	--	0.62	0.00
Short-finned pilot whale	Western N. Pacific	53608	0.40	0.29	0.26	--	0.95	0.00
Risso's dolphin	Western N. Pacific	83289	0. 38	0.40	0.35	--	1.13	0.00
Common dolphin	Western N. Pacific	3286163	0.04	0.05	0.04	--	0.13	0.00
Bottlenose dolphin	Western N. Pacific	168791	0.24	0.20	0.11	--	0.55	0.00
Bottlenose dolphin	Inshore Archipelago	105138	--	0.11	0.21	--	0.32	0.00
Spinner dolphin	Western N. Pacific	1015059	0.01	0.21	0.38	--	0.60	0.00
Pantropical spotted dolphin	Western N. Pacific	438064	0.21	0.11	0.12	--	0.44	0.00
Striped dolphin	Western N. Pacific	570038	0.10	0.08	0.09	--	0.27	0.00
Rough-toothed dolphin	Western N. Pacific	145729	0.12	0.11	0.08	--	0.31	0.00
Fraser's dolphin	Western N. Pacific	220789	0.05	0.05	0.04	--	0.14	0.00
Fraser's dolphin	Central N. Pacific	10226	1.07	--	--	--	1.07	0.00
Pacific white-sided dolphin	Western N. Pacific	931000	0.07	0.06	0.03	--	0.16	0.00

Note: Bolded and italicized species (animals) are listed under the Endangered Species Act (ESA)

Table 7. Post-Operational Estimates of Marine Mammal Stocks Potentially Affected - Totals for USNS EFFECTIVE 4th Year LOA

LOA 4—USNS EFFECTIVE								
Animal	**Stock**	**# Animals in Stock**	**% Affected (w/mit) 120 – 180 dB**					**% Affected (w/mit) ≥ 180 dB**
			Q1	**Q2**	**Q3**	**Q4**	**AN**	**Annual Total**
Bryde's whale	Western N. Pacific	20501	--	--	--	0.07	0.07	0.00
Minke whale	Western N. Pacific	25049	--	--	--	0.44	0.44	0.00
N. Pacific right whale (Oct-May)	***Western N. Pacific***	***922***	--	--	--	***0.00***	***0.00***	***0.00***
Sperm whale	***N. Pacific***	***102112***	--	--	--	***0.06***	***0.06***	***0.00***
Kogia	N. Pacific	350553	--	--	--	0.02	0.02	0.00
Cuvier's beaked whale	N. Pacific	90725	--	--	--	0.15	0.15	0.00
Blainville's beaked whale	N. Pacific	8032	--	--	--	0.16	0.16	0.00
Ginkgo-toothed beaked whale	N. Pacific	22799	--	--	--	0.06	0.06	0.00
Killer whale	Western N. Pacific	12256	--	--	--	0.08	0.08	0.00
False killer whale	Western N. Pacific	16668	--	--	--	0.44	0.44	0.00
Pygmy killer whale	Western N. Pacific	30214	--	--	--	0.17	0.17	0.00
Melon-headed whale	Western N. Pacific	36770	--	--	--	0.08	0.08	0.00
Short-finned pilot whale	Western N. Pacific	53608	--	--	--	0.72	0.72	0.00
Risso's dolphin	Western N. Pacific	83289	--	--	--	0.41	0.41	0.00
Common dolphin	Western N. Pacific	3286163	--	--	--	0.05	0.05	0.00
Bottlenose dolphin	Western N. Pacific	168791	-`-	--	--	0.28	0.28	0.00
Spinner dolphin	Western N. Pacific	1015059	--	--	--	0.00	0.00	0.00
Pantropical spotted dolphin	Western N. Pacific	438064	--	--	--	0.09	0.09	0.00
Striped dolphin	Western N. Pacific	570038	--	--	--	0.16	0.16	0.00
Rough-toothed dolphin	Western N. Pacific	145729	--	--	--	0.11	0.11	0.00
Fraser's dolphin	Western N. Pacific	220789	--	--	--	0.05	0.05	0.00
Pacific white-sided dolphin	Western N. Pacific	931000	--	--	--	0.04	0.04	0.00

Note: Bolded and italicized species (animals) are listed under the Endangered Species Act (ESA)

Table 8. Post-Operational Estimates of Marine Mammal Stocks Potentially Affected - Totals for USNS IMPECCABLE 4th Year LOA

LOA 4—USNS IMPECCABLE								
Animal	**Stock**	**# Animals in Stock**	**% Affected (w/mit) 120 – 180 dB**					**% Affected (w/mit) ≥ 180 dB**
			Q1	**Q2**	**Q3**	**Q4**	**AN**	**Annual Total**
Fin whale	***N. Pacific***	***9250***	***0.01***	***0.05***	***0.01***	***--***	***0.07***	***0.00***
Bryde's whale	Western N. Pacific	20501	0.02	0.09	0.03	--	0.14	0.00
Minke whale	Western N. Pacific	25049	0.08	0.43	0.14	--	0.65	0.00
N. Pacific right whale (Oct-May)	***Western N. Pacific***	***922***	***--***	***0.01***	***0.01***	***--***	***0.02***	***0.00***
Humpback whale (winter only)	***Western N. Pacific***	***1107***	***0.00***	***1.78***	***--***	***--***	***1.78***	***0.00***
Gray whale (winter only)	***Western N. Pacific***	***121***	***--***	***--***	***0.00***	***--***	***0.00***	***0.00***
Sperm whale	***N. Pacific***	***102112***	***0.00***	***0.04***	***0.02***	***--***	***0.06***	***0.00***
Kogia	N. Pacific	350553	0.00	0.01	0.00	--	0.01	0.00
Cuvier's beaked whale	N. Pacific	90725	0.00	0.05	0.02	--	0.07	0.00
Blainville's beaked whale	N. Pacific	8032	0.03	0.17	0.05	--	0.25	0.00
Ginkgo-toothed beaked whale	N. Pacific	22799	0.01	0.06	0.02	--	0.09	0.00
Killer whale	Western N. Pacific	12256	--	0.02	0.01	--	0.03	0.00
False killer whale	Western N. Pacific	16668	0.10	0.54	0.05	--	0.69	0.00
False killer whale	Inshore Archipelago	9777	--	--	0.08	--	0.08	0.00
Pygmy killer whale	Western N. Pacific	30214	0.04	0.21	0.02	--	0.27	0.00
Melon-headed whale	Western N. Pacific	36770	0.02	0.10	0.09	--	0.21	0.00
Short-finned pilot whale	Western N. Pacific	53608	0.08	0.52	0.11	--	0.71	0.00
Risso's dolphin	Western N. Pacific	83289	0.09	0.48	0.17	--	0.74	0.00
Common dolphin	Western N. Pacific	3286163	0.01	0.06	0.02	--	0.09	0.00
Bottlenose dolphin	Western N. Pacific	168791	0.06	0.33	0.03	--	0.42	0.00
Bottlenose dolphin	Inshore Archipelago	105138	0.00	0.00	0.14	--	0.14	0.00
Spinner dolphin	Western N. Pacific	1015059	0.00	0.00	0.26	--	0.26	0.00
Pantropical spotted dolphin	Western N. Pacific	438064	0.02	0.11	0.06	--	0.19	0.00
Striped dolphin	Western N. Pacific	570038	0.02	0.12	0.04	--	0.18	0.00
Rough-toothed dolphin	Western N. Pacific	145729	0.03	0.11	0.03	--	0.17	0.00
Fraser's dolphin	Western N. Pacific	220789	0.01	0.06	0.03	--	0.10	0.00
Pacific white-sided dolphin	Western N. Pacific	931000	0.02	0.08	0.00	--	0.10	0.00

Note: Bolded and italicized species (animals) are listed under the Endangered Species Act (ESA).

Table 9. Post-Operational Estimates of Marine Mammal Stocks Potentially Affected - Totals for 4th Year LOAs

LOA 4—USNS ABLE, USNS EFFECTIVE, & USNS IMPECCABLE								
Animal	**Stock**	**# Animals in Stock**	**% Affected (w/mit) 120 – 180 dB**					**% Affected (w/mit) ≥ 180 dB**
			Q1	**Q2**	**Q3**	**Q4**	**AN**	**Annual Total**
Blue whale	***Eastern N. Pacific***	***1186***	***0.14***	***--***	***--***	***--***	***0.14***	***0.00***
Fin whale	***N. Pacific***	***9250***	***0.11***	***0.10***	***0.01***	***--***	***0.22***	***0.00***
Sei whale	***N. Pacific***	***8600***	***0.06***	***--***	***--***	***--***	***0.06***	***0.00***
Bryde's whale	Western N. Pacific	20501	0.13	0.17	0.09	0.07	0.46	0.00
Minke whale	Western N. Pacific	25049	0.40	0.75	0.43	0.44	2.02	0.00
N. Pac right whale (Oct-May))	***Western N. Pacific***	***922***	***--***	***0.02***	***0.03***	***0.00***	***0.05***	***0.00***
Humpback whale (winter only)	***Western N. Pacific***	***1107***	***0.00***	***3.18***	***0.44***	***--***	***3.62***	***0.00***
Humpback whale (Oct-May)	***Central N. Pacific***	***10103***	***0.00***	***--***	***--***	***--***	***0.00***	***0.00***
Gray whale (winter only)	***Western N. Pacific***	***121***	***--***	***0.04***	***0.08***	***--***	***0.12***	***0.00***
Sperm whale	***N. Pacific***	***102112***	***0.04***	***0.05***	***0.04***	***0.06***	***0.19***	***0.00***
Kogia	N. Pacific	350553	0.05	0.02	0.00	0.02	0.09	0.00
Cuvier's beaked whale	N. Pacific	90725	0.11	0.06	0.05	0.15	0.37	0.00
Blainville's beaked whale	N. Pacific	8032	0.37	0.30	0.16	0.16	0.99	0.00
Ginkgo-toothed beaked whale	N. Pacific	22799	0.08	0.11	0.06	0.06	0.31	0.00
Longman's beaked whale	Central N. Pacific	1007	0.61	--	--	--	0.61	0.00
Killer whale	Western N. Pacific	12256	--	0.02	0.01	0.08	0.11	0.00
Killer whale	Central N. Pacific	349	0.90	--	0.02	--	0.92	0.00
False killer whale	Western N. Pacific	16668	0.65	0.88	0.24	0.44	2.21	0.00
False killer whale	Inshore Archipelago	9777	--	0.07	0.20	--	0.27	0.00
Pygmy killer whale	Western N. Pacific	30214	0.21	0.34	0.09	0.17	0.81	0.00
Melon-headed whale	Western N. Pacific	36770	0.35	0.23	0.25	0.08	0.91	0.00
Short-finned pilot whale	Western N. Pacific	53608	0.48	0.81	0.37	0.72	2.38	0.00
Risso's dolphin	Western N. Pacific	83289	0.47	0.88	0.52	0.41	2.28	0.00
Common dolphin	Western N. Pacific	3286163	0.05	0.11	0.06	0.05	0.27	0.00
Bottlenose dolphin	Western N. Pacific	168791	0.30	0.53	0.14	0.28	1.25	0.00
Bottlenose dolphin	Inshore Archipelago	105138	0.00	0.11	0.35	--	0.46	0.00
Spinner dolphin	Western N. Pacific	1015059	0.01	0.21	0.64	0.00	0.86	0.00
Pantropical spotted dolphin	Western N. Pacific	438064	0.23	0.22	0.18	0.09	0.72	0.00
Striped dolphin	Western N. Pacific	570038	0.12	0.20	0.13	0.16	0.61	0.00
Rough-toothed dolphin	Western N. Pacific	145729	0.15	0.22	0.11	0.11	0.59	0.00
Fraser's dolphin	Western N. Pacific	220789	0.06	0.11	0.07	0.05	0.29	0.00
Fraser's dolphin	Central N. Pacific	10226	1.07	--	--	--	1.07	0.00
Pacific white-sided dolphin	Western N. Pacific	931000	0.09	0.14	0.03	0.04	0.30	0.00

Note: Bolded and italicized species (animals) are listed under the Endangered Species Act (ESA)

4.3 Mitigation Effectiveness

Under LOA Condition 8(b)(i) the following assessment of the effectiveness of the mitigation measures is provided. There are no recommendations for mitigation improvements at this time.

4.3.1 LFA Mitigation and Buffer Zones

During the missions, the minimum radial distance to the safety zone from the LFA array was 1 km (0.54 nmi). Therefore, the safety and buffer zones comprised a 2-km (1.08-nmi) radius.

4.3.2 Visual Monitoring

Visual observers, trained in marine mammal identification in accordance with Condition 7(c) of the LOAs, were posted as specified in LOA Condition 7(a)(i) and CNO executive directive (Chapter 2.0). There were three visual sightings.

4.3.2.1 Visual Sightings of Marine Mammals

During a non-operational period (no LFA transmissions) on the USNS ABLE in the third quarter (16 February to 15 May 2011), there was one visual sighting of marine mammals. Species was not identified.

In the fourth quarter (16 May to 15 August 2011) on the USNS EFFECTIVE, there was a visual sighting of a marine mammal at 060 degrees relative (R) at 1100 m (1200 yds) after an alert by the HF/M3 sonar operator. Species was not identified. There was no passive confirmation. LFA transmissions were suspended in accordance with protocols.

4.3.2.2 Visual Sighting of a Sea Turtle

Also in the fourth quarter (16 May to 15 August 2011) on the USNS EFFECTIVE, there was a visual sighting of a sea turtle at 090 degrees R, 15 m (50 ft). LFA transmissions were suspended in accordance with protocols.

Because of the contact's proximity to the SURTASS LFA sonar vessel, an assessment was made to determine the potential for the sea turtle to be within the LFA mitigation zone (180 dB sound field). The closest LFA transmission in time to the sea turtle ended 8 minutes and 20 seconds prior to the sighting and subsequent suspension. This equated to an estimated horizontal range of 700 m (0.4 nmi) from the LFA array. Assuming that at this range the sea turtle would be in the far field (that is the LFA array would appear to be a point source), the RL would be approximately 170 dB re 1 µPa (rms) (SPL) based on spherical spreading. Additionally, the center of the array is approximately 100 m (328 ft) below the surface with the HF/M3 sonar located at the top of the array. Because of the depth of LFA array, the HF/M3 sonar was not designed to detect marine mammals or sea turtles at or near the surface in proximity to the vessel. In order for the sea turtle to enter the 180-dB mitigation zone, it would have to swim through the HF/M3 detection zone, which at this range would have a high probability of

detection. The lack of detection by the HF/M3 sonar would indicate that the sea turtle remained at or near the surface and did not dive into the 180 dB LFA mitigation zone during transmissions. Thus, it is improbable that the sea turtle received SPL from SURTASS LFA sonar at or above 180 dB re 1 µPa (rms).

4.3.3 Passive Acoustic Monitoring

The embarked military detachment (MILDET) and system support engineers monitored the SURTASS passive displays for marine mammal vocalizations as specified in LOA Condition 7(a)(ii). There was one passive contact reported.

During operations on the USNS ABLE in the first quarter (16 August to 15 November 2010), there was one period of marine mammal vocalizations. There was no visual or active acoustic (HF/M3) confirmation. LFA transmissions were suspended in accordance with protocols. After the contact was assessed to be outside of the LFA safety and buffers zones, transmissions were resumed.

4.3.4 Active Acoustic Monitoring

The HF/M3 sonar systems were operated continuously during the course of the missions in accordance with LOA Conditions 6(c) and 7(a)(iii). There were five HF/M3 sonar alerts.

During operations on the USNS ABLE in the third quarter (16 February to 15 May 2011), there was one HF/M3 alert with no visual or passive confirmation. This occurred just after LFA transmissions ended.

During operations on the USNS EFFECTIVE in the fourth quarter (16 May to 15 August 2011), there were two HF/M3 alerts. The first contact was confirmed by visual monitoring at 060 degrees R, 1100 m (1200 yds). The species was not identified. There was no visual or passive confirmation of the second alert. LFA transmissions were suspended in both instances in accordance with protocols.

During operations on the USNS IMPECCABLE in the first quarter (16 August to 15 November 2010), there were two HF/M3 alerts that were identified as possible marine mammal contacts. The first was at 115 degree true (T) at 1.0 km (0.54 nmi). The second was at 230 degrees T at 1.0 km (0.54 nmi). There were no visual or passive confirmations. LFA transmissions were suspended in both instances in accordance with protocols.

4.3.5 Delay/Suspension of Operations

In accordance with the requisite protocols under LOA Condition 6(b), LFA transmissions were delayed or suspended on seven occasions.

There was one operational suspension aboard the USNS ABLE due to a passive acoustic contact.

On the USNS EFFECTIVE, there four suspensions/delays due to two HF/M3 sonar alerts with one visual confirmation, one visual contact of a sea turtle, and one while resolving a tuning issue with the HF/M3 sonar.

On the USNS IMPECCABLE, operations were delayed or suspended two times for HF/M3 alerts.

4.4 Marine Mammal Observer Training

In accordance with Condition 7(c) of the third year LOAs, on-site individuals will be qualified to conduct the mitigation, monitoring, and reporting activities. Specifically, one or more marine mammal biologists, highly experienced in marine mammal observations techniques, will train observers to conduct visual monitoring during active sonar operations. To meet this requirement, marine mammal observers were trained by a qualified Marine Acoustics, Inc. (MAI) marine biologist onboard USNS ABLE on 14 August 2011 during in-port periods in Sasebo, Japan.

4.5 Assessment of Long-Term Effects and Estimated Cumulative Impacts

Because the impacts that were encountered during the period of this report are consistent with what was projected in the FSEIS (DoN, 2007a) and supporting documentation, the Navy's assessment of the long-term effects and estimated cumulative impacts from employment of SURTASS LFA sonar remain consistent with the analysis of such impacts in the FSEIS.

5.0 LONG TERM MONITORING AND RESEARCH

As part of its continuing commitment to protect the environment, the Navy is continuing the LTM Program to assess and analyze the potential for effects of the employment of SURTASS LFA sonar on the marine environment.

The principal objectives of the LTM Program for the SURTASS LFA sonar system are to:

- Analyze and assess the effectiveness of mitigation measures, and make recommendations for improvements where applicable, to incorporate them as early as possible, with NMFS concurrence;
- Provide the necessary input data for reports on estimates of percentages of marine mammal populations affected by SURTASS LFA sonar operations, using predictive modeling based on operating location, system characteristics, and animal demographics;
- Study the potential effects of Navy SURTASS LFA sonar-generated underwater sound on long-term ecological processes relative to LF sound-sensitive marine animals, focusing on the application of Navy technology for the detection, classification, localization, and tracking of these animals; and
- Collaborate, as feasible, with pertinent Navy, academic, and industry laboratories and research organizations, and where applicable, with Allied navy and academic laboratories.

The LTM Program consists of two parts—reporting and research.

5.1 Reporting Requirements Under the Final Rule and Letters of Authorization

The first part of the LTM Program consists of NMFS-directed reports under the MMPA Final Rule and LOAs. These reports provide information for assessments of whether incidental harassment of marine mammals occurred within the SURTASS LFA sonar mitigation and buffer zones during operations, based upon data from the monitoring mitigation (visual, passive acoustic, active acoustic). Data analysis from the LTM Program and post-operation acoustic information are utilized to estimate the percent of marine mammal stocks potentially exposed to SURTASS LFA sonar received levels below 180 dB re 1 µPa (rms).

During routine operations of SURTASS LFA sonar, technical and environmental data are collected and recorded. As part of the LTM Program and as stipulated in the 2007 Final Rule and LOAs, the following reports are required:

- Mission reports are submitted to NMFS on a quarterly basis for each vessel, including all active-mode missions that have been completed 30 days or more prior to the date of the deadline for the report.
- Annual reports are submitted to NMFS 45 days after the expiration of the LOAs.
- A final comprehensive report is submitted to NMFS, which analyzes any impacts of SURTASS LFA sonar on marine mammal stocks during the 5-year period of the regulations.

The summary of SURTASS LFA sonar operations for the fourth year LOAs (16 August 2010 to 15 August 2011) have been provided in Chapter 4.0 of this report.

5.2 Monitoring and Research Requirements under the Final Rule and Letters of Authorization

The Department of the Navy is committed to demonstrating environmental stewardship while executing its national defense mission, and is responsible for compliance with a suite of federal environmental and natural resources laws and regulations that apply to the marine environment. For example, the MMPA implementing regulations (216.104(a)(13)) require that an applicant for an MMPA authorization provide NMFS with a monitoring plan that will result in an increased understanding of the species and the impact that the proposed activity will have on those species.

Condition 7(d) of the LOAs and Final Rule (72 FR 46888) (NOAA, 2007c) included the conduct of additional research involving the topics listed below. These research activities are to help increase the knowledge of marine mammal species and the determination of levels of effects from potential takes. NMFS recommended that the Navy conduct, or continue to conduct, the following monitoring and research regarding SURTASS LFA sonar over the 5-year authorization period:

1. Systematically observe SURTASS LFA sonar training exercises for injured or disabled marine mammals.
2. Compare the effectiveness of the three forms of mitigation (visual, passive acoustic, HF/M3 sonar).
3. Conduct research on the responses of deep-diving odontocetes to LF sonar signals.
4. Conduct research on the habitat preferences of beaked whales.
5. Conduct passive acoustic monitoring using bottom mounted hydrophones before, during, and after LF sonar operations for the possible silencing of calls of large whales.
6. Continue to evaluate the HF/M3 mitigation sonar.
7. Continue to evaluate improvements in passive sonar capabilities.

5.2.1 Research Status

Table 10 below provides the status of research pertinent to SURTASS LFA sonar that has been and is being conducted to address NMFS' research objectives.

Table 10. Status of Navy-Funded Monitoring/Studies Regarding SURTASS LFA Sonar

NMFS Research Topics	Status
Injured/disabled Marine Animals Systematically observe SURTASS LFA sonar training exercises for injured or disabled marine animals	This monitoring study is ongoing based on the mitigation and reporting requirements under the LOAs (APPENDIX A). As reported in the annual reports for the first three LOA periods (DoN, 2008b, 2009, 2010b) and this report under the 2007-2012 Rule (NOAA, 2007c), post-operational incidental harassment assessments demonstrated that there were no known marine mammal exposures to RLs at or above 180 dB. These findings are supported by the results from the visual, passive acoustic and active acoustic monitoring efforts discussed in the first three annual reports for the initial three-year period 16 August 2007 to 15 August 2010 under the current Rule. In addition, a review of recent strandings did not indicate any stranding events associated with the times and locations of SURTASS LFA sonar operations (Subchapter 5.2.3). This research is continuing under the current LOAs for the period 16 August 2011 to 15 August 2012.
Mitigation Effectiveness Compare the effectiveness of the three forms of mitigation (visual, passive acoustic, HF/M3 sonar)	A summary of mitigation effectiveness was provided in Subchapter 4.1.8 of the Final Comprehensive Report (DoN, 2007c) for the 2002-2007 Rule. Under the current Rule, the Navy is also required to summarize the effectiveness of the mitigation in a final comprehensive report. Therefore, data collection and analyses are continuing as part of the reporting requirements of the LTM Program.
Passive Acoustic Monitoring Conduct passive acoustic monitoring using bottom-mounted hydrophones before, during, and after LF sonar operations for the possible silencing of calls of large whales	The Navy has and is continuing to sponsor multi-year studies regarding the acoustic monitoring of marine mammals using fixed passive acoustic monitoring systems in the North Atlantic Ocean (NORLANT). During four of these monitoring/study efforts (NORLANT 2004, 2005, 2006-01, 2006-02), no variations in normal behavior patterns for fin, blue, or humpback whales were noted in response to anthropogenic LF sounds. The fifth NORLANT monitoring/study effort was completed in 2007 (NORLANT 2007). During this period, seismic airguns were the most prevalent anthropogenic noise. The reports for these tasks are classified; unclassified summary reports have been produced. During the period of this report for the third year LOAs, the collection of cross spectral matrix (CSM) data from the arrays has continued. These data will be used to count fin and humpback whale calls and estimate their population. Observations of CSM data over time can also note the interaction and influence of noise sources (seismic profilers, storms, shipping, fishing activity, naval activities) on large whale behavior.
Evaluate HF/M3 Sonar Continue to evaluate the HF/M3 mitigation sonar	The HF/M3 sonar has been upgraded for integration into the installations of Compact Low Frequency Active (CLFA) sonar on the T-AGOS 19 Class vessels. The first installation of the upgraded HF/M3 sonar was onboard the USNS ABLE (T-AGOS 20). The USNS EFFECTIVE (T-AGOS 21), which is currently undergoing initial at-sea testing, is also equipped with the upgraded HF/M3 sonar. Evaluation of the HF/M3 sonar is part of the at-sea testing and will be documented in the unclassified final comprehensive reports. The USNS VICTORIOUS (T-AGOS 19), which is scheduled to commence initial at-sea testing in late FY 2012, will also be equipped with the upgraded HF/M3 sonar. Evaluation of the HF/M3 sonar will be part of the at-sea testing and will be documented in the unclassified final comprehensive reports.

NMFS Research Topics	Status
Improvements in Passive Sonar Continue to evaluate improvements in passive sonar capabilities	Advances in the development of passive acoustic technology include the development of SURTASS Twin-Line (TL-29A), a shallow water variant of the SURTASS system, which provides improved littoral capability. The USNS ABLE (T-AGOS 20), USNS EFFECTIVE (T-AGOS 21), and USNS IMPECCABLE (T-AGOS 23) have the TL-29A twin-line passive arrays. The USNS VICTORIOUS (T-AGOS 19) will also have the TL-29A passive array. The integrated common processor (ICP) has been, or is scheduled to be, installed on the SURTASS LFA/CLFA sonar vessels. The ICP uses enhanced signal processing and automation to get accurate, actionable information on undersea threats to operational decision makers. The capability of passive acoustic sensors is also benefiting from increased processing power in computers and by networking, which is incorporating data from a variety of acoustic and non-acoustic sensors, and sources to construct a more complete battlefield picture (Friedman, 2007).

5.2.2 Navy-Sponsored Research

The Department of the Navy sponsors significant research and monitoring projects for marine living resources to study the potential effects of its activities on marine mammals. These funding levels have increased in recent years to $31M in FY 2009 and $32M in FY 2010 for marine mammal research and monitoring activities at universities, research institutions, federal laboratories, and private companies. Navy-funded research has produced, and is producing, many peer-reviewed articles in professional journals as demonstrated in Table 11. Publication in open professional literature with thorough peer review is the benchmark for the quality of the research. This ongoing marine mammal research includes hearing and hearing sensitivity, auditory effects, dive and behavioral response models, noise impacts, beaked whale global distribution, modeling of beaked whale hearing and response, tagging of free-ranging marine animals at-sea, and radar-based detection of marine mammals from ships.

The Navy continues to fund national and international research on the responses of deep-diving odontocetes to sonar signals by independent scientists for whale behavioral response studies (BRS) with Navy and NOAA funding support for the 2007, 2008, and 2009 BRSs. Findings from the Deep-Diving Odontocetes BRSs are being published in peer-reviewed literature.

BRS-07 took place in the Tongue of the Ocean (TOTO) and at the adjacent Atlantic Undersea Test and Evaluation Center (AUTEC) on Andros Island, Bahamas during August and September 2007. BRS-07 demonstrated the feasibility of the BRS approach and refined protocols. Direct visual observations were made when whales were at the surface, and passive acoustic measurements were recorded during foraging dives. Data was also collected from ten suction cup tags (six on Blainville's beaked whales and four on short-finned pilot whales). A total of 109 hours of data was collected from these tags. A Cruise Report on BRS-07 was prepared (Boyd, et al., 2007).

BRS-08 was conducted in the TOTO adjacent to AUTEC in August and September 2008. The primary objectives and accomplishments were to: 1) Increase sample size of mid-frequency (MF)

sonar signal playbacks and controls from that achieved in BRS-07 (the sample size was increased, but not as much as hoped); 2) Measure received levels of sonar sound that produce a behavioral response during playbacks (done); 3) Investigate variation in responses in relation to context and species (done—four species investigated); 4) Include at least one killer whale playback to examine whether response of beaked whales might be explained by confusion between sonar signals and killer whale calls (not achieved primarily due to a greater than predicted number of inclement weather days); and 5) Compare responses to MF sonar signals versus more spread spectrum signal with similar overall bandwidth, duration and timing (achieved in some species). A Cruise Report on BRS-08 was prepared (Boyd, 2008).

SOCAL-10 (Southern California) was the first phase of a multi-year research effort (2010 to 2015), notionally referred to as SOCAL-BRS, which is designed to contribute to emerging understanding of marine mammal behavior and changes in behavior as a function of sound exposure. It is in some ways an extension of previous Navy-sponsored BRS efforts in the Bahamas and Mediterranean Sea in 2007 through 2009, but is being constructively integrated with several related, ongoing, successful field efforts (e.g., population surveys of Navy range areas and satellite tagging before active sonar operations) already ongoing in southern California. The research is continuing as SOCAL-BRS (2010 to 2015) to study diving, foraging, and vocal behavior in various marine mammals and their response to controlled underwater sound exposures. The initial phase off southern California was successfully completed during the summer of 2010 (Southall et al., 2011).

These research projects may not be specifically related to SURTASS LFA sonar operations; however, they are crucial to the overall knowledge base on marine mammals and the potential effects from underwater anthropogenic noise.

The Navy is also sponsoring research to determine marine mammal abundances and densities for all Navy ranges and other operational areas. Up-to-date abundance and density data are necessary to support the SURTASS LFA sonar reporting of incidental harassment under the requirements of the MMPA 5-Year Rule (NOAA, 2007c) and the LOAs.

The Navy notes that research and evaluation is being carried out on various monitoring and mitigation methods, including passive acoustic monitoring (PAM). The results from this research could be applicable to SURTASS LFA sonar passive acoustic monitoring.

Table 11. Department of the Navy Sponsored Monitoring and Research

Beaked Whale Habitat Conduct research on characteristics of beaked whales habitat preferences, population structure, physiology, movements, bioacoustics, and behavior	The U.S. Navy/Office of Naval Research (ONR) has provided funding for research on beaked whales, which has resulted in the following published articles: • Baird, R.W., D.L. Webster, G.S. Schorr, D.J. McSweeney, and J. Barlow. 2008. Diel variation in beaked whale diving behavior. Marine Mammal Science 24(3):630-642. • Baumann-Pickering, S., S.M. Wiggins, E.H. Roth, M.A. Roch, H.-U. Schnitzler, and J.A. Hildebrand. 2010. Echolocation signals of a beaked whale at Palmyra Atoll. Journal of the Acoustical Society of America 127(6):3790-3799. • Claridge, D., and J. Durban. 2007. Distribution, Abundance and Population Structuring of Beaked Whales in the Great Bahama Canyon, Northern Bahamas. • Cranford, T.W., P. Krysl, and J.A. Hildebrand. 2008. Acoustic pathways revealed: simulated sound transmission and reception in Cuvier's beaked whale (*Ziphius cavirostris*). Bioinspiration & Biomimetics 3(1):016001. 10 pp. • Cranford, T.W., M.F. McKenna, M.S. Soldevilla, S.W. Wiggins, J.A. Goldbogen, R.E. Shadwick, P. Krysl, J.A. St. Leger, and J.A. Hildebrand. 2008. Anatomic geometry of sound transmission and reception in Cuvier's beaked whale (*Ziphius cavirostris*). The Anatomical Record 291:353–378. • D'Amico, A. R.C. Gisiner, D.R. Ketten, J.A. Hammock, C. Johnson, P.L. Tyack, and J. Mead. 2009. Beaked whale strandings and naval exercises. Aquatic Mammals 35(4):252-272. • DiMarzio, N., D. Moretti, J. Ward, R. Morrissey, S. Jarvis, A.M. Izzi, M. Johnson, P. Tyack, and A. Hansen. 2008. Passive acoustic measurement of dive vocal behavior and group size of Blainville's beaked whale (*Mesoplodon densirostris)* in the Tongue of the Ocean (TOTO). Canadian Acoustics 36(1):166-173. • Falcone, E.A., G.S. Schorr, A.B. Douglas, J. Calambokidis, E. Henderson, M.F. McKenna, J. Hildebrand, and D. Moretti. 2009. Sighting characteristics and photo-identification of Cuvier's beaked whales (*Ziphius cavirostris*) near San Clemente Island, California: A key area for beaked whales and the military? Marine Biology 156:2631-2640. • Filadelfo, R., J. Mintz, E. Michlovich, A. D'Amico, P.L. Tyack, and D.R. Ketten. 2009. Correlating military sonar use with beaked whale mass strandings: What do the historical data show? Aquatic Mammals 35(4):435-444. • Finneran, J.F., D.S. Houser, B. Mase-Guthrie, R.Y. Ewing, and R.G. Lingenfelser. 2009. Auditory evoked potentials in a stranded Gervais' beaked whale *(Mesoplodon europaeus*). Journal of the Acoustical Society of America 126(1):484-490. • Gillespie, D., C. Dunn, J. Gordon, D. Claridge, C. Embling, and I. Boyd. 2009. Field recordings of Gervais' beaked whales *Mesoplodon europaeus* from the Bahamas. Journal of the Acoustical Society 125(5):3428-3433. • Hooker, S.K., R.W. Baird, and A. Fahlman. 2009. Could beaked whales get the bends? Effect of diving behaviour and physiology on modelled gas exchange for three species: *Ziphius cavirostris, Mesoplodon densirostris,* and *Hyperoodon ampullatus*. Respiratory Physiology & Neurobiology 167(3):235-246. • Johnson, M., L.S. Hickmott, N. Aguilar Soto, and P.T Madsen. 2008. Echolocation behaviour adapted to prey in foraging Blainville's beaked whale (*Mesoplodon densirostris*). Proceedings of the Royal Society, B (Biological Sciences) 275:133-139. • Jones, B.A., T.K. Stanton, A.C. Lavery, M.P. Johnson, P.T. Madsen, and P.L. Tyack. 2008. Classification of broadband echoes from prey of a foraging Blainville's beaked whale. Journal of the Acoustical Society of America 123(3):1753-1762.

Table 11. Department of the Navy Sponsored Monitoring and Research

Beaked Whale Habitat Conduct research on characteristics of beaked whales habitat preferences, population structure, physiology, movements, bioacoustics, and behavior (Continued)	•MacLeod, C. W.F. Perrin, R. Pitman, J. Barlow, L. Ballance, A. D'amico, T. Gerrodette, G. Joyce, K.D. Mullin, D.L. Palka, and G.T. Waring. 2006. Known and inferred distributions of beaked whale species (Cetacea: Ziphiidae). Journal of Cetacean Research and Management, 7(3): 271-286. •MacLeod, C. D., and G. Mitchell. 2006. Key areas for beaked whales worldwide. J. Cetacean Res. Manage. 7(3):309-322. •MacLeod, C.D., W.F. Perrin, R. Pitman, J. Barlow, L. Balance, A. D'Amico, T. Gerrodette, G. Joyce, K.D. Mullin, D.L. Palka, and G.T. Waring. 2006. Known and inferred distributions of beaked whale species (Cetacea: Ziphiidae). J. Cetacean Res. Manage. 7(3):271-286. •McSweeney, D.J., R.W. Baird, and S.D. Mahaffy. 2007. Site fidelity, associations, and movements of Cuvier's (*Ziphius cavirostris*) and Blainville's (*Mesoplodon densirostris*) beaked whales off the island of Hawai'i. Marine Mammal Science 23(3):667-687. •Mellinger, D.K. 2008. A neural network for classifying clicks of Blainville's beaked whales (*Mesoplodon densirostris*). Canadian Acoustics 55(36):55-59. •Moretti, D., T.A. Marques, L. Thomas, N. DiMarzio, A. Dilley, R. Morrissey, E. McCarthy, J. Ward, and S. Jarvis. 2010. A dive counting density estimation method for Blainville's beaked whale (*Mesoplodon densirostris*) using a bottom-mounted hydrophone field as applied to a Mid-Frequency Active (MFA) sonar operation. Applied Acoustics 71**:**1036-1042. •Rankin, S. and J. Barlow. 2007. Sounds recorded in the presence of Blainville's beaked whales, *Mesoplodon densirostris*, near Hawai'i. Journal of the Acoustical Society of America 122(1)**:**42-45. •Schorr, G.S., R.W. Baird, M.B. Hanson, D.L. Webster, D.J. McSweeney, R.D. Andrews. 2009. Movements of satellite-tagged Blainville's beaked whales off the island of Hawai'i. Endangered Species Research 10:203-213. •von Benda-Beckmann, A.M., F.P.A. Lam, D.J. Moretti, K. Fulkerson, M.A. Ainslie, S.P. van IJsselmuide, J. Theriault, S.P. Beerens. 2010. Detection of Blainville's beaked whales with towed arrays. Applied Acoustics 71**:**1027-1035. •Ward, J., R. Morrissey, D. Moretti, N. DiMarzio, S. Jarvis, M. Johnson, P. Tyack, and C. White. 2008. Passive acoustic detection and localization of *Mesoplodon densirostris* (Blainville's beaked whale) vocalizations using distributed bottom-mounted hydrophones in conjunction with a digital tag (Dtag) recording. Canadian Acoustics 36(1):60-66. •Zimmer, W.M.X., J. Harwood, P.L. Tyack, M.P. Johnson, and P.T. Madsen. 2008. Passive acoustic detection of deep-diving beaked whales. Journal of the Acoustical Society of America 124(5):2823-2832. Other funded research that included beaked whale species: •Ferguson, M. C., J. Barlow, B., S. B. Reilly, and T. Gerrodette. 2006. Predicting Cuvier's (*Ziphius cavirostris*) and *Mesoplodon* beaked whale population density from habitat characteristics in the Eastern Tropical Pacific Ocean. JCRM 7(3):287-299. •Filadelfo, R., Y.K. Pinelis, S. Davis, R. Chase, J. Mintz, J. Wolfanger,. P.L. Tyack, D.R. Ketten, and A. D'Amico. 2009. Correlating whale strandings with navy exercises off southern California. Aquatic Mammals 35(4):445-451. •Redfern, J.V., M.C. Ferguson, E.A. Becker, K.D. Hyrenbach, C. Good, J. Barlow, K. Kaschner, M.F. Baumgartner, K.A. Forney, L.T. Ballance, P. Fauchald, P. Halpin, T. Hamazaki, A.J. Pershing, S.S. Qian, A. Read, S.B. Reilly, L. Torres, and F. Werner. 2006. Techniques for cetacean–habitat modeling. MEPS 310:271-295.

5.2.3 Incident Monitoring

The Navy monitors and reviews data on strandings from federal, state, and international organizations, and the media. During the period of this report, there were no strandings reported that coincided spatially and/or temporally with active operations of the SURTASS LFA vessels.

In addition, as part of the analyses for the SURTASS LFA Draft Supplemental Environmental Impact Statement/Supplemental Overseas Environmental Impact Statement (SEIS/SOEIS) (DoN, 2011), mass strandings and unusual mortality events (UME) were examined in more detail. The use of SURTASS LFA sonar was not associated with any of the reported 27 mass stranding events or UMEs that occurred globally between 2006 and early 2010. Also, there is no evidence that LFA sonar transmissions have resulted in any difference in the stranding rates of marine mammals in Japanese coastal waters adjacent to current LFA sonar operating areas. As has been reported previously (DoN, 2001 and 2007a) and has been further documented in the Draft SEIS/SOEIS (DoN, 2011), the employment of LFA sonar is not expected to result in any sonar-induced strandings of marine mammals. Given the large number of natural factors that can result in marine mammal mortality, the high occurrence of marine mammal strandings, and the many years of LFA sonar operations without any reported associated stranding events, the likelihood of LFA sonar transmissions causing marine mammals to strand is negligible.

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APPENDIX A

Letters of Authorization Governing the Take of Marine Mammals Incidental to the U.S. Navy's Operation of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar on the USNS ABLE, USNS EFFECTIVE, and USNS IMPECCABLE, Office of Protected Resources, National Marine Fisheries Service, August 13, 2010

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

AUG 13 2010

Commander Neil Smith
Head, Undersea Surveillance Branch
Submarine Warfare Division, N872A
Office of the Chief of Naval Operations
2000 Navy Pentagon
Washington, D.C. 20350-2000

Dear Commander Smith:

Enclosed are three Letters of Authorization (LOAs) for the USNS ABLE (T-AGOS 20), the USNS EFFECTIVE (T-AGOS 21), and the USNS IMPECCABLE (T-AGOS 23), issued to the Chief of Naval Operations (N872A), Department of the Navy, under the authority of Section 101(a)(5)(A) of the Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*), and the regulations governing the take of marine mammals incidental to the U.S. Navy's operation of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar. These authorizations cover the taking of marine mammals by harassment incidental to SURTASS LFA sonar operations in the Archipelagic Deep Basins Province, the Western Pacific Warm Pool Province, the North Pacific Tropical Gyre West Province and the North Pacific Tropical Gyre East Province all within the Pacific Trade Wind Biome; the Kuroshio Current Province and the Northern Pacific Transition Zone Province within the Pacific Westerly Winds Biome; the North Pacific Epicontinental Sea Province within the Pacific Polar Biome; and the China Sea Coastal Province within the Pacific Coastal Biome, for a period of one year, provided the mitigation, monitoring and reporting requirements are undertaken as required by the regulations (attached) and the LOAs.

Please note that the 2010 LOAs require the U.S. Navy to estimate the percentage of each marine mammal species provide this information within the quarterly reports.

If you have any questions concerning the LOAs or its requirements, please contact Jeannine Cody, Office of Protected Resources, National Marine Fisheries Service at (301) 713-2289.

Sincerely,

James H. Lecky, Director
Office of Protected Resources

Enclosures

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL MARINE FISHERIES SERVICE

Letter of Authorization

The Chief of Naval Operations (N872A), Department of the Navy, 2000 Navy Pentagon, Washington, D.C. 20350-2000, and persons operating under his authority, are authorized to conduct the activity specified below pursuant to 50 CFR Part 216, Subpart Q--Taking of Marine Mammals Incidental to Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar subject to the provisions of the Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*; MMPA), the Regulations Governing Small Takes of Marine Mammals Incidental to Specified Activities (50 CFR Part 216, Subpart I)(the Regulations) and the following conditions:

1. This Authorization is valid for the period August 16, 2010, through August 15, 2011.

2. This Authorization is valid only for the unintentional taking of the species of marine mammals identified in 50 CFR § 216.180(b) and Condition 3(c) of this Authorization governing the taking of these animals incidental to the activity specified in Condition 3(a) within those biogeographic areas specified in Condition 3(b) and shall be valid only for takings consistent with the provisions in 50 CFR § 216.182 and the terms of this Authorization as specified below.

3. (a) This Authorization is valid only for activities associated with the operation of the SURTASS LFA Sonar onboard the USNS ABLE (T-AGOS 20). The signals transmitted by the SURTASS LFA sonar source must be between 100 and 500 Hertz (Hz) with a source level for each of the 18 projectors no more than 215 dB (re: 1 micro Pascal (μPa) at 1 meter (m)) and a maximum duty cycle of 20 percent.

(b) This Authorization, combined with an Authorization for the USNS IMPECCABLE (T-AGOS 23) and the USNS EFFECTIVE (T-AGOS 21), is valid for an estimated total of 20 nominal active sonar missions (16 combined missions in the Northwestern Pacific Ocean and 4 combined missions in the Hawaii Range Complex) between the three SURTASS LFA sonar vessels (or equivalent shorter missions but not to exceed a total of 432 hours of transmit time per vessel during the period of effectiveness of this Authorization). These SURTASS LFA sonar operating areas are contained within the Archipelagic Deep Basins Province, the Western Pacific Warm Pool Province, the North Pacific Tropical Gyre West Province, and the North Pacific

Tropical Gyre East Province all within the Pacific Trade Wind Biome; the Kuroshio Current Province and the Northern Pacific Transition Zone Province within the Pacific Westerly Winds Biome; the North Pacific Epicontinental Sea Province within the Pacific Polar Biome; and the China Sea Coastal Province within the Pacific Coastal Biome, as identified in 50 CFR § 216.180(a).

(c) The incidental take of marine mammals under the activity identified in Condition 3(a) is limited to the following species:

(i) Mysticete whales-blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), minke whale (*Balaenoptera acutorostrata*), Bryde's whale (*Balaenoptera edeni*), sei whale (*Balaenoptera borealis*), humpback whale (*Megaptera novaeangliae*), northern Pacific right whale (*Eubalaena japonica*), southern right whale (*Eubalaena australis*), pygmy right whale (*Caperea marginata*), and gray whale (*Eschrichtius robustus*).

(ii) Odontocete whales-sperm whale (*Physeter macrocephalus*), dwarf and pygmy sperm whales (*Kogia simus* and *K. breviceps*), short-finned pilot whale (*Globicephala macrorhynchus*), Risso's dolphin (*Grampus griseus*), rough-toothed dolphin (*Steno bredanensis*), Fraser's dolphin (*Lagenodelphis hosei*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), Dall's porpoise (*Phocoenoides dalli*), spinner dolphin (*Stenella longirostris*), pantropical spotted dolphin (*S. attenuata*), striped dophin (*S. coeruleoalba*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), melon-headed whale (*Peponocephala spp.*), Baird's beaked whale (*Berardius bairdii*), *Mesoplodon* spp. [including Stejneger's (*Mesoplodon stejnegeri*)], Hubbs' (*M. carlhubbsi*), Blaineville's (*M. densirostris*) beaked whales, ginko-toothed beaked whale (*M. ginkgodens*), Cuvier's beaked whale (*Ziphius cavirostris*), killer whale (*Orcinus orca*), false killer whale (*Pseudorca crassidens*), and pygmy killer whale (*Feresa attenuata*).

(iii) Pinnipeds-Hawaiian monk seal (*Monachus shauinslandi*)

(d) The taking of marine mammals by the Holder of this Authorization is limited to the incidental taking of marine mammal species identified in Condition 3(c) by Level A and Level B harassment (as defined in the MMPA and 50 CFR § 216.3) within those areas authorized under Condition 3(b). Taking of marine mammal species not listed under Condition 3(c) by harassment, injury, or mortality, or the taking by mortality of any marine mammal species listed under Condition 3(c) is prohibited.

4. The Holder of this Authorization, and any individuals operating under his authority, must not broadcast the SURTASS LFA sonar signal at a frequency greater than 500 Hz.

5. The Holder of this Authorization, and any individuals operating under his authority, are required to cooperate with the National Marine Fisheries Service (NMFS) and any other Federal agency with jurisdiction in the monitoring of impacts of the activity on marine mammals.

6. Mitigation

The Holder of this Authorization, and any individuals operating under his authority, must conduct the activity identified in 50 CFR § 216.180 and Condition 3(a) of this Authorization in a manner that minimizes, to the greatest extent practicable, adverse impacts on marine mammals, their habitats, and the availability of marine mammals for subsistence. When conducting operations identified in 50 CFR § 216.180, the following mitigation measures must be implemented:

(a) Through monitoring described under 50 CFR § 216.185 and Condition 7 of this Authorization, the Holder of this Authorization (and any individuals operating under his authority) must ensure, to the greatest extent practicable, that no marine mammal is subjected to a sound pressure level of 180 dB (re 1 μPa_{rms}) or greater.

(b) If a marine mammal is detected within the area subjected to a sound pressure level of 180-dB (re 1 μ Pa_{rms}) or greater (safety zone) or within the 1 kilometer (km) (0.5 nautical mile (nm)) buffer zone extending beyond the 180-dB (re 1 μ Pa_{rms}) safety zone, SURTASS LFA sonar transmissions will be immediately delayed or suspended. Transmissions will not resume earlier than 15 minutes after:

(i) All marine mammals have left the area of the safety and buffer zones; and

(ii) There is no further detection of any marine mammal within the safety and buffer zones as determined by the visual, passive or active acoustic monitoring described in 50 CFR § 216.185 and Condition 7.

(c) The High Frequency Marine Mammal Monitoring (HF/M3) sonar source referenced in 50 CFR § 216.185 will be ramped-up slowly to operating levels over a period of no less than 5 minutes. The HF/M3 source level will not be increased if a marine mammal is detected during ramp-up. Ramp-up may continue once marine mammals are no longer detected by any of the three monitoring programs. HF/M3 sonar will be ramped-up:

(i) At least 30 minutes prior to any SURTASS LFA sonar transmissions;

(ii) Prior to any SURTASS LFA sonar calibrations or testing that are not part of regular SURTASS LFA sonar transmissions described in Condition 6(c)(i); and

(iii) Anytime after the HF/M3 source has been powered down for more than 2 minutes.

(d) The SURTASS LFA sonar will not be operated such that the SURTASS LFA sonar sound field exceeds 180 dB (re 1 μ Pa_{rms}):

(i) At a distance of 12 nm (22 km) or less from any coastline, including offshore islands;

(ii) At a distance of 1 km (0.5 nm) seaward of the outer perimeter of any offshore biologically important area designated for marine mammals under 50 CFR § 216.184(f) and described in Condition 6(e), during biologically important period specified.

(e) The following areas have been designated by NMFS as offshore areas of critical biological importance for marine mammals (by season if appropriate):

Name of Area	Location of Area	Months of Importance
(1) 200-m isobath North American East Coast[1]	From 28°N, to 50° N., west of 40° W.	Year-round
(2) Costa Rica Dome	Centered at 9° N. and 88° W.	Year-round
(3) Antarctic Convergence Zone	30° E. to 80° E.: 45° S. 80° E. to 150° E.: 55° S. 150° E. to 50° W.: 60° S. 50° W. to 30° E.: 50° S.	October through March
(4) Hawaiian Island Humpback Whale NMS-Penguin Bank[2]	Centered at 21° N. and 157° 30'W	November 1 through May 1
(5) Cordell Bank NMS[2]	Boundaries IAW 15 CFR 922.110	Year-round
(6) Gulf of the Farallones NMS[2]	Boundaries IAW 15 CFR 922.80	Year-round
(7) Monterey Bay NMS[2]	Boundaries IAW 15 CFR 922.130	Year-round
(8) Olympic Coast NMS[2]	Within 23 nm of coast from 47 07'N to 48 30'N latitude	December, January, March, and May
(9) Flower Garden Banks NMS[2]	Boundaries IAW 15 CFR 922.120	Year-round
(10) The Gully	44° 13'N., 59° 06'W. to 43° 47'N.; 58° 35' W. to 43° 35' N.; 58° 35' W. to 43° 35' N.; 59° 08' W. to 44° 06'N.; 59° 20' W.	Year-round

Note: 1. OBIA boundaries encompass Northern Right Whale Critical Habitat, Stellwagen Bank NMS, Monitor NMS, and Gray's Reef NMS.
2. Office of National Marine Sanctuaries, National Ocean Service, NOAA, letter dated 15 May 2001.

(f) In order to meet the sound pressure level criteria in Conditions 6(b) and 6(d), the SURTASS LFA sonar safety zone (distance to the 180-dB (re 1 μ Pa_{rms}) isopleth) will be estimated prior to and during operations using near-real-time environmental data and underwater acoustic prediction models. These sound field estimates will be updated every 12 hours, or more frequently when meteorological or oceanographic conditions change.

(g) All SURTASS LFA sonar missions will be planned to ensure that no greater than 12 percent of any marine mammal stock is incidentally harassed by SURTASS LFA sonar operations during the effective period of this Authorization. The Holder of this Authorization must coordinate with the Holder of the Letter of Authorization issued to the USNS IMPECCABLE (T-AGOS 23) and the USNS EFFECTIVE (T-AGOS 21), to ensure that this condition is met for all vessels combined.

7. Monitoring

The Holder of this Authorization, and any individuals operating under his authority, must:

(a) Perform the following monitoring mitigation:

(i) Visual monitoring from the ship's bridge during all daylight hours;

(ii) Passive acoustic monitoring using the low frequency, passive SURTASS to listen for vocalizing marine mammals; and

(iii) Active acoustic monitoring using the HF/M3 sonar to locate and track marine mammals in relation to the SURTASS LFA sonar vessel and the sound field produced by the SURTASS LFA sonar source array.

(b) Perform monitoring under Condition 7(a) to:

(i) Commence at least 30 minutes before the first SURTASS LFA sonar transmission (30 minutes before sunrise for visual monitoring);

(ii) Continue between transmission pings; and

(iii) Continue for at least 15 minutes after completion of the SURTASS LFA sonar transmission exercise (30 minutes after sunset for visual monitoring), or if marine mammals are showing abnormal behavioral patterns, for a period of time until behavior patterns return to normal or conditions prevent continued observations.

(c) Designate qualified on-site individuals to conduct the mitigation, monitoring and reporting activities specified in this Authorization. The Holder of this Authorization will hire one or more qualified marine mammal biologists, highly experienced in marine mammal observation techniques, to train observers for conducting visual monitoring.

(d) Conduct research to supplement monitoring and increase knowledge of the affected marine mammal species. Under this Authorization, NMFS recommends at least one of the following: (1) systematically observe SURTASS LFA sonar training exercises for injured or disabled marine mammals, (2) compare the effectiveness of the three forms of mitigation (visual,

passive acoustic, HF/M3 sonar), (3) conduct research on the responses of deep-diving odontocete whales to LF sonar signals, (4) conduct research on the habitat preferences of beaked whales, (5) conduct passive acoustic monitoring using bottom-mounted hydrophones before, during, and after LF sonar operations for the possible silencing of calls of large whales, (6) continue to evaluate the HF/M3 mitigation sonar, and (7) continue to evaluate improvements in passive sonar capabilities. In consultation with NMFS, the Holder of this Authorization will determine which of these listed research items should be conducted during the period of this Authorization.

8. Reporting

The Holder of this Authorization must:

(a) Submit quarterly, classified mission reports to the Director, Office of Protected Resources, NMFS no later than 30 days after the end of the quarter beginning on August 16, 2010. Each quarterly, classified mission report will include all active-mode missions during the quarter. Specifically, these reports will include dates/times of exercises, location of vessel, biogeographic province, location of the safety and buffer zones in relation to the LFA sonar array, marine mammal observations, and records of any delays or suspensions of operations. Marine mammal observations will include animal type and/or species, number of animals sighted, date and time of observations, type of detection (visual, passive acoustic, HF/M3 sonar), bearing and range from vessel, abnormal behavior (if any), and remarks/narrative (as necessary). The report will include the Navy's estimates of the percentages of marine mammal stocks affected (both for the quarter and cumulatively for the year covered by the LOA) by SURTASS LFA sonar operations (both within and outside the safety and buffer zones), using predictive modeling based on operating locations, dates/times of operations, system characteristics, oceanographic environmental conditions, and animal demographics. In the event that no SURTASS LFA missions are completed during a quarter, a report of negative activity will be provided.

(b) Submit an annual, unclassified report to the Director, Office of Protected Resources, NMFS, no later than 45 days after expiration of this Authorization. This report will provide NMFS with an unclassified summary of the year's quarterly reports and will include the Navy's estimates of the percentages of marine mammal stocks affected by SURTASS LFA sonar operations (both within and outside the safety and buffer zones), using predictive modeling based on operating locations, dates/times of operations, system characteristics, oceanographic environmental conditions, and animal demographics. The annual report will also include:

(i) Analysis of the effectiveness of the mitigation measures with recommendations for improvements where applicable;

(ii) Assessment of any long-term effects from SURTASS LFA sonar operations; and

(iii) Any discernible or estimated cumulative impacts from SURTASS LFA sonar operations.

9. A copy of this Authorization and the attached Subpart Q of the regulations must be in the possession of the Officer in Charge of the Military Detachment (MILDET) on board the USNS ABLE (T-AGOS 20) in order to conduct the activity under the authority of this Letter of Authorization.

AUG 13 2010

James H. Lecky, Director
Office of Protected Resources
National Marine Fisheries Service

Date

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL MARINE FISHERIES SERVICE

Letter of Authorization

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1. This Authorization is valid for the period August 16, 2010, through August 15, 2011.

2. This Authorization is valid only for the unintentional taking of the species of marine mammals identified in 50 CFR § 216.180(b) and Condition 3(c) of this Authorization governing the taking of these animals incidental to the activity specified in Condition 3(a) within those biogeographic areas specified in Condition 3(b) and shall be valid only for takings consistent with the provisions in 50 CFR § 216.182 and the terms of this Authorization as specified below.

3. (a) This Authorization is valid only for activities associated with the operation of the SURTASS LFA Sonar onboard the USNS EFFECTIVE (T-AGOS 21). The signals transmitted by the SURTASS LFA sonar source must be between 100 and 500 Hertz (Hz) with a source level for each of the 18 projectors no more than 215 dB (re: 1 micro Pascal (μPa) at 1 meter (m)) and a maximum duty cycle of 20 percent.

(b) This Authorization, combined with an Authorization for the USNS ABLE (T-AGOS 20) and the USNS IMPECCABLE (T-AGOS 23), is valid for an estimated total of 20 nominal active sonar missions (16 combined missions in the Northwestern Pacific Ocean and 4 combined missions in the Hawaii Range Complex) between the three SURTASS LFA sonar vessels (or equivalent shorter missions but not to exceed a total of 432 hours of transmit time per vessel during the period of effectiveness of this Authorization). These SURTASS LFA sonar operating areas are contained within the Archipelagic Deep Basins Province, the Western Pacific Warm Pool Province, the North Pacific Tropical Gyre West Province, and the North Pacific

Tropical Gyre East Province all within the Pacific Trade Wind Biome; the Kuroshio Current Province and the Northern Pacific Transition Zone Province within the Pacific Westerly Winds Biome; the North Pacific Epicontinental Sea Province within the Pacific Polar Biome; and the China Sea Coastal Province within the Pacific Coastal Biome, as identified in 50 CFR § 216.180(a).

(c) The incidental take of marine mammals under the activity identified in Condition 3(a) is limited to the following species:

(i) Mysticete whales-blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), minke whale (*Balaenoptera acutorostrata*), Bryde's whale (*Balaenoptera edeni*), sei whale (*Balaenoptera borealis*), humpback whale (*Megaptera novaeangliae*), northern Pacific right whale (*Eubalaena japonica*), southern right whale (*Eubalaena australis*), pygmy right whale (*Caperea marginata*), and gray whale (*Eschrichtius robustus*).

(ii) Odontocete whales-sperm whale (*Physeter macrocephalus*), dwarf and pygmy sperm whales (*Kogia simus* and *K. breviceps*), short-finned pilot whale (*Globicephala macrorhynchus*), Risso's dolphin (*Grampus griseus*), rough-toothed dolphin (*Steno bredanensis*), Fraser's dolphin (*Lagenodelphis hosei*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), Dall's porpoise (*Phocoenoides dalli*), spinner dolphin (*Stenella longirostris*), pantropical spotted dolphin (*S. attenuata*), striped dophin (*S. coeruleoalba*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), melon-headed whale (*Peponocephala spp.*), Baird's beaked whale (*Berardius bairdii*), *Mesoplodon* spp. [including Stejneger's (*Mesoplodon stejnegeri*)], Hubbs' (*M. carlhubbsi*), Blaineville's (*M. densirostris*) beaked whales, ginko-toothed beaked whale (*M. ginkgodens*), Cuvier's beaked whale (*Ziphius cavirostris*), killer whale (*Orcinus orca*), false killer whale (*Pseudorca crassidens*), and pygmy killer whale (*Feresa attenuata*).

(iii) Pinnipeds-Hawaiian monk seal (*Monachus shauinslandi*)

(d) The taking of marine mammals by the Holder of this Authorization is limited to the incidental taking of marine mammal species identified in Condition 3(c) by Level A and Level B harassment (as defined in the MMPA and 50 CFR § 216.3) within those areas authorized under Condition 3(b). Taking of marine mammal species not listed under Condition 3(c) by harassment, injury, or mortality, or the taking by mortality of any marine mammal species listed under Condition 3(c) is prohibited.

4. The Holder of this Authorization, and any individuals operating under his authority, must not broadcast the SURTASS LFA sonar signal at a frequency greater than 500 Hz.

5. The Holder of this Authorization, and any individuals operating under his authority, are required to cooperate with the National Marine Fisheries Service (NMFS) and any other Federal agency with jurisdiction in the monitoring of impacts of the activity on marine mammals.

6. Mitigation

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(a) Through monitoring described under 50 CFR § 216.185 and Condition 7 of this Authorization, the Holder of this Authorization (and any individuals operating under his authority) must ensure, to the greatest extent practicable, that no marine mammal is subjected to a sound pressure level of 180 dB (re 1 μPa_{rms}) or greater.

(b) If a marine mammal is detected within the area subjected to a sound pressure level of 180-dB (re 1 μ Pa_{rms}) or greater (safety zone) or within the 1 kilometer (km) (0.5 nautical mile (nm)) buffer zone extending beyond the 180-dB (re 1 μ Pa_{rms}) safety zone, SURTASS LFA sonar transmissions will be immediately delayed or suspended. Transmissions will not resume earlier than 15 minutes after:

(i) All marine mammals have left the area of the safety and buffer zones; and

(ii) There is no further detection of any marine mammal within the safety and buffer zones as determined by the visual, passive or active acoustic monitoring described in 50 CFR § 216.185 and Condition 7.

(c) The High Frequency Marine Mammal Monitoring (HF/M3) sonar source referenced in 50 CFR § 216.185 will be ramped-up slowly to operating levels over a period of no less than 5 minutes. The HF/M3 source level will not be increased if a marine mammal is detected during ramp-up. Ramp-up may continue once marine mammals are no longer detected by any of the three monitoring programs. HF/M3 sonar will be ramped-up:

(i) At least 30 minutes prior to any SURTASS LFA sonar transmissions;

(ii) Prior to any SURTASS LFA sonar calibrations or testing that are not part of regular SURTASS LFA sonar transmissions described in Condition 6(c)(i); and

(iii) Anytime after the HF/M3 source has been powered down for more than 2 minutes.

(d) The SURTASS LFA sonar will not be operated such that the SURTASS LFA sonar sound field exceeds 180 dB (re 1 μ Pa_{rms}):

(i) At a distance of 12 nm (22 km) or less from any coastline, including offshore islands;

(ii) At a distance of 1 km (0.5 nm) seaward of the outer perimeter of any offshore biologically important area designated for marine mammals under 50 CFR § 216.184(f) and described in Condition 6(e), during biologically important period specified.

(e) The following areas have been designated by NMFS as offshore areas of critical biological importance for marine mammals (by season if appropriate):

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(4) Hawaiian Island Humpback Whale NMS-Penguin Bank[2]	Centered at 21° N. and 157° 30'W	November 1 through May 1
(5) Cordell Bank NMS[2]	Boundaries IAW 15 CFR 922.110	Year-round
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(7) Monterey Bay NMS[2]	Boundaries IAW 15 CFR 922.130	Year-round
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Note: 1. OBIA boundaries encompass Northern Right Whale Critical Habitat, Stellwagen Bank NMS, Monitor NMS, and Gray's Reef NMS.
2. Office of National Marine Sanctuaries, National Ocean Service, NOAA, letter dated 15 May 2001.

(f) In order to meet the sound pressure level criteria in Conditions 6(b) and 6(d), the SURTASS LFA sonar safety zone (distance to the 180-dB (re 1 μ Pa_{rms}) isopleth) will be estimated prior to and during operations using near-real-time environmental data and underwater acoustic prediction models. These sound field estimates will be updated every 12 hours, or more frequently when meteorological or oceanographic conditions change.

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7. Monitoring

The Holder of this Authorization, and any individuals operating under his authority, must:

(a) Perform the following monitoring mitigation:

(i) Visual monitoring from the ship's bridge during all daylight hours;

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(iii) Active acoustic monitoring using the HF/M3 sonar to locate and track marine mammals in relation to the SURTASS LFA sonar vessel and the sound field produced by the SURTASS LFA sonar source array.

(b) Perform monitoring under Condition 7(a) to:

(i) Commence at least 30 minutes before the first SURTASS LFA sonar transmission (30 minutes before sunrise for visual monitoring);

(ii) Continue between transmission pings; and

(iii) Continue for at least 15 minutes after completion of the SURTASS LFA sonar transmission exercise (30 minutes after sunset for visual monitoring), or if marine mammals are showing abnormal behavioral patterns, for a period of time until behavior patterns return to normal or conditions prevent continued observations.

(c) Designate qualified on-site individuals to conduct the mitigation, monitoring and reporting activities specified in this Authorization. The Holder of this Authorization will hire one or more qualified marine mammal biologists, highly experienced in marine mammal observation techniques, to train observers for conducting visual monitoring.

(d) Conduct research to supplement monitoring and increase knowledge of the affected marine mammal species. Under this Authorization, NMFS recommends at least one of the following: (1) systematically observe SURTASS LFA sonar training exercises for injured or disabled marine mammals, (2) compare the effectiveness of the three forms of mitigation (visual, passive acoustic, HF/M3 sonar), (3) conduct research on the responses of deep-diving odontocete

whales to LF sonar signals, (4) conduct research on the habitat preferences of beaked whales, (5) conduct passive acoustic monitoring using bottom-mounted hydrophones before, during, and after LF sonar operations for the possible silencing of calls of large whales, (6) continue to evaluate the HF/M3 mitigation sonar, and (7) continue to evaluate improvements in passive sonar capabilities. In consultation with NMFS, the Holder of this Authorization will determine which of these listed research items should be conducted during the period of this Authorization.

8. Reporting

The Holder of this Authorization must:

(a) Submit quarterly, classified mission reports to the Director, Office of Protected Resources, NMFS no later than 30 days after the end of the quarter beginning on August 16, 2010. Each quarterly, classified mission report will include all active-mode missions during the quarter. Specifically, these reports will include dates/times of exercises, location of vessel, biogeographic province, location of the safety and buffer zones in relation to the LFA sonar array, marine mammal observations, and records of any delays or suspensions of operations. Marine mammal observations will include animal type and/or species, number of animals sighted, date and time of observations, type of detection (visual, passive acoustic, HF/M3 sonar), bearing and range from vessel, abnormal behavior (if any), and remarks/narrative (as necessary). The report will include the Navy's estimates of the percentages of marine mammal stocks affected (both for the quarter and cumulatively for the year covered by the LOA) by SURTASS LFA sonar operations (both within and outside the safety and buffer zones), using predictive modeling based on operating locations, dates/times of operations, system characteristics, oceanographic environmental conditions, and animal demographics. In the event that no SURTASS LFA missions are completed during a quarter, a report of negative activity will be provided.

(b) Submit an annual, unclassified report to the Director, Office of Protected Resources, NMFS, no later than 45 days after expiration of this Authorization. This report will provide NMFS with an unclassified summary of the year's quarterly reports and will include the Navy's estimates of the percentages of marine mammal stocks affected by SURTASS LFA sonar operations (both within and outside the safety and buffer zones), using predictive modeling based on operating locations, dates/times of operations, system characteristics, oceanographic environmental conditions, and animal demographics. The annual report will also include:

(i) Analysis of the effectiveness of the mitigation measures with recommendations for improvements where applicable;

(ii) Assessment of any long-term effects from SURTASS LFA sonar operations; and

(iii) Any discernible or estimated cumulative impacts from SURTASS LFA sonar operations.

9. A copy of this Authorization and the attached Subpart Q of the regulations must be in the possession of the Officer in Charge of the Military Detachment (MILDET) on board the USNS EFFECTIVE (T-AGOS 21) in order to conduct the activity under the authority of this Letter of Authorization.

AUG 13 2010

James H. Lecky, Director
Office of Protected Resources
National Marine Fisheries Service

Date

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL MARINE FISHERIES SERVICE

Letter of Authorization

The Chief of Naval Operations (N872A), Department of the Navy, 2000 Navy Pentagon, Washington, D.C. 20350-2000, and persons operating under his authority, are authorized to conduct the activity specified below pursuant to 50 CFR Part 216, Subpart Q--Taking of Marine Mammals Incidental to Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar subject to the provisions of the Marine Mammal Protection Act (16 U.S.C. 1361 *et seq.*; MMPA), the Regulations Governing Small Takes of Marine Mammals Incidental to Specified Activities (50 CFR Part 216, Subpart I)(the Regulations) and the following conditions:

1. This Authorization is valid for the period August 16, 2010, through August 15, 2011.

2. This Authorization is valid only for the unintentional taking of the species of marine mammals identified in 50 CFR § 216.180(b) and Condition 3(c) of this Authorization governing the taking of these animals incidental to the activity specified in Condition 3(a) within those biogeographic areas specified in Condition 3(b) and shall be valid only for takings consistent with the provisions in 50 CFR § 216.182 and the terms of this Authorization as specified below.

3. (a) This Authorization is valid only for activities associated with the operation of the SURTASS LFA Sonar onboard the USNS IMPECCABLE (T-AGOS 23). The signals transmitted by the SURTASS LFA sonar source must be between 100 and 500 Hertz (Hz) with a source level for each of the 18 projectors no more than 215 dB (re: 1 micro Pascal (μPa) at 1 meter (m)) and a maximum duty cycle of 20 percent.

(b) This Authorization, combined with an Authorization for the USNS ABLE (T-AGOS 20) and the USNS EFFECTIVE (T-AGOS 21), is valid for an estimated total of 20 nominal active sonar missions (16 combined missions in the Northwestern Pacific Ocean and 4 combined missions in the Hawaii Range Complex) between the three SURTASS LFA sonar vessels (or equivalent shorter missions but not to exceed a total of 432 hours of transmit time per vessel during the period of effectiveness of this Authorization). These SURTASS LFA sonar operating areas are contained within the Archipelagic Deep Basins Province, the Western Pacific Warm Pool Province, the North Pacific Tropical Gyre West Province, and the North Pacific

Tropical Gyre East Province all within the Pacific Trade Wind Biome; the Kuroshio Current Province and the Northern Pacific Transition Zone Province within the Pacific Westerly Winds Biome; the North Pacific Epicontinental Sea Province within the Pacific Polar Biome; and the China Sea Coastal Province within the Pacific Coastal Biome, as identified in 50 CFR § 216.180(a).

(c) The incidental take of marine mammals under the activity identified in Condition 3(a) is limited to the following species:

(i) Mysticete whales-blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), minke whale (*Balaenoptera acutorostrata*), Bryde's whale (*Balaenoptera edeni*), sei whale (*Balaenoptera borealis*), humpback whale (*Megaptera novaeangliae*), northern Pacific right whale (*Eubalaena japonica*), southern right whale (*Eubalaena australis*), pygmy right whale (*Caperea marginata*), and gray whale (*Eschrichtius robustus*).

(ii) Odontocete whales-sperm whale (*Physeter macrocephalus*), dwarf and pygmy sperm whales (*Kogia simus* and *K. breviceps*), short-finned pilot whale (*Globicephala macrorhynchus*), Risso's dolphin (*Grampus griseus*), rough-toothed dolphin (*Steno bredanensis*), Fraser's dolphin (*Lagenodelphis hosei*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*), Dall's porpoise (*Phocoenoides dalli*), spinner dolphin (*Stenella longirostris*), pantropical spotted dolphin (*S. attenuata*), striped dophin (*S. coeruleoalba*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), melon-headed whale (*Peponocephala spp.*), Baird's beaked whale (*Berardius bairdii*), *Mesoplodon* spp. [including Stejneger's (*Mesoplodon stejnegeri*)], Hubbs' (*M. carlhubbsi*), Blaineville's (*M. densirostris*) beaked whales, ginko-toothed beaked whale (*M. ginkgodens*), Cuvier's beaked whale (*Ziphius cavirostris*), killer whale (*Orcinus orca*), false killer whale (*Pseudorca crassidens*), and pygmy killer whale (*Feresa attenuata*).

(iii) Pinnipeds-Hawaiian monk seal (*Monachus shauinslandi*)

(d) The taking of marine mammals by the Holder of this Authorization is limited to the incidental taking of marine mammal species identified in Condition 3(c) by Level A and Level B harassment (as defined in the MMPA and 50 CFR § 216.3) within those areas authorized under Condition 3(b). Taking of marine mammal species not listed under Condition 3(c) by harassment, injury, or mortality, or the taking by mortality of any marine mammal species listed under Condition 3(c) is prohibited.

4. The Holder of this Authorization, and any individuals operating under his authority, must not broadcast the SURTASS LFA sonar signal at a frequency greater than 500 Hz.

5. The Holder of this Authorization, and any individuals operating under his authority, are required to cooperate with the National Marine Fisheries Service (NMFS) and any other Federal agency with jurisdiction in the monitoring of impacts of the activity on marine mammals.

6. Mitigation

The Holder of this Authorization, and any individuals operating under his authority, must conduct the activity identified in 50 CFR § 216.180 and Condition 3(a) of this Authorization in a manner that minimizes, to the greatest extent practicable, adverse impacts on marine mammals, their habitats, and the availability of marine mammals for subsistence. When conducting operations identified in 50 CFR § 216.180, the following mitigation measures must be implemented:

(a) Through monitoring described under 50 CFR § 216.185 and Condition 7 of this Authorization, the Holder of this Authorization (and any individuals operating under his authority) must ensure, to the greatest extent practicable, that no marine mammal is subjected to a sound pressure level of 180 dB (re 1 μPa_{rms}) or greater.

(b) If a marine mammal is detected within the area subjected to a sound pressure level of 180-dB (re 1 μ Pa_{rms}) or greater (safety zone) or within the 1 kilometer (km) (0.5 nautical mile (nm)) buffer zone extending beyond the 180-dB (re 1 μ Pa_{rms}) safety zone, SURTASS LFA sonar transmissions will be immediately delayed or suspended. Transmissions will not resume earlier than 15 minutes after:

(i) All marine mammals have left the area of the safety and buffer zones; and

(ii) There is no further detection of any marine mammal within the safety and buffer zones as determined by the visual, passive or active acoustic monitoring described in 50 CFR § 216.185 and Condition 7.

(c) The High Frequency Marine Mammal Monitoring (HF/M3) sonar source referenced in 50 CFR § 216.185 will be ramped-up slowly to operating levels over a period of no less than 5 minutes. The HF/M3 source level will not be increased if a marine mammal is detected during ramp-up. Ramp-up may continue once marine mammals are no longer detected by any of the three monitoring programs. HF/M3 sonar will be ramped-up:

(i) At least 30 minutes prior to any SURTASS LFA sonar transmissions;

(ii) Prior to any SURTASS LFA sonar calibrations or testing that are not part of regular SURTASS LFA sonar transmissions described in Condition 6(c)(i); and

(iii) Anytime after the HF/M3 source has been powered down for more than 2 minutes.

(d) The SURTASS LFA sonar will not be operated such that the SURTASS LFA sonar sound field exceeds 180 dB (re 1 μ Pa_{rms}):

(i) At a distance of 12 nm (22 km) or less from any coastline, including offshore islands;

(ii) At a distance of 1 km (0.5 nm) seaward of the outer perimeter of any offshore biologically important area designated for marine mammals under 50 CFR § 216.184(f) and described in Condition 6(e), during biologically important period specified.

(e) The following areas have been designated by NMFS as offshore areas of critical biological importance for marine mammals (by season if appropriate):

Name of Area	Location of Area	Months of Importance
(1) 200-m isobath North American East Coast[1]	From 28°N, to 50° N., west of 40° W.	Year-round
(2) Costa Rica Dome	Centered at 9° N. and 88° W.	Year-round
(3) Antarctic Convergence Zone	30° E. to 80° E.: 45° S. 80° E. to 150° E.: 55° S. 150° E. to 50° W.: 60° S. 50° W. to 30° E.: 50° S.	October through March
(4) Hawaiian Island Humpback Whale NMS-Penguin Bank[2]	Centered at 21° N. and 157° 30'W	November 1 through May 1
(5) Cordell Bank NMS[2]	Boundaries IAW 15 CFR 922.110	Year-round
(6) Gulf of the Farallones NMS[2]	Boundaries IAW 15 CFR 922.80	Year-round
(7) Monterey Bay NMS[2]	Boundaries IAW 15 CFR 922.130	Year-round
(8) Olympic Coast NMS[2]	Within 23 nm of coast from 47 07'N to 48 30'N latitude	December, January, March, and May
(9) Flower Garden Banks NMS[2]	Boundaries IAW 15 CFR 922.120	Year-round
(10) The Gully	44° 13'N., 59° 06'W. to 43° 47'N.; 58° 35' W. to 43° 35' N.; 58° 35' W. to 43° 35' N.; 59° 08' W. to 44° 06'N.; 59° 20' W.	Year-round

Note: 1. OBIA boundaries encompass Northern Right Whale Critical Habitat, Stellwagen Bank NMS, Monitor NMS, and Gray's Reef NMS.
2. Office of National Marine Sanctuaries, National Ocean Service, NOAA, letter dated 15 May 2001.

(f) In order to meet the sound pressure level criteria in Conditions 6(b) and 6(d), the SURTASS LFA sonar safety zone (distance to the 180-dB (re 1 μ Pa_{rms}) isopleth) will be estimated prior to and during operations using near-real-time environmental data and underwater acoustic prediction models. These sound field estimates will be updated every 12 hours, or more frequently when meteorological or oceanographic conditions change.

(g) All SURTASS LFA sonar missions will be planned to ensure that no greater than 12 percent of any marine mammal stock is incidentally harassed by SURTASS LFA sonar operations during the effective period of this Authorization. The Holder of this Authorization must coordinate with the Holder of the Letter of Authorization issued to the USNS ABLE (T-AGOS 20) and the USNS EFFECTIVE (T-AGOS 21), to ensure that this condition is met for all vessels combined.

7. Monitoring

The Holder of this Authorization, and any individuals operating under his authority, must:

(a) Perform the following monitoring mitigation:

(i) Visual monitoring from the ship's bridge during all daylight hours;

(ii) Passive acoustic monitoring using the low frequency, passive SURTASS to listen for vocalizing marine mammals; and

(iii) Active acoustic monitoring using the HF/M3 sonar to locate and track marine mammals in relation to the SURTASS LFA sonar vessel and the sound field produced by the SURTASS LFA sonar source array.

(b) Perform monitoring under Condition 7(a) to:

(i) Commence at least 30 minutes before the first SURTASS LFA sonar transmission (30 minutes before sunrise for visual monitoring);

(ii) Continue between transmission pings; and

(iii) Continue for at least 15 minutes after completion of the SURTASS LFA sonar transmission exercise (30 minutes after sunset for visual monitoring), or if marine mammals are showing abnormal behavioral patterns, for a period of time until behavior patterns return to normal or conditions prevent continued observations.

(c) Designate qualified on-site individuals to conduct the mitigation, monitoring and reporting activities specified in this Authorization. The Holder of this Authorization will hire one or more qualified marine mammal biologists, highly experienced in marine mammal observation techniques, to train observers for conducting visual monitoring.

(d) Conduct research to supplement monitoring and increase knowledge of the affected marine mammal species. Under this Authorization, NMFS recommends at least one of the following: (1) systematically observe SURTASS LFA sonar training exercises for injured or disabled marine mammals, (2) compare the effectiveness of the three forms of mitigation (visual, passive acoustic, HF/M3 sonar), (3) conduct research on the responses of deep-diving odontocete

whales to LF sonar signals, (4) conduct research on the habitat preferences of beaked whales, (5) conduct passive acoustic monitoring using bottom-mounted hydrophones before, during, and after LF sonar operations for the possible silencing of calls of large whales, (6) continue to evaluate the HF/M3 mitigation sonar, and (7) continue to evaluate improvements in passive sonar capabilities. In consultation with NMFS, the Holder of this Authorization will determine which of these listed research items should be conducted during the period of this Authorization.

8. Reporting

The Holder of this Authorization must:

(a) Submit quarterly, classified mission reports to the Director, Office of Protected Resources, NMFS no later than 30 days after the end of the quarter beginning on August 16, 2010. Each quarterly, classified mission report will include all active-mode missions during the quarter. Specifically, these reports will include dates/times of exercises, location of vessel, biogeographic province, location of the safety and buffer zones in relation to the LFA sonar array, marine mammal observations, and records of any delays or suspensions of operations. Marine mammal observations will include animal type and/or species, number of animals sighted, date and time of observations, type of detection (visual, passive acoustic, HF/M3 sonar), bearing and range from vessel, abnormal behavior (if any), and remarks/narrative (as necessary). The report will include the Navy's estimates of the percentages of marine mammal stocks affected (both for the quarter and cumulatively for the year covered by the LOA) by SURTASS LFA sonar operations (both within and outside the safety and buffer zones), using predictive modeling based on operating locations, dates/times of operations, system characteristics, oceanographic environmental conditions, and animal demographics. In the event that no SURTASS LFA missions are completed during a quarter, a report of negative activity will be provided.

(b) Submit an annual, unclassified report to the Director, Office of Protected Resources, NMFS, no later than 45 days after expiration of this Authorization. This report will provide NMFS with an unclassified summary of the year's quarterly reports and will include the Navy's estimates of the percentages of marine mammal stocks affected by SURTASS LFA sonar operations (both within and outside the safety and buffer zones), using predictive modeling based on operating locations, dates/times of operations, system characteristics, oceanographic environmental conditions, and animal demographics. The annual report will also include:

(i) Analysis of the effectiveness of the mitigation measures with recommendations for improvements where applicable;

(ii) Assessment of any long-term effects from SURTASS LFA sonar operations; and

(iii) Any discernible or estimated cumulative impacts from SURTASS LFA sonar operations.

9. A copy of this Authorization and the attached Subpart Q of the regulations must be in the possession of the Officer in Charge of the Military Detachment (MILDET) on board the USNS IMPECCABLE (T-AGOS 23) in order to conduct the activity under the authority of this Letter of Authorization.

AUG 13 2010

James H. Lecky, Director
Office of Protected Resources
National Marine Fisheries Service

Date

APPENDIX B

Stipulated Settlement Agreement Order, U.S. District Court, Northern District of California, San Francisco Division, Civ. Action No. 07-4771-EDL, 12 August 2008

RONALD J. TENPAS
Assistant Attorney General
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UNITED STATES DEPARTMENT OF JUSTICE

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UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

NATURAL RESOURCES DEFENSE COUNCIL, INC., et al.,	) Civ. Action No. 07-4771-EDL
Plaintiffs,	)
v.	) STIPULATED SETTLEMENT AGREEMENT
CARLOS GUTIERREZ, SECRETARY OF THE UNITED STATES DEPARTMENT OF COMMERCE, et al.	) [~~PROPOSED~~] ORDER
Defendants.	) Judge: Hon. Elizabeth D. Laporte

Pursuant to the Court's February 6, 2008 Opinion and Order Granting in Part Plaintiffs' Motion for Preliminary Injunction ("Opinion and Order") and Order Referring Case for Settlement Conference, the parties, Defendants United States Navy ("Navy") and National Marine Fisheries Service ("NMFS") and the Natural Resources Defense Council, Inc. ("NRDC") on

behalf of itself and other Plaintiffs, attended settlement conferences on March 26, 2008, and May 27, 2008, before Magistrate Judge Spero to meet and confer on the precise terms of a preliminary injunction consistent with the Court's Opinion and Order. During mediation, the parties agreed to settle the case in its entirety on the terms memorialized in this Stipulation. In the event that any party seeks to alter the agreed upon operating areas described in paragraph 4 and in Tabs 1-4, paragraph 6 of the Stipulation establishes a procedure for the parties to meet and confer with the assistance of a court-designated mediator. Accordingly, the parties agree to the following:

WHEREAS in 2002, Plaintiffs NRDC, International Fund for Animal Welfare, The Humane Society of The United States, Cetacean Society International, League for Coastal Protection, Ocean Futures Society, and Jean-Michel Cousteau filed suit in this Court alleging that Defendants had violated the Marine Mammal Protection Act ("MMPA"), National Environmental Policy Act ("NEPA"), Endangered Species Act ("ESA"), and Administrative Procedure Act ("APA") by publishing a Final Rule under the MMPA, 67 Fed. Reg. 46712 (July 16, 2002), and issuing a Record of Decision ("ROD") under NEPA, 67 Fed. Reg. 48145 (July 23, 2002), regarding the Navy's use of Surveillance Towed Array Sensor System Low Frequency Active ("SURTASS LFA") sonar;

WHEREAS on October 31, 2002, the Court granted in part and denied in part Plaintiffs' motion for a preliminary injunction and on August 26, 2003, granted in part and denied in part Plaintiffs' motion for summary judgment and ordered the parties to meet and confer on the precise terms of the permanent injunction;

WHEREAS on October 8, 2003, the parties filed a joint stipulation regarding the permanent injunction and use of SURTASS LFA in the western Pacific Ocean, which the Court approved on October 14, 2003;

WHEREAS both the July 16, 2002 Final Rule and the permanent injunction expired by their own terms on August 15, 2007;

WHEREAS in April 2007, the Navy published a Final Supplemental Environmental Impact Statement ("SEIS") and on August 15, 2007, signed a ROD under NEPA regarding the Navy's use of SURTASS LFA sonar;

WHEREAS on August 15, 2007, Plaintiffs filed a motion for leave to file a supplemental complaint in the foregoing action, alleging that Defendants had failed to meet their obligations under NEPA and the permanent injunction;

WHEREAS on August 15, 2007, NMFS issued a Final Rule under the MMPA, 72 Fed. Reg. 46846 (August 21, 2007), 50 C.F.R. Part 216 Subpart Q (Taking of Marine Mammals Incidental to Navy Operations of Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar) ("Final Rule"), and on August 15, 2007, NMFS issued Letters of Authorization ("LOAs") to the Navy pursuant to the Final Rule;

WHEREAS the Navy and NMFS consulted under the ESA, and on August 15, 2007, NMFS issued biological opinions concluding that the Navy's use of SURTASS LFA sonar was not likely to jeopardize the continued existence of any endangered or threatened species and was not likely to adversely affect any designated critical habitat;

WHEREAS, after stipulating with Defendants on August 28, 2007, to file a new complaint and to withdraw their pending motion requesting leave of the Court to file supplemental pleadings in the prior action, Plaintiffs filed the above-captioned lawsuit on September 17, 2007, challenging Defendants' actions under the MMPA, NEPA, ESA, and APA, and subsequently moved for preliminary injunctive relief;

WHEREAS to avoid unnecessary emergency litigation and to ensure that the Court had sufficient time to render a decision on Plaintiffs' motion for preliminary injunction, on August 28, 2007, the parties agreed via e-mail correspondence, and stipulated on October 5, and December 19, 2007, to extend the terms of the October 8, 2003 permanent injunction, as amended in 2005, "with the exception that [the Navy] may operate the LFA sonar system within the coastal exclusion zones set forth in that injunction only when necessary to continue tracking an existing underwater contact detected outside the exclusion zone or when operationally necessary to detect a new underwater contact that would place the LFA sonar system within the coastal exclusion

zone to maximize opportunities for detection," until the earlier of the Court's decision on Plaintiffs' motion or a date certain specified in the stipulation;

WHEREAS the Court's February 6, 2008 Opinion and Order granted in part and denied in part Plaintiffs' Motion for Preliminary Injunction, and ordered the parties to meet and confer on the precise terms of a preliminary injunction consistent with the Court's Opinion and Order;

WHEREAS the parties attended settlement conferences on March 26, 2008, and May 27, 2008, before Magistrate Judge Spero;

WHEREAS Plaintiffs and Defendants, through their authorized representatives, and without any admission or final adjudication of the issues of fact or law with respect to Plaintiffs' claims, have reached a settlement resolving the claims raised in Plaintiffs' Complaint;

WHEREAS all parties agree that settlement of this action in this manner is in the public interest and is an appropriate way to resolve the dispute between them;

THE PARTIES THEREFORE STIPULATE AS FOLLOWS:

1. The parties agree that all negotiations leading up to this Stipulation are confidential. The parties further agree that this Stipulation supersedes all prior stipulations regarding injunctive relief entered into by the parties in this case.

2. The parties agree that this Stipulation shall remain in effect until the earliest of the following: (a) a modification by the Court, either as the Court elects or pursuant to a noticed motion or stipulation by the parties, that this Stipulation has been superseded by subsequent relevant events or authority, including but not limited to the outcome of further negotiations described in paragraph 6 below; (b) the expiration of the Final Rule, 72 Fed. Reg. 46846 (August 21, 2007), 50 C.F.R. Part 216 Subpart Q; or (c) the issuance of a new final rule and regulations that supersede the Final Rule.

3. The parties agree that the Final Rule will be remanded voluntarily without vacatur for reconsideration in light of the Court's conclusions in the February 6, 2008 Opinion and Order, and that Defendants will conduct their activities pursuant to this Stipulation during the period that the Stipulation is in effect. Nothing in this Stipulation shall be construed to modify or limit the discretion afforded to NMFS under the MMPA, NEPA, and ESA or principles of administrative

law on remand; nor shall the Stipulation, or the dismissal with prejudice required by it, operate to modify or limit Plaintiffs' rights or arguments with respect to NMFS's actions on remand, including seeking potential judicial review of such actions in a new civil action. No provision of this Stipulation shall be interpreted as or constitute a commitment or requirement that the United States is obligated to pay funds in contravention of the Anti-Deficiency Act, 31 U.S.C. § 1341, or any other provisions of law. No provision of this Stipulation shall be interpreted as or constitute a commitment or requirement that Plaintiffs or Defendants take actions in contravention of, or waive any rights under, the MMPA, NEPA, ESA, APA, or any other law or regulation, either substantive or procedural. However, the parties waive their rights to seek appellate review of the Court's February 6, 2008 Opinion and Order and this Stipulation.

4. Except as provided for in paragraph 5 below, the parties agree that the attached maps and associated text (Tabs 1-4) will govern the Navy's use of SURTASS LFA sonar for testing, training, and military operations under the current LOAs and any future LOAs issued during the pendency of the Stipulation. In the event of a discrepancy between the maps and the associated text, the associated text controls. For the Western Pacific operating area, the Navy will ensure that its use of SURTASS LFA sonar for testing, training, and military operations does not result in received sound pressure levels exceeding 180 dB at a distance less than the specified distances from coastlines or baselines drawn between islands in an archipelagic chain as defined in Tab 2; however, this limitation shall not apply to the circumstances described in paragraph 5.

5. The parties agree that the Navy may operate the SURTASS LFA sonar system outside the agreed upon operating areas described in Tabs 1-4, but within the areas authorized under the current LOA for the Western Pacific operating area and future LOAs for the Western Pacific and Hawaiian operating areas, when necessary to continue tracking an existing underwater contact or when operationally necessary to detect a new underwater contact to maximize opportunities for detection. This exception applies to operations only, and does not apply to any testing or training activities, including multinational training exercises such as the Rim of the Pacific Exercise ("RIMPAC").

6. The parties agree that if either Plaintiffs or Defendants seek an alteration to the agreed-upon operating areas described in Tabs 1-4, the parties shall first engage in a meet-and-confer process with the assistance of a court-designated mediator. This meet-and-confer process shall be subject to the Opinion and Order and any subsequent relevant opinions, orders, or other applicable authority. If the meet-and-confer process does not yield an agreement, any party may apply to the Court for resolution of the dispute.

7. Use of SURTASS LFA sonar pursuant to this Stipulation shall remain subject to the current Final Rule and applicable LOAs issued by NMFS. In the event of a conflict between this Stipulation and any LOA issued under the current Final Rule, the more restrictive condition, provision, or requirement will apply.

8. Defendants agree to pay Plaintiffs a reasonable amount for their costs of litigation (including reasonable attorneys' fees). The parties agree to employ good faith efforts to reach an expeditious negotiated resolution of the amount of such costs and fees. By this agreement, Defendants do not waive any right to contest specific fees or expenses claimed by either Plaintiffs or the Plaintiffs' counsel, including hourly rates, in this litigation or in any future litigation. Pursuant to Civil Local Rule 6-2, the parties stipulate that the deadlines established by the Equal Access to Justice Act ("EAJA"), 28 U.S.C. § 2412, shall govern any application of attorneys' fees and costs in this matter, notwithstanding any deadline provisions of the Civil Local Rules, including Local Rule 54-1 and 54-6. Pursuant to EAJA, 28 U.S.C. § 2412, if a negotiated resolution is not arrived at by that time, an initial application for attorneys' fees and costs will be made within 30 days of the Court's entry of Plaintiffs' request for dismissal with prejudice to be filed pursuant to Paragraph 11 below. Plaintiffs shall then have up to 120 days following the filing of an initial EAJA application to file any supplementary or modified applications, related pleadings to advance the adjudication of the application, and/or supporting materials they deem appropriate. The length of any brief or memorandum of points and authorities filed in support of Plaintiffs' EAJA application shall be governed by the Civil Local Rules. If Plaintiffs' initial EAJA application is filed within 30 days of the Court's entry of Plaintiffs' request for dismissal with prejudice, Defendants hereby agree not to argue that any supplementary or modified

applications, related pleadings and/or supporting materials filed within the 120 days following the filing of an initial EAJA application are untimely, should have been filed with the initial EAJA application or, except as provided above, are otherwise out of order.

9. This Stipulation is not to be construed as a concession by either party as to (a) the potential impacts on marine mammals or other animals of operating SURTASS LFA sonar, (b) the absence or presence of marine mammals or other animals in any areas depicted in the attached maps, or (c) the validity of any other fact or legal position concerning the claims or defenses in this action. This Stipulation applies to the SURTASS LFA sonar system and is not intended to serve as precedent in any future rulemaking, in any other geographical areas, or regarding any other Navy activities, including the use of any other sonar system.

10. Nothing in this Stipulation shall prevent any party from filing an application with the Court at any time to seek relief from its terms. Before any such application is filed, the parties shall meet and confer in good faith.

11. Upon notification of approval of this Stipulation by the Court, Plaintiffs shall, within no more than 15 days, submit a request that the Court dismiss the Complaint with prejudice. During the time period between the filing of this Stipulation and the Court's dismissal of the Complaint with prejudice, the parties hereby agree not to file any pleadings or motions in this matter that are not expressly contemplated by this Stipulation. Notwithstanding the dismissal of Plaintiffs' Complaint, the parties agree that the Court shall retain jurisdiction for the purpose of resolving attorneys' fees and cost reimbursement issues under EAJA in the event that the parties do not reach a negotiated resolution thereof, to oversee compliance with the terms of this Stipulation, and to resolve any future disputes concerning the interpretation or implementation of the Stipulation or motions to modify its terms.

Dated: August 8, 2008

RONALD J. TENPAS
Assistant Attorney General
United States Department of Justice
Environment & Natural Resources Division

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By: /s/
Kristen L. Gustafson

Counsel for Federal Defendants

Dated: August 8, 2008

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I hereby attest that I have on file all holograph signatures for any signatures indicated by a "conformed" signature (/s/) within this efiled document.

By: /s/ Robin Stafford
Robin Stafford

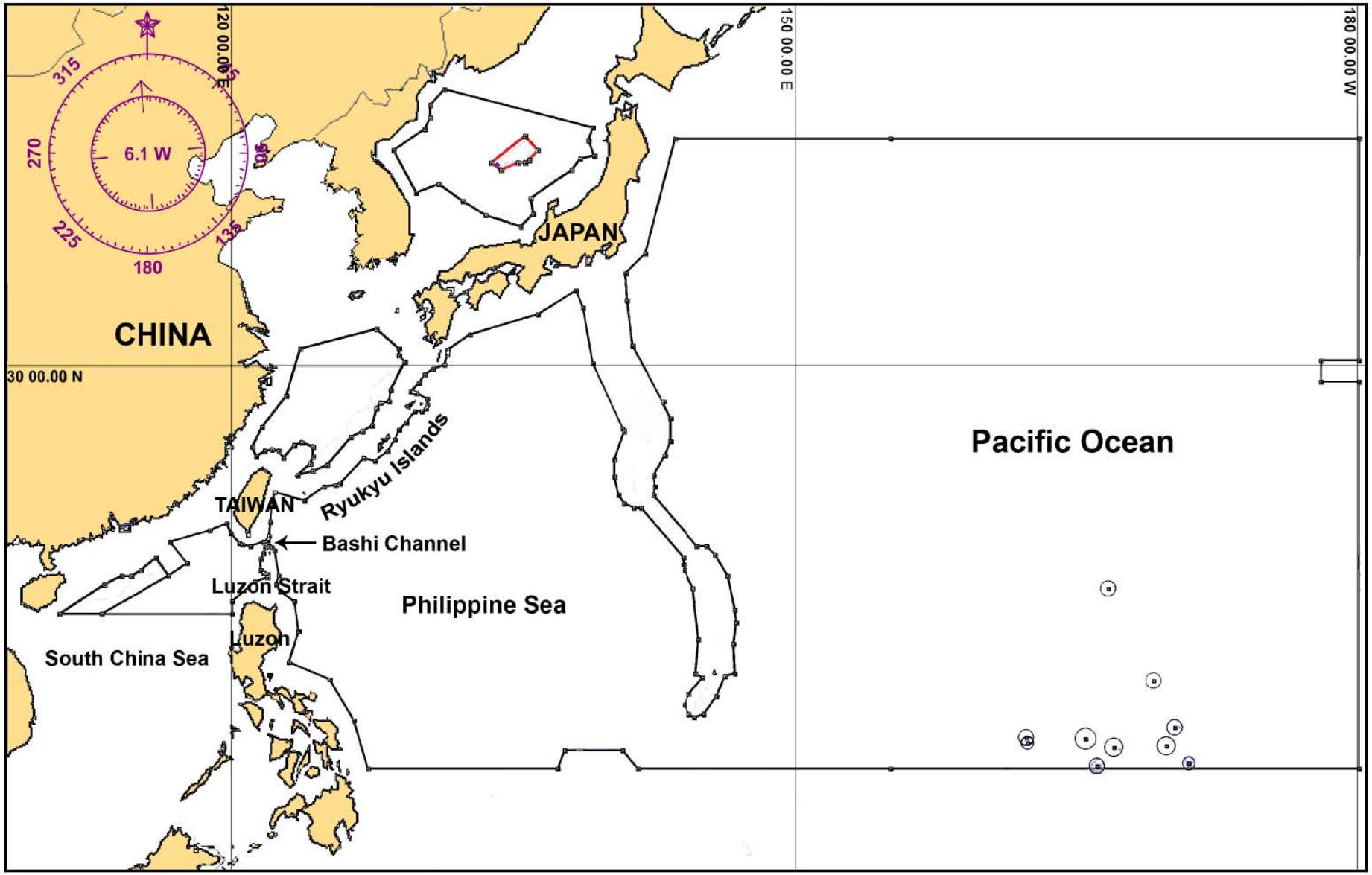
PURSUANT TO STIPULATION, IT IS SO ORDERED.

Dated: August 12, 2008.

By: _____
Hon. Elizabeth D. Laporte
United States Magistrate Judge

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
IT IS SO ORDERED
Judge Elizabeth D. Laporte

Tab 1: Western Pacific



Case No. 07-4771-EDL

Tab 2: Western Pacific

(1) PHILIPPINE SEA AREA - OPERATIONS AUTHORIZED YEAR ROUND. Note: Between 17º 09.8' N., 123º 32.2' E and 30º 50.6' N., 131º 25.4' E., boundaries for the Philippine Sea are defined as set forth in coordinate sets (3) through (5); i.e., the Ryukyu Island Chain, the Luzon Strait, and Taiwan.

LATITUDE	LONGITUDE
17 09.8 N	123 32.2 E
15 33.5 N	123 00.9 E
14 41.2 N	125 07.7 E
12 31.3 N	126 28.6 E
10 00.0 N	127 09.5 E
10 00.0 N	137 16.0 E
11 00.0 N	137 37.0 E
11 00.0 N	140 44.6 E
10 00.0 N	141 31.9 E
10 00.0 N	180 00.0 E
29 20.0 N	180 00.0 E
29 20.0 N	178 00.0 E
30 20.0 N	178 00.0 E
30 20.0 N	180 00.0 E
40 00.0 N	180 00.0 E
40 00.0 N	143 32.7 E
35 09.6 N	141 55.4 E
34 17.2 N	140 55.2 E
33 06.7 N	140 58.4 E
31 02.2 N	141 17.3 E
28 24.4 N	142 52.1 E
27 10.0 N	140 44.8 E
30 10.7 N	139 10.3 E
32 45.7 N	138 35.4 E
33 34.3 N	138 14.5 E
32 29.3 N	136 12.3 E
31 34.6 N	132 38.6 E
30 50.6 N	131 25.4 E

(2) PHILIPPINE SEA EXCLUSION ZONE - NO OPERATIONS

LATITUDE	LONGITUDE
28 24.4 N	142 52.1 E
27 39.4 N	143 15.9 E
26 33.3 N	143 16.6 E
25 51.3 N	142 57.4 E
24 54.2 N	142 22.7 E
24 22.9 N	142 26 2 E
23 57.5 N	142 24.2 E
21 26.0 N	144 44.6 E
21 24.5 N	145 13.5 E
21 01.1 N	145 43.5 E
19 55.5 N	146 21.7 E
18 14.8 N	146 46.6 E
17 33.4 N	146 49.8 E
16 30.0 N	146 42.4 E
15 00.0 N	146 43.0 E
14 51.2 N	146 13.5 E
13 47.4 N	145 44.3 E
12 50.1 N	145 04.4 E
12 40.5 N	144 35.8 E
12 52.2 N	144 14.9 E
13 19.9 N	144 01.1 E
13 57.6 N	144 15.4 E
14 45.4 N	145 01.0 E
15 00.0 N	144 37.4 E
16 44.9 N	144 46.6 E
19 17.6 N	144 31.1 E
20 15.0 N	144 00.7 E
20 32.5 N	143 56.1 E
20 50.2 N	143 59.3 E
23 20.0 N	141 41.6 E
23 19.3 N	141 18.8 E
23 31.0 N	140 50.2 E
23 55.9 N	140 31.0 E
24 51.7 N	140 15.3 E
25 39.0 N	140 18.3 E
27 10.0 N	140 44.8 E
30 10.7 N	139 10.3 E

(3) WESTERN PHILIPPINE SEA AREA - RYUKYU ISLAND CHAIN - OPERATIONS AUTHORIZED YEAR ROUND

LATITUDE	LONGITUDE
24 07.2 N	122 13.8 E
23 42.3 N	123 49.3 E
24.22.6 N	124 51.2 E
24 25.9 N	125 28.4 E
24 29.8 N	125 42.7 E
25 44.4 N	126 57.6 E
25 35.7 N	127 35.4 E
26 03.2 N	128 13.1 E
26 37.6 N	128 37.5 E
27 06.0 N	128 50.8 E
27 27.3 N	129 12.5 E
27 57.2 N	129 39.6 E
27 59.1 N	130 01.8 E
28 05.7 N	130 16.3 E
28 18.5 N	130 22.4 E
28 32.9 N	130 21.5 E
28 49.1 N	129 46.2 E
28 52.4 N	129 31.0 E
28 54.8 N	129 26.9 E
29 15.2 N	129 53.1 E
29 39.3 N	130 11.9 E
29 57.1 N	130 39.4 E
30 09.4 N	131 13.8 E
30 40.0 N	131 25.9 E
30 50.6 N	131 25.4 E
31 34.6 N	132 38.6 E

(4) WESTERN PHILIPPINE SEA AREA - LUZON STRAIT (INCLUDING BASHI CHANNEL) - OPERATIONS AUTHORIZED YEAR ROUND

LATITUDE	LONGITUDE
15 33.5 N	123 00.9 E
17 09.8 N	123 32.3 E
18 39.6 N	123 18.9 E
19 09.5 N	122 31.0 E
19 32.2 N	122 18.3 E
19 55.8 N	122 29.3 E
21 15.4 N	122 15.1 E
21 23.0 N	122 06.7 E
21 25.3 N	121 55.0 E
21 20.6 N	121 42.2 E
21 05.5 N	121 35.7 E
20 47.3 N	121 28.6 E
20 14.3 N	121 27.8 E
20 04.1 N	121 37.6 E
20 00.0 N	121 50.8 E
19 50.7 N	121 51.2 E
19 37.9 N	121 12.1 E
18 39.1 N	119 58.1 E
18 00.0 N	119 56.4 E

(5) WESTERN PHILIPPINE SEA AREA - TAIWAN - OPERATIONS AUTHORIZED YEAR ROUND

LATITUDE	LONGITUDE
22 34.1 N	119 41.6 E
22 04.9 N	119 53.0 E
21 33.1 N	120 22.2 E
21 28.3 N	120 31.6 E
21 26.6 N	120 56.6 E
21 39.1 N	121 39.6 E
21 43.5 N	121 49.9 E
21 55.6 N	121 55.5 E
22 38.6 N	122 01.9 E
23 26.6 N	122 03.2 E
24 07.2 N	122 13.8 E
23 42.3 N	123 49.3 E

(6) SEA OF JAPAN - NO OPERATIONS MAY THRU JULY

LATITUDE	LONGITUDE
42 00.0 N	131 14.9 E
40 28.7 N	139 10.7 E
39 58.3 N	138 57.5 E
39 18.1 N	139 13.9 E
39 13.4 N	138 27.5 E
38 43.6 N	138 03.1 E
37 33.6 N	135 51.5 E
36 53.0 N	135 57.6 E
36 18.2 N	135 19.2 E
36 48.9 N	133 27.8 E
37 24.1 N	132 13.0 E
38 07.6 N	130 57.8 E
37 45.7 N	129 43.1 E
39 31.2 N	128 33.2 E
40 25.3 N	130 12.2 E
40 51.4 N	130 28.4 E
41 24.1 N	130 28.9 E

(7) SEA OF JAPAN - YAMATO RISE - NO OPERATIONS

LATITUDE	LONGITUDE
40 05.9 N	135 31.3 E
39 34.0 N	136 12.0 E
39 06.0 N	135 45.4 E
39 01.9 N	135 32.9 E
39 02.4 N	135 11.6 E
38 41.8 N	134 15.0 E
39 01.9 N	133 42.9 E

(8) EAST CHINA SEA AREA - OPERATIONS AUTHORIZED YEAR ROUND

LATITUDE	LONGITUDE
31 49.2 N	127 40.3 E
30 55.6 N	128 50.1 E
30 36.6 N	128 49.5 E
30 18.0 N	129 09.4 E
28 56.1 N	128 22.3 E
28 23.6 N	128 20.8 E
28 23.2 N	127 52.5 E
28 03.7 N	127 38.8 E
27 18.5 N	127 25.9 E
27 00.5 N	126 53.1 E
26 45.7 N	126 17.0 E
25 24.0 N	124 59.3 E
25 08.7 N	124 14.0 E
24 54.1 N	123 25.7 E
25 27.9 N	124 05.0 E
25 48.9 N	124 15.8 E
26 16.2 N	124 14.7 E
26 29.1 N	123 39.5 E
26 20.4 N	123 17.6 E
25 44.5 N	122 42.6 E
26 03.9 N	122 25.3 E
26 10.2 N	122 06.9 E
26 04.6 N	121 42.8 E
25 46.3 N	121 17.3 E
26 16.9 N	121 03.3 E
27 11.8 N	121 33.8 E
28 41.6 N	122 47.9 E
30 54.3 N	123 33.5 E

(9) SOUTH CHINA SEA AREA - OPERATIONS AUTHORIZED YEAR ROUND

LATITUDE	LONGITUDE
18 39.1 N	119 58.1 E
18 00.0 N	119 56.4 E
18 00.0 N	112 58.9 E
19 55.9 N	116 35.5 E
20 35.8 N	117 32.2 E
21 40.2 N	116 38.4 E
22 10.8 N	118 46.4 E
22 34.1 N	119 41.6 E
22 04.9 N	119 53.0 E

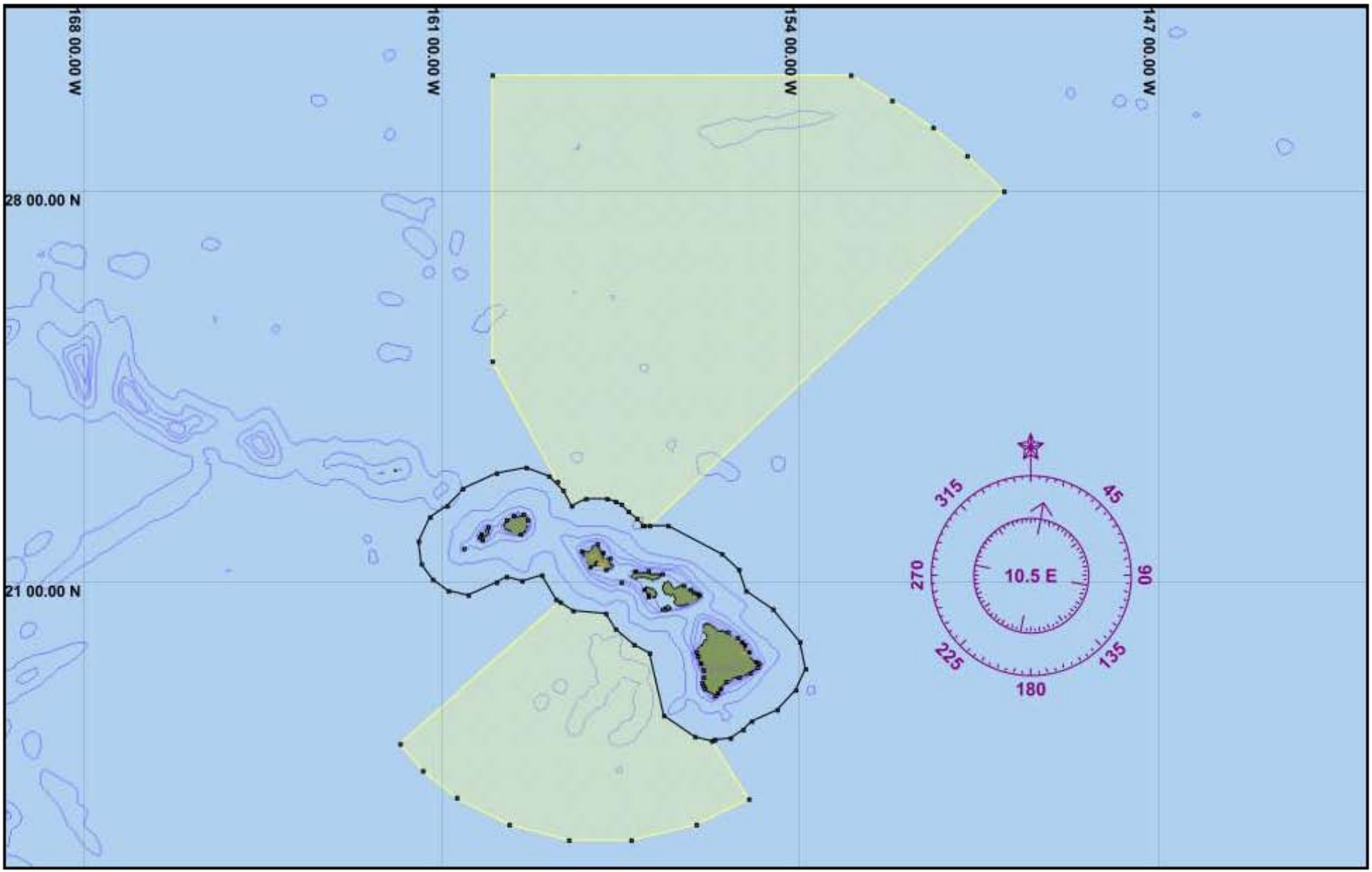
(10) SOUTH CHINA SEA - NO OPERATIONS NOV THRU APR

LATITUDE	LONGITUDE
18 00.0 N	112 58.9 E
18 00.0 N	110 43.5 E
19 30.2 N	113 06.3 E
19 58.1 N	114 03.7 E
19 56.0 N	114 32.1 E
20 14.3 N	115 02.9 E
20 54.1 N	115 53.2 E
19 55.9 N	116 35.5 E

(11) YEAR ROUND OPERATIONS AUTHORIZED OUTSIDE OF RADII FOR THE FOLLOWING ISLANDS IN THE NORTHWESTERN PACIFIC WITHIN THE PHILIPPINE SEA AREA.

LOCATION	LATITUDE (N)	LONGITUDE (E)	RADIUS (NM)
WAKE	19 17.978	166 37.113	30
SIBYLLA	14 36.072	169 00.399	30
BIKAR	12 11.703	170 06.769	30
TAKA/UTRIK	11 11.141	169 43.444	35
MEJIT	10 16.993	170 53.053	30
WOTHO	10 10.639	166 01.002	30
RONGELAP	11 09.158	166 53.636	35
BIKINI	11 36.512	165 23.887	40
ENEWATAK	11 20.015	162 19.518	30
ENJEBI	11 39.878	162 14.245	30

Tab 3: Hawaii


168 00.00 W
161 00.00 W
154 00.00 W
147 00.00 W
28 00.00 N
21 00.00 N
315
45
270
90
225
135
180
10.5 E

Tab 4. Hawaii

Operations are authorized year round

Hawaii North	
Latitude	Longitude
30 00.0N	160 00.0W
30 00.0N	153 00.0W
29 34.2N	152 13.1W
29 06.0N	151 23.5W
28 37.2N	150 42.4W
28 00.0N	150 00.0W
22 03.4N	156 55.5W
22 02.5N	157 03.5W
22 09.9N	157 11.5W
22 18.7N	157.21.2W
22 25.5N	157 28.8W
22 29.1N	157.36.3W
22 32.6N	157 45.9W
22 32.6N	158 10.3W
22 24.5N	158 27.2W
22 42.0N	158 36.5W
22 49.8N	158 44.1W
25 00.0N	160.00.0W

Hawaii South	
Latitude	Longitude
18 01.5N	161 50.3W
20 39.6N	158 41.2W
20 29.6N	158 25.0W
20 26.5N	157 47.5W
20 09.6N	157 35.6W
19 51.6N	157 14.4W
19 42.9N	156 56.5W
18 33.2N	156 38.9W
18 09.1N	156 03.0W
18 04.7N	155 42.4W
17 00.0N	155 00.8W
16 30.3N	156 01.4W
16 13.0N	157 17.3W
16 13.5N	158 30.6W
16 30.3N	159 39.7W
17 00.8N	160 43.5W
17 30.7N	161 23.1W

APPENDIX C

Background for Marine Mammal Density and Stock Estimates for SURTASS LFA Sonar Fourth Annual Report

Appendix C: Background for Marine Mammal Density and Stock Estimates for SURTASS LFA Sonar 4th Year Annual Report

The following information describes the estimation approach and scientific literature sources used to derive density and stock estimates for the marine mammal species potentially occurring in the operational areas utilized during the of this report (16 August 2010 to 15 August 2011) of the SURTASS LFA sonar operating areas. Information is listed by operating area and marine mammal species. This information was developed for the fourth year LOA application.

1. Mission Area #2—North Philippine Sea

- Bryde's whale: Yoshida and Kato (1999) identified three stocks of Bryde's whales in the western North Pacific: Solomon Islands/Southeast Asia, East China Sea, and offshore western North Pacific. The density estimate (0.0006 animals/km^2) for the Western North Pacific stock is derived from derived from scouting vessels sighting data (Ohsumi, 1977). The IWC provides the best available population estimate for the western North Pacific stock at 20,501 whales (IWC, 2009). Ohizumi et al. (2002) conducted winter sighting surveys, observing Bryde's whales at about 20°N, which is the southern limit of their summer range. Barlow (2006) observed Bryde's whales around the Hawaiian Islands, deriving a comparable density estimate (0.00019 animals/km^2).
- Minke whale: The south coast of Honshu and Shikoku were whaling grounds for this species (Ohsumi, 1978). Minke whales migrate through western North Pacific waters, traveling in summer north to the Chukchi Sea and in winter south to near the equator (Perrin and Brownell, 2002). Two stocks of minke whales are recognized in the western North Pacific, the "O" stock in the Okhotsk Sea and off the eastern side of Japan and the "J" stock around the Korean peninsula and in the Sea of Japan (Pastene et al., 1998). Minkes in this stipulation area are believed to be part of the "O" stock. Buckland et al. (1992) conducted sighting surveys in July and August in the western North Pacific and Sea of Okhotsk. The density estimate, 0.0044 animals/km^2, for this area was derived from the encounter rates and effective search widths for the offshore population (Standard Error (SE) = 0.17), while the stock estimate for the western North Pacific/Sea of Okhotsk stock is estimated as 25,049 individuals by Buckland et al. (1992). Ferguson and Barlow (2001; 2003) computed density estimates in offshore areas of the ETP that are an order of a magnitude lower.
- North Pacific right whale: The western North Pacific right whale population is considered distinct from the eastern population, arbitrarily separated by the 180° line of longitude (Best et al. 2001). The Okhotsk Sea, Kuril Islands, and eastern Kamchatka coast represent major feeding grounds for the western population (Brownell et al., 2001) where animals are typically found May through September (Clapham et al., 2004). Various areas have been proposed for breeding and calving grounds, including the Ryukyu Islands, Yellow Sea, Sea of Japan, offshore waters far from land, and the Bonin Islands, but a lack of winter sightings (December to February) makes a definitive assessment impossible (Brownell et al., 2001). Clapham et al. (2004) note the extensive offshore component to the right whale's distribution in the 19th century data. Movement north in spring (peak months of February to April) and south in fall (peak months September to December) suggest the possibility of two putative sub-populations in the western population that are kept apart by the Japanese islands, though this seems unlikely (Brownell et al. 2001, Clapham et al. 2004). Data from Japanese sighting cruises in the Okhotsk Sea provide an abundance estimate of 922 animals (CV=0.433, 95% CI=404-2,108) (Best et al., 2001) for the western North Pacific population. The western population may be affected by proposed LFA operations in the spring, fall, and winter in the North Philippine Sea. Although no density estimates are available for this very rare marine mammal species, a density estimate is necessary to compute the potential risk to this species. Thus, a density estimate of <0.0001 animals/km^2 was used in the risk analysis to reflect the very low probability of occurrence in this region.
- Sperm whale: Stock structure of this species has not been completely delineated for the western North Pacific. Sightings collected by Kasuya and Miyashita (1988) suggest that two stocks of sperm whales occur in the western North Pacific, a northwestern stock with females that summer off the Kuril Islands (~50°N) and winter off Hokkaido and Sanriku (~40°N), and the southwestern North Pacific stock with females that summer off Hokkaido and Sanriku (~40°N) and winter around the

Bonin Islands (~25°N). The males of these two stocks are found north of the range of the corresponding females, i.e., in the Bering Sea (~55°N) and off Hokkaido and Sanriku (~40°N), respectively, during the summer. The best abundance estimate for the western North Pacific stock of sperm whales is 102,112 individuals (CV=0.155) (Angliss and Allen, 2009). As no densities have been derived from sperm whale sighting data for the western North Pacific, the most appropriate density estimate for use is this region is 0.00282 animals/km^2, which was estimated from the 2002 summer/fall survey data off Hawaii (Barlow, 2006).

- *Kogia* spp.: Evans (1987) reported records of *Kogia* spp. off the Japanese coast with primarily an oceanic distribution and no specific areas of concentration. Few occurrence data are available for *Kogia* spp. in the western North Pacific. In the ETP, Ferguson and Barlow (2001; 2003) summed the abundances of *Kogia breviceps, Kogia simus,* and *Kogia* spp. for an estimated overall abundance of 350,553 animals. Although only *Kogia breviceps* (pygmy sperm whale) is expected at the northern latitude of this stipulation area, the abundance from the ETP remains the best population estimate for *Kogia* spp. in the North Pacific. The density estimate of 0.0031 animals/km^2 calculated for *Kogia* spp. from the eastern Pacific Ocean at about 30° N is considered the best estimate (Ferguson and Barlow, 2001, 2003). This density is comparable to the density estimates for pygmy sperm whale (0.00291 animals/km^2, CV=1.12) and dwarf sperm whale (0.00714 animals/km^2, CV=0.74) observed within the Hawaii EEZ (Barlow, 2006).

- Cuvier's beaked whale: No density or stock estimate data are available for this region on this beaked whale. Considering habitat preferences (e.g., water temperature, bathymetry), the best data available are the density (0.0054 animals/km^2) and abundance estimates of (90,725 animals) from the eastern Pacific (Ferguson and Barlow, 2003). This density is comparable to that estimated for the Hawaii EEZ (0.00621 animals/km^2; Barlow, 2006) and the mean predicted density estimate for the ETP (0.00455 animals/km^2; Ferguson et al., 2006).

- Blainville's beaked whale: Miyazaki et al. (1987) reported two strandings of Blainville's on Taiwan and one stranding on the southern Ryukyu Archipelago. Without any data on stock or density estimates for the western North Pacific, data from the ETP (Ferguson and Barlow, 2001, 2003) are appropriate; the density of 0.0005 animals/km^2 and the *Mesoplodon densirostris* estimate added to one-fifth of the *Mesoplodon* spp. abundance estimate equal to 8,032 individuals were used for this analysis. This density estimate is lower than the density of Blainville's beaked whales estimated in the Hawaii EEZ (0.00117 animals/km^2; Barlow, 2006) and the main Hawaiian Islands (0.0012 animals/km^2; Mobley et al., 2001), although the mean predicted density estimate (0.000296 animals/km^2; Ferguson et al., 2006) for the ETP *Mesoplodon* spp. is comparable.

- Ginkgo-toothed beaked whale: Miyazaki et al. (1987) reported five strandings of *M. ginkgodens* from the east coast of Japan and two strandings from the east coast of Taiwan. Of the 15 known strandings of *M. ginkgodens*, Palacios (1996) reported eight being reported on Taiwan and Japan. With no data on stock or density estimates available for ginkgo-toothed beaked whales in the western North Pacific, the best population estimations are those derived from the ETP for *Mesoplodon* spp. (Ferguson and Barlow, 2001, 2003). Using Ferguson and Barlow's (2001, 2003) northernmost strata, a density of 0.0005 animals/km^2 and an abundance of 22,799 animals are estimated. This density estimate is similar to that for unidentified beaked whales in the Hawaii EEZ (0.00015 animals/km^2; (Barlow 2006)) and the mean predicted density estimate for the ETP *Mesoplodon* spp. (0.000296 animals/km^2; Ferguson et al. 2006).

- Killer whale: A few schools have been seen off the southeast coast of Honshu (off Taiji) in April, October, and November; however, none have been taken in the drive fisheries (Miyashita, 1993). Without any data for the western North Pacific, the best available data are from the long-term time series in the ETP, with density (0.0004 animals/km^2) and abundance estimates (12,256 animals) reported (Ferguson and Barlow, 2001, 2003). This density can be compared to the density estimate from the Hawaii EEZ of 0.00014 animals/km^2 (Barlow, 2006).

- False killer whale: Miyashita (1993) estimated an abundance of 16,668 (CV=0.263) false killer whales from 34 sighting cruises associated with the Japanese drive fishery, as well as the derived density estimate of 0.0029 animals/km^2. This estimated density is higher than the density estimated in the

Hawaii EEZ (0.0001 animals/km^2; Barlow 2006) but is more similar to the nearshore Hawaii waters (0.0017 animals/km^2; Mobley et al. 2000).

- Pygmy killer whale: Kishiro and Kasuya (1993) reviewed the historical catches of Japanese drive fisheries. No pygmy killer whales were caught in Taiji fisheries (located on the south coast of Kii Peninsula of Japan), but Leatherwood and Reeves (1983) reported that they were seen relatively frequently in the tropical Pacific off Japan. Without data available in the western North Pacific, a density estimate (0.0021 animals/km^2) and abundance estimate (30,214 animals) from eastern Pacific (Ferguson and Barlow, 2003) were used. This density estimate is almost an order of magnitude larger than that observed in the Hawaii EEZ (0.00039 animals/km^2; Barlow, 2006). No pygmy killer whales were sighted in nearshore Hawaii waters (Mobley et al., 2000).

- Melon-headed whale: Leatherwood and Reeves (1983) reported that melon-headed whales are not observed frequently anywhere except in the Philippine Sea, especially near Cebu Island. An abundance estimated by Ferguson and Barlow (2001, 2003) from the eastern Pacific of 36,770 animals and a density estimate of 0.0012 animals/km^2 for the offshore region around the Hawaiian archipelago (Barlow, 2006) were used in the analysis for this stipulation area. The density estimate from Mobley et al. (2000) for near the Main Hawaiian Islands, 0.0021/km^2, is higher.

- Short-finned pilot whale: Miyashita (1993) estimated the abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery at 53,608 individuals (CV=0.224), while the derived average density estimated in 1° blocks was 0.0153 animals/km^2 derived.

- Risso's dolphin: Miyashita (1993) reported an abundance estimate (83,289 (CV=0.179)) and density estimate off southern Japan/east Taiwan (0.0106 animals/km^2). This is an order of magnitude larger than that observed in the Hawaii EEZ (0.00097 animals/km^2; Barlow, 2006) and no Risso's dolphins were observed in nearshore Hawaii waters (Mobley et al. 2000).

- Common dolphin: There are no data on density or abundance estimates for this species in the western Pacific (Miyashita, 1993). Common dolphins are gregarious, and it is not unusual to find them associated with Pacific white-sided dolphins in eastern North Pacific feeding grounds. They are pelagic, offshore creatures encountered along or seaward of the 183-m (100-fm) contour, and found in waters of temperature 10-28°C (50-82.4ºF). These animals are very widely distributed, occurring in all oceans to the limits of tropical and warm temperate waters (Leatherwood and Reeves, 1983). Without any data on stock or density estimates for the western North Pacific, the population data derived from ETP surveys of 3,286,163 animals and 0.0761 animals/km^2 from the eastern Pacific (Ferguson and Barlow, 2001, 2003) are appropriate.

- Fraser's dolphin: As a highly gregarious species, groups of a hundred to a thousand Fraser's dolphins have been observed. Kishiro and Kasuya (1993) reported catches off the Pacific coast of Japan in drive fisheries. Dolar et al. (2003) reported Fraser's and spinners found together in the eastern Sulu Sea, Philippines. Without any data on abundance or density estimates for the western North Pacific, it is roughly estimated that estimates (0.0040 animals/km^2 and 220,789 animals) from the ETP (Ferguson and Barlow 2001, 2003) are appropriate. This is comparable to that observed in the Hawaii EEZ (0.00417 animals/km^2; Barlow, 2006).

- Bottlenose dolphin: Miyashita (1993) reports an abundance estimate (168,791 animals CV=0.261) and density estimate off southern Japan (0.0146 animals/km^2). This is comparable to that observed in the nearshore Hawaii waters (0.0103 animals/km^2; (Mobley et al., 2000)) and an order of magnitude larger than that observed in the Hawaii EEZ (0.00131 animals/km^2; Barlow, 2006).

- Pantropical spotted dolphin: Gilpatrick et al. (1987) cited a known distribution of pantropical spotted dolphins east of Taiwan and in the Philippine Sea. Miyashita (1993) abundance estimate (438,064 animals CV=0.174)) and density estimate off southern Japan/east Taiwan (0.0137 animals/km^2) were used. This is comparable to those observed in the Hawaii EEZ (0.00366 animals/km^2; Barlow, 2006) and in nearshore Hawaii waters (0.0407 animals/km^2; Mobley et al., 2000).

- Striped dolphin: There are two concentrations in western North Pacific, one south of 30°N and the other in the offshore waters north of 30°N. There is also the potential for three populations in the area: one south of 30°N, one inshore north of 30°N, and one offshore north of 30°N, east of 145°E.

However, the boundaries between these populations have not been resolved (Miyashita, 1993). Therefore, Miyashita (1993) derived a total population estimate (570,038 animals, CV=0.186). The density estimate off southern Japan/east Taiwan (0.0329 animals/km^2) was used.

- Spinner dolphin: Gilpatrick et al. (1987) did not report any sightings from the Pacific coast of Japan, and this species was not mentioned in historical Japanese whaling records (Kishiro and Kasuya, 1993). No data on density or abundance estimates are available (Miyashita, 1993). Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that estimates (0.0005 animals/km^2 and 1,015,059 animals) from the ETP (Ferguson and Barlow, 2001, 2003) at a similar latitude are appropriate.

- Pacific white-sided dolphin: No data on density or abundance estimates are available in the western North Pacific (Miyashita, 1993). A gregarious species, these pelagic, offshore creatures are encountered along or seaward of the 183-m (100-fm) contour. They feed at night on the deep-scattering layer and have a primarily temperate distribution, found north of tropical waters and south of arctic waters (Leatherwood and Reeves, 1983). Recent research on genetic differentiation suggests that animals found in coastal Japanese waters and the Sea of Japan belong to a different population than animals found in offshore North Pacific waters (Hayano et al., 2004). Sighting surveys in the North Pacific were analyzed to estimate the abundance of Pacific white-sided dolphins as 931,000 individuals (Buckland et al., 1993). This estimate is over an order of magnitude larger than the abundance estimate in the eastern North Pacific (Ferguson and Barlow, 2001, 2003). Without any data on density estimates for the western North Pacific (Miyashita, 1993), it is roughly estimated that the data from the ETP (Ferguson and Barlow, 2001, 2003) are appropriate. No sightings of Pacific white-sided dolphins were reported in Hawaii surveys (Mobley et al., 2000; Barlow, 2006).

- Rough-toothed dolphin: This species has a primarily pelagic distribution in tropical to warm temperate waters. They are seen from time to time with bottlenose dolphins and short-finned pilot whales, and are reportedly rare off Japan and in the heavily studied ETP. There are no data on abundance or density estimates for the western North Pacific; therefore, a density estimate (0.0059 animals/km^2) an abundance (145,729 animals) from the eastern Pacific waters was used (Ferguson and Barlow, 2001, 2003). This is comparable to those observed in the Hawaii EEZ (0.00355 animals/km^2; Barlow, 2006) but was higher than those estimated in nearshore Hawaii waters (0.0017 animals/km^2; (Mobley et al., 2000)).

2. Mission Area #3—West Philippine Sea

- Fin whale: Fin whales winter to about 20°N, including waters along the Pacific coast of Japan. Since fin whales migrate south from offshore waters of the northwest Pacific, density and stock estimates were derived from encounter rates of Japanese scouting boats in the northwest Pacific (Masaki, 1977, Ohsumi ,1977, Tillman, 1977). These data are comparable to density estimates in offshore areas of the ETP (Ferguson and Barlow, 2001, 2003).

- Bryde's whale: Animals found around the Bonin Islands are an offshore morph of *Balaenoptera edeni*. three stocks are currently recognized in the western North Pacific: Solomon Islands/Southeast Asia, East China Sea, and offshore western North Pacific (Yoshida and Kato, 1999). The Ohsumi (1977) density estimate (0.0006 animals/km^2) was used for this analysis. The IWC provides the best available population estimate for the western North Pacific stock at 20,501 whales (IWC, 2009). Ohizumi et al. (2002) conducted winter sighting surveys, observing Bryde's whales at about 20°N, which is the southern limit of their summer range. Barlow (2006) observed Bryde's whales around the Hawaiian Islands, deriving a higher density estimate (0.00019 animals/km^2).

- Minke whale: The south coast of Honshu and Shikoku were whaling grounds for the minke whale (Ohsumi, 1978). Animals are migratory from the offshore western North Pacific waters. Minke whales are migratory animals, with a summer distribution extending north to the Chukchi Sea and a winter distribution extending south to near the equator (Perrin and Brownell, 2002). Two stocks of minke whales are recognized in the western North Pacific, the "O" stock in the Okhotsk Sea and off the eastern side of Japan and the "J" stock around the Korean peninsula and in the Sea of Japan (Pastene et al., 1998). Animals in this region are believed to be part of the "O" stock. Buckland et al.

(1992) conducted sighting surveys in July and August in the western North Pacific and Sea of Okhotsk. Density estimates were derived from encounter rates and effective search widths for the offshore population. The stock estimate is for the western North Pacific/Sea of Okhotsk stock (25,049 individuals) (Buckland et al., 1992). Ferguson and Barlow (2001; 2003) computed density estimates in offshore areas of the ETP an order of a magnitude lower.

- Humpback whale: Many specific humpback feeding and wintering grounds have been identified in the North Pacific Ocean. Recent research conducted by the Structure of Populations, Levels of Abundance, and Status of Humpbacks (SPLASH) consortium of scientists throughout the North Pacific Ocean has shown that humpback whale movement patterns between feeding areas in high latitudes and wintering grounds in lower latitudes are extremely complex but indicate a high level of population structure (Calambokidis et al., 2008). In the western North Pacific during winter, humpback whale distribution is centered along the Ogasawara Islands, Ryukyu Islands, Taiwan, the Philippines, and the Mariana Islands (Calambokidis et al., 2008). The remainder of the year, humpback whales are largely absent from these regions as they move northward to other regions of the North Pacific, principally off Russia but also to the Bering Sea and the Gulf of Alaska, to feed (Calambokidis et al., 2008). Thus, humpback whales are only expected in the western Philippine Sea stipulation area during winter. The SPLASH consortium derived an average abundance for the Asian wintering grounds of 1,107 humpback whales (Calambokidis et al., 2008). Since no density estimate for the Asian humpback wintering grounds is available, a density estimated for the California/Oregon/Washington wintering humpback stock of 0.00083 animals/km^2 was used for this stipulation area (Barlow and Forney, 2007).

- Sperm whale: Although the sperm whale stock structure is better defined in U.S. North Pacific EEZ waters, some uncertainty exists in the delineation of the remaining North Pacific stock structure. The best available population estimate for sperm whales in the western North Pacific is Kato and Miyashita's (1998) estimate of 102,112 animals (CV=0.155). Sightings collected by Kasuya and Miyashita (1988) suggest that that there are two stocks of sperm whales in the western North Pacific, a northwestern stock with females that summer off the Kuril Islands (~50°N) and winter off Hokkaido and Sanriku (~40°N), and the southwestern North Pacific stock with females that summer off Hokkaido and Sanriku (~40°N) and winter around the Bonin Islands (~25°N). The males of these two stocks are found north of the range of the corresponding females, i.e., in the Bering Sea (~55°N) and off Hokkaido and Sanriku (~40°N), respectively, during the summer. Although no densities for sperm whales in this stipulation area have been estimated, the estimated density for sperm whales (0.0010 animals/km^2) derived from the sighting data collected by Mobley et al. (2000), where sperm whales were generally seen in the outer 5% of survey effort, is most applicable for this region. This density estimate is comparable to the sperm whale density (0.00123 animals/km^2) estimated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007).

- *Kogia* spp.: Evans (1987) reported records of *Kogia* spp. off the Japanese coast with primarily an oceanic distribution that are not believed to be concentrated anywhere specific. Summing the abundances of *Kogia breviceps, Kogia simus, and Kogia* spp. in the geographic strata defined by Ferguson and Barlow (2001), an overall abundance of 350,553 animals was computed in the ETP. At this latitude, *Kogia breviceps* and *Kogia simus* are expected to occur. Reviewing density estimates calculated in the eastern Pacific Ocean at about 20°N (Ferguson and Barlow, 2003), a density estimate of 0.0017 animals/km^2 was modeled. This density is slightly lower than the densities for pygmy sperm whale (0.00291 animals/km^2, CV=1.12) and dwarf sperm whale (0.00714 animals/km^2, CV=0.74) estimated within the Hawaii EEZ (Barlow, 2006).

- Cuvier's beaked whale: No data are available for Cuvier's beaked whales in this region. Considering habitat preferences (e.g., water temperature, bathymetry), it was determined that best data available are a density estimate (0.0003 animals/km^2) and an abundance estimate of 90,725 animals from the same latitudes in the eastern Pacific (Ferguson and Barlow, 2003). This density was lower than those estimated for the Hawaii EEZ (0.00621 animals/km^2; Barlow, 2006) and the mean predicted density estimate for the ETP (0.00455 animals/km^2; Ferguson et al., 2006).

- Blainville's beaked whale: Miyazaki et al. (1987) reported two strandings on Taiwan and one stranding on the southern Ryukyu Archipelago. Without any data on stock or density estimates for the

western North Pacific, it is roughly estimated that the data from the ETP (Ferguson and Barlow, 2001, 2003) are appropriate. The *Mesoplodon densirostris* abundance estimate added to one-fifth of the *Mesoplodon* spp. abundance estimate is 8,032. Since no data on density or stock estimates are available for this species, it was roughly estimated that the density and abundance estimates for *Mesoplodon* spp. at the same latitudes in the eastern Pacific (0.0005 animals/km^2; Ferguson and Barlow, 2001, 2003) are approximate. This density estimate is comparable to that for Blainville's beaked whales in the Hawaii EEZ (0.00117 animals/km^2; Barlow, 2006), in the main Hawaiian Islands (0.0012 animals/km^2; Mobley et al., 2001), and the mean predicted density estimate for the ETP *Mesoplodon* spp. (0.000296 animals/km^2; Ferguson et al., 2006).

- Ginkgo-toothed beaked whale: Miyazaki et al. (1987) reported two strandings of *M. ginkgodens* from the east coast of Taiwan. Of the 15 known *M. ginkgodens* strandings, Palacios (1996) reported eight off Taiwan and Japan. Leatherwood and Reeves (1983) stated that some hunting of this species apparently takes place in Taiwan. Since no data on density or stock estimates are available for this species, the density 0.0005 animals/km^2 and abundance 22,799 animals (Ferguson and Barlow, 2001, 2003) estimated for *Mesoplodon* spp. at the same latitudes in the eastern Pacific are approximate. This density estimate is comparable to that for unidentified beaked whales in the Hawaii EEZ (0.00015 animals/km^2; Barlow, 2006) and the mean predicted density estimate for the ETP *Mesoplodon* spp. (0.000296 animals/km^2; Ferguson et al., 2006).

- False killer whale: Miyashita (1993) estimated the abundance of false killer whales from 34 sighting cruises associated with the Japanese drive fishery (16,668, CV=0.263). He also derived density estimates in 1° latitude by 1° longitude boxes from which an average was derived for the modeled site (0.0029 animals/km^2). This is comparable to density estimates in the Hawaii EEZ (0.0001 animals/km^2; (Barlow, 2006)) and to nearshore Hawaii waters (0.0017 animals/km^2; Mobley et al., 2000).

- Pygmy killer whale: Kishiro and Kasuya (1993) reviewed the historical catches of Japanese drive fisheries. No pygmy killer whales were caught in Taiji fisheries (located on the south coast of Kii Peninsula of Japan), but Leatherwood and Reeves (1983) reported that they were seen relatively frequently in the tropical Pacific off Japan. Without data available in the western North Pacific, a density estimate (0.0021 animals/km^2) and abundance estimate (30,214) from eastern Pacific (Ferguson and Barlow, 2003) was used. This is almost an order of magnitude larger than that observed in the Hawaii EEZ (0.00039 animals/km^2; Barlow, 2006). None were sighted in nearshore Hawaii waters (Mobley et al., 2000).

- Melon-headed whale: Leatherwood and Reeves (1983) reported that melon-headed whales are not observed frequently anywhere except in the Philippine Sea, especially near Cebu Island. Abundance estimated from eastern Pacific (36,770 animals) (Ferguson and Barlow, 2001, 2003). A density estimate for the offshore region around the Hawaiian archipelago (Barlow, 2006) was used (0.0012 animals/km^2). This value is very similar to the estimate from Mobley et al. (2000) for near the Main Hawaiian Islands: 0.0021 animals/km^2.

- Short-finned pilot whale: Miyashita (1993) estimated abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery (53,608, CV=0.224). He also derived density estimates in 1° latitude by 1° longitude boxes. There was limited coverage of the Philippine Sea, but Kishiro and Kasuya (1993) reported a southern limit to the short-finned pilot whale range of approximately 20°N; therefore, a density estimate was derived as one-half the density estimate of the area south of Japan. Kasuya et al. (1988) suggest that there might be more than one stock of short-finned pilot whales off the Pacific coast of Japan and Taiwan, since there is a southern form found south of the Kuroshio Current front (south of 35°N) and a northern form found between the Kuroshio Current front and the Oyashio Current front (from approximately 35-43°N). However, the northern form has not been harvested by Japanese drive fisheries (Kishiro and Kasuya, 1993), and it was therefore not included in the above analyses (Miyashita, 1993).

- Risso's dolphin: Miyashita (1993) abundance estimate (83,289 animals CV=0.179) and density estimate off southern Japan/east Taiwan (0.0106 animals/km^2) were used. This is an order of magnitude larger than that observed in the Hawaii EEZ (0.00097 animals/km^2; Barlow, 2006) and no Risso's dolphins were observed in nearshore Hawaii waters (Mobley et al., 2000).

- Common dolphin: There are no data on density or stock estimates for this gregarious species (Miyashita, 1993). It is not unusual to find common dolphins associated with Pacific white-sided dolphins in eastern North Pacific feeding grounds. These pelagic, offshore creatures are encountered along or seaward of the 183-m (100-fm) contour and are found in waters of temperature 10-28°C (50-82.4°F). They are very widely distributed, occurring in all oceans to the limits of tropical and warm temperate waters (Leatherwood and Reeves, 1983). Without any data on stock or density estimates for the western North Pacific, the population data estimated of 3,286,163 animals and 0.0562 animals/km^2 from the eastern Pacific (Ferguson and Barlow, 2001, 2003) are appropriate to use for this area.

- Fraser's dolphin: Kishiro and Kasuya (1993) reported takes of Fraser's dolphin off the Pacific coast of Japan in the Japanese drive fisheries. Dolar et al. (2003) reported Fraser's and spinners found together in the eastern Sulu Sea, Philippines. Amano et al. (1996) also stated that Fraser's dolphins are common in Philippine waters. A highly gregarious species, groups of a hundred to a thousand have been observed, are occasionally found mixed in herds of spotted dolphins, and observed in the company of false killer whales, sperm whales, striped dolphins, and spinner dolphins. Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the estimates (0.0040 animals/km^2 and 220,789 animals) from the ETP (Ferguson and Barlow, 2001, 2003) are appropriate. This is comparable to that observed in the Hawaii EEZ (0.00417 animals/km^2; Barlow, 2006).

- Bottlenose dolphin: Miyashita (1993) abundance estimate (168,791 (CV=0.261)) and density estimate off southern Japan (0.0146/km^2) were used. This is comparable to that observed in the nearshore Hawaii waters (0.0103/km^2; (Mobley et al., 2000)) and an order of magnitude larger than that observed in the Hawaii EEZ (0.00131/km^2; Barlow, 2006).

- Pantropical spotted dolphin: Gilpatrick et al. (1987) cited a known distribution of pantropical spotted dolphins east of Taiwan and in the Philippine Sea. The Miyashita (1993) abundance estimate (438,064, CV=0.174) and density estimate off southern Japan/east Taiwan (0.0137 animals/km^2) were used. This is comparable to those observed in the Hawaii EEZ (0.00366/km^2; Barlow, 2006) and in nearshore Hawaii waters (0.0407 animals/km^2; Mobley et al., 2000).

- Striped dolphin: Two concentrations exist in the western North Pacific, one south of 30°N and the other in the offshore waters north of 30°N. However, there is the potential for only one population in the area: one south of 30°N, though the boundaries between these populations have not been resolved (Miyashita 1993). Therefore, Miyashita (1993) derived a total population estimate (570,038, CV=0.186). One-half the density estimate from off southern Japan/east Taiwan for this site (0.0164 animals/km^2) was used.

- Spinner dolphin: Gilpatrick et al. (1987) reported a high density of sightings in the Korea Strait, but none were reported from the Philippine Sea. Spinners are also not mentioned in historical Japanese whaling records (Kishiro and Kasuya, 1993), and no data on density or abundance estimates are available (Miyashita, 1993). Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that estimates (0.0005 animals/km^2 and 1,015,059 animals) from the ETP (Ferguson and Barlow, 2001, 2003) at a similar latitude are appropriate.

- Pacific white-sided dolphin: There are no data on density or stock estimates available for this species (Miyashita, 1993). These pelagic, offshore animals are encountered along or seaward of the 183-m (100-fm) contour. Pacific white-sided dolphins have a primarily temperate distribution, found north of tropical waters and south of arctic waters (Leatherwood and Reeves, 1983). Recent research on genetic differentiation suggests that animals found in coastal Japanese waters and the Sea of Japan belong to a different population than animals found in offshore North Pacific waters (Hayano et al., 2004). Sighting surveys in the North Pacific were analyzed to estimate the abundance of Pacific white-sided dolphins as 931,000 individuals (Buckland et al., 1993). This estimate is over an order of magnitude larger than the abundance estimate in the eastern North Pacific (Ferguson and Barlow, 2001, 2003). Without any data on density estimates for the western North Pacific (Miyashita 1993), it is roughly estimated that the data from the ETP (Ferguson and Barlow, 2001, 2003) are appropriate. No sightings of Pacific white-sided dolphins were reported in Hawaii surveys (Mobley et al., 2000; Barlow, 2006).

- Rough-toothed dolphin: Their distribution is primarily pelagic, in tropical to warm temperate waters. Rough-toothed dolphins are seen from time to time with bottlenose dolphins and short-finned pilot whales, and are reportedly rare off Japan and in the heavily studied ETP. No data on stock or density estimates for the western North Pacific are available; therefore, a density estimate (0.0059 animals/km^2) and an abundance estimate from the ETP (145,729) were used (Ferguson and Barlow, 2001, 2003). This is comparable to those observed in the Hawaii EEZ (0.00355 animals/km^2; Barlow, 2006) and in nearshore Hawaii waters (0.0017 animals/km^2; Mobley et al., 2000).

3. Mission Area #4—Guam

The only recent research on marine mammals in the vicinity of Guam is from a January-April 2007 survey (DoN, 2007). Eldredge (1991) compiled the first list of published and unpublished records, reporting 19 species from the region. A compilation of the best available information for the region was recently completed (DoN, 2005).

- Blue whale: Within U.S. EEZ waters, two stocks of blue whales are recognized in the North Pacific: the western North Pacific stock, which includes whales found around the Hawaiian Islands during winter and the eastern North Pacific stock, which feeds primarily off California (Carretta et al., 2009). Blue whales occur rarely in the central North Pacific, with few sightings and acoustic detections having been made (Carretta et al., 2009). Blue whales found near Guam would be in the western North Pacific stock. Evidence of their occurrence in the area exists in acoustic recordings. Stafford et al. (2001) showed that recordings made near Kaneohe, Hawaii from August 1992 through April 1993 consisted of approximately 30% of the northwest Pacific blue whale call type and 70% of northeast Pacific call type. Since data are so limited on the western North Pacific stock, and the current uncertainty in blue whale stock delineation in the North Pacific (IWC recognizes only one stock in North Pacific, NMFS delineates two stocks in U.S. EEZ waters, up to five populations are believed to exist in the entire North Pacific basin [Reeves et al. 1998], and acoustic data suggest two populations), data from the ETP are most appropriate for application to this stipulation area. Due to their rare status and lack of sightings in the region, the lowest density estimate (0.0001 animals/km^2) for blue whales in the ETP is considered appropriate for a year-round estimate in this region (Ferguson and Barlow, 2001, 2003). Since there is currently no stock estimate available for the western North Pacific stock, the most appropriate stock estimate for use in analysis of this stipulation area is 1,368 individuals, which is the stock estimate for the eastern North Pacific stock (Carretta et al., 2009).
- Fin whale: These animals are typically not expected south of 20°N, so it is unlikely that they would be encountered near Guam. One Hawaii stock is recognized (Carretta et al., 2009), and there has been one sighting in Hawaiian waters in recent years (February) (Mobley et al., 1996). There has been acoustic evidence of fin whale presence in fall and winter (Moore et al., 1998; Thompson and Friedl, 1982). Because of the limited data available for the Hawaiian stock, and no data available for the Guam region, density estimates and stock abundance were derived from data on the eastern North Pacific stock (Ferguson and Barlow, 2003). The stock estimate is 9,250 for animals outside of the Gulf of California, and a density estimate of 0.0003 animals/km^2 is based on the lowest density estimate for fin whales in the ETP. It is conservative to use the eastern North Pacific data because McDonald and Fox (1999) derived an average calling whale density estimate of 0.027 animals per 1000 km^2 (0.000027 animals/km^2) based on recordings made north of Oahu, Hawaii–a value an order of magnitude less than what was modeled. The seasonal maximum calling whale density was about three times the average, or 0.081 animals/1000 km^2 (McDonald and Fox, 1999), still considerably less than the modeled density. Based on the chosen methodology and parameters, the call density was variable and ranged from 0.011/1000 km^2 to 0.106/1,000 km^2.
- Sei whale: The IWC recognizes one stock of sei whales in the North Pacific (Donovan, 1991), however some evidence exists for several populations (Carretta et al., 2009). Very few sightings of sei whales have occurred in any region of the North Pacific. Until the recent survey conducted in the Mariana Island Range Complex (DoN, 2007), sei whales were considered rare in the Marianas region. The best density estimate is 0.00029 animals animals/km^2, derived from that survey (DoN, 2007). The Marianas survey derived an abundance estimate of 177 animals, which is similar to other site-specific estimates in the eastern North Pacific where limited sightings have occurred (Carretta et

al., 2009). Therefore, the best available estimate for the entire North Pacific stock region is 8,600 animals based on very old catch data (Tillman, 1977).

- Bryde's whale: The IWC provides the best available population estimate for the western North Pacific stock at 20,501 whales (IWC, 2009). The best available density estimate (0.00041 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is comparable to density estimates from the ETP (0.0009/km^2) (Ferguson and Barlow, 2001, 2003) and the Hawaii EEZ (0.00019 animals/km^2; Barlow, 2006).

- Minke whale: They are not abundant anywhere in the Pacific except in the Bering and Chukchi seas and in the Gulf of Alaska. A Hawaii stock is not recognized (Carretta et al., 2009). There is an Alaska stock that is considered migratory and a "resident" CA/OR/WA stock that establishes home ranges (Dorsey et al., 1990). The IWC identifies three Pacific stocks—one in the Sea of Japan/East China Sea, one in the remainder of western Pacific west of 180°, and one east of 180°. The stock estimate is for the western North Pacific/Sea of Okhotsk stock (25,049 individuals) (Buckland et al., 1992). This is conservative because it is significantly higher than the limited data available on the CA/OR/WA stock. Rankin and Barlow (2005) acoustically identified the "boing" as minke whales, suggesting that they are more common than previously thought. No density or abundance estimates were provided from the visual data, but are forthcoming from the acoustic data. A recent survey around Guam and the Mariana Islands (DoN, 2007) heard but did not observe minke whales. It is estimated that the best density is 0.0003 animals/km^2, the highest density reported for minke whales in the ETP (Ferguson and Barlow, 2001, 2003).

- Humpback whale: Humpback whales are only expected in this region during the winter (October through May), and they are typically found in water depths of less than 183 m (100 fm) (Mobley et al. 2001). A central North Pacific stock has been identified as individuals that migrate from summer/fall feeding grounds of northern British Columbia and southeast Alaska (Prince William Sound west to Kodiak), to winter/spring breeding and calving grounds of the Hawaiian Islands (Carretta et al., 2009). Some exchange between winter/spring areas has been documented, as well as movement between Japan and British Columbia, and Japan and the Kodiak Archipelago (Calambokidis et al. 1997). Recent acoustic surveys around Hawaii (Norris et al., 1999) suggest a northbound migration heading of approximately magnetic north (10° true), with a "migration corridor" of 150° to 160°W. Animals are cycling through the breeding grounds with an average residency of approximately 30 to 45 days. The best abundance estimate for the central North Pacific stock is 10,103 animals, from mark-recapture model estimates for North Pacific data from 2004 to 2006 (Calambokidis et al., 2008). A recent survey around Guam and the Mariana Islands (DoN, 2007) heard humpback whales and conducted photo-id work with the observed animals; however, density estimate was not derived. Therefore, the best available density estimate is 0.0069 animals/km^2, the highest density reported for humpback whales in the ETP (Ferguson and Barlow 2001, 2003).

- Sperm whale: Three stocks are recognized in U.S. EEZ waters, a North Pacific stock that migrates between Alaska and the western North Pacific, a central North Pacific stock around Hawaii, and a California/Oregon/Washington stock off the U.S. west coast (Angliss and Allen, 2009). Although sperm whales in the Guam stipulation area are in the U.S. North Pacific stock, currently available population estimates for this stock are considered unreliable by the NMFS (Angliss and Allen, 2009). Thus, the best abundance estimate for this region is that of the western North Pacific stock, estimated at 102,112 individuals (Kato and Miyashita, 1998). A sperm whale density estimate, 0.00123 animals/km^2, calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007), is the estimate used in the analyses for this area.

- *Kogia* spp.: Hawaiian stocks of pygmy and dwarf sperm whales are recognized (Carretta et al., 2009). Mobley et al. (2000) observe two pods of five individuals during the 1993 to 1998 surveys in Hawaii, but no density or abundance estimates were derived. Ferguson and Barlow's (2003) derived an abundance estimate for *Kogia* spp. of 350,553 for in the ETP, which is the best estimate available for the Guam area. The combined densities of 0.00291 animals/km^2 (CV=1.12) for pygmy sperm whales and 0.00714 animals/km^2 (CV=0.74) for dwarf sperm whales derived for the Hawaii EEZ (Barlow, 2006) were used for *Kogia* spp. in the Guam region.

- Cuvier's beaked whale: The best data available on density and abundance estimates are 0.00621 animals/km^2 for the Hawaii EEZ (Barlow, 2006) and 90,725 animals from the ETP (Ferguson and Barlow, 2003). This is comparable to the mean predicted density estimate for the ETP (0.00455 animals/km^2; Ferguson et al., 2006).
- Blainville's beaked whale: The best data available density estimate (0.00117 animals/km^2) is from the Hawaii EEZ (Barlow, 2006) and abundance estimate is from the eastern Pacific (Ferguson and Barlow, 2003). The *Mesoplodon densirostris* estimate added to one-fifth of the *Mesoplodon* spp. abundance estimate is 8,032 animals. This density estimate is comparable to that for Blainville's beaked whales in the eastern Pacific (0.0013 animals/km^2; Ferguson and Barlow, 2003), in the main Hawaiian Islands (0.0012 animals/km^2; Mobley et al., 2001), and the mean predicted density estimate for the ETP *Mesoplodon* spp. (0.000296/km^2; Ferguson et al., 2006).
- Ginkgo-toothed beaked whale: Since no data on density or stock estimates are available for this species, the best available density and abundance estimates for *Mesoplodon* spp. at the same latitudes in the ETP are most approximate for this region (Ferguson and Barlow, 2001, 2003). Using Ferguson and Barlow's (2001, 2003) northernmost strata, the density estimate of 0.0005 animals/km^2 and abundance estimate of 22,799 animals were used for analyses of this stipulation area.
- Longman's beaked whale: Longman's beaked whale is known from tropical waters of the Pacific and Indian Oceans (Pitman et al., 1999; Dalebout et al., 2003). Ferguson and Barlow (2001) reported that all Longman's beaked whale sightings were south of 25ºN. Beaked whales may be expected to occur in the area including around seaward of the shelf break. There was no density estimate for Longman's beaked whales available from the Mariana Islands (DoN, 2007), therefore, a density estimate of 0.00041 animals per km^2 (CV = 1.26) and an abundance estimate of 1,007 animals that were derived from the Hawaii offshore area was used (Barlow, 2006).
- Killer whale: Killer whales are considered rare with limited sightings reported (Carretta et al., 2009). The best available density estimate (0.00014 animals/km^2) and abundance estimate (349 animals, CV=0.98) are calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). Mobley et al. (2000) did not report any sightings in their surveys of waters within 25 nm of the Main Hawaiian Islands, nor did the DoN (2007) surveys around the Mariana Islands.
- False killer whale: Miyashita (1993) estimated the abundance of false killer whales from 34 sighting cruises associated with the Japanese drive fishery (16,668 animals (CV=0.263)). The best available density estimate (0.00111 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is an order of magnitude larger than the density estimate (0.0001 animals/km^2) calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006) and comparable to nearshore Hawaii waters (0.0017 animals/km^2) during the spring, summer and fall (Mobley et al., 2000).
- Pygmy killer whale: One sighting of six animals was observed during surveys around the Mariana Islands, from which a density estimate (0.00014 animals/km^2) was derived (DoN, 2007). Data from the eastern North Pacific was used to derive a stock-wide abundance estimate (30,214 animals) (Ferguson and Barlow, 2003). This is comparable to that observed in the Hawaii EEZ (0.00039 animals/km^2; Barlow, 2006). None were sighted in nearshore Hawaii waters (Mobley et al., 2000).
- Melon-headed whale: The best available density estimate (0.00428 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is comparable to the density estimate (0.0012 animals/km^2) calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006) and in nearshore Hawaii waters (0.0021 animals/km^2) during the spring, summer and fall (Mobley et al., 2000). An abundance estimate in the eastern North Pacific (36,770) (Ferguson and Barlow, 2003) was used.
- Short-finned pilot whale: Miyashita (1993) estimated abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery (53,608 animals, CV=0.224). The best available density estimate (0.00159 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is comparable to the density estimate (0.0036 animals/km^2) calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006) and an order

of magnitude less than in nearshore Hawaii waters (0.0237 animals/km^2) during the spring, summer and fall (Mobley et al., 2000).

- Risso's dolphin: Neither DoN (2007) or Mobley et al. (2000) collected sufficient sighting data to derive density nor abundance estimates. One Hawaiian stock is recognized, though animals appear to be rare in pelagic waters far from shore with only very rare sightings near shore (Carretta et al., 2009). Leatherwood and Reeves (1983) stated that there is a sighting hiatus at about 20°N along the western coast of the U.S. where Risso's have been intensely studied. This sighting hiatus may extend out to the main Hawaiian Islands which are centered at about 20°N, and contribute to the rarity of their sightings. Miyashita (1993) reports a western North Pacific stock estimate of 83,289 animals (CV=0.179). The density estimate (0.00097 animals/km^2) used for this stipulation area is from surveys in the Hawaii EEZ (Barlow, 2006). This density is comparable to the density estimate calculate for the eastern North Pacific (0.0007 animals/km^2; Ferguson and Barlow, 2003).

- Common dolphin: These pelagic, offshore creatures are encountered along or seaward of the 183-m (100-fm) contour and are found in waters of temperature 10 to 28°C (50 to 82.4°F). They are very widely distributed, occurring in all oceans to the limits of tropical and warm temperate waters (Leatherwood and Reeves, 1983). Without any data on stock or density estimates for the western North Pacific, the population data estimated of 3,286,163 animals and 0.0021 animals/km^2 from the eastern Pacific (Ferguson and Barlow, 2001, 2003) are appropriate for use in this stipulation area.

- Fraser's dolphin: Fraser's dolphin is an oceanic, tropical species. They were first documented in Hawaii waters during a recent summer/fall survey (Barlow, 2006), resulting in the best available density estimate (0.0042 animals/km^2) and abundance estimate (10,226 individuals, CV=1.16) for the Guam/Mariana Islands region.

- Bottlenose dolphin: Miyashita (1993) reports an abundance estimate (168,791 animals CV=0.261). The best available density estimate (0.00021 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is an order of magnitude less than that observed in the Hawaii EEZ (0.00131 animals/km^2; Barlow, 2006) and in the eastern North Pacific at similar latitudes and distance from the mainland (0.0025 animals/km^2) (Ferguson and Barlow, 2003).

- Pantropical spotted dolphin: Gilpatrick et al. (1987) cited a known distribution of pantropical spotted dolphins east of Japan. Miyashita (1993) reports an abundance estimate (438,064 animals, CV=0.174) and density estimate east of Japan (0.0259 animals/km^2). The best available density estimate (0.00226 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is comparable to that observed in the Hawaii EEZ (0.00366 animals/km^2; Barlow, 2006) and an order of magnitude less than that observed in nearshore waters of Hawaii (0.0407 animals/km^2) (Mobley et al., 2000).

- Striped dolphin: Two concentrations exist in the western North Pacific, one south of 30°N and the other in the offshore waters north of 30°N. There is the potential for two populations in the area: one inshore north of 30°N, and one offshore north of 30°N, east of 145°E. However, the boundaries between these populations have not been resolved (Miyashita, 1993). Therefore, Miyashita (1993) derived a total population estimate of 570,038 (CV=0.186). The best available density estimate (0.00616 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is comparable to that observed in the Hawaii EEZ (0.00536 animals/km^2; Barlow, 2006) and in nearshore waters of Hawaii (0.0016 animals/km^2) (Mobley et al., 2000).

- Spinner dolphin: The best available density estimate (0.00314 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is comparable to that observed in the Hawaii EEZ (0.00137 animals/km^2; Barlow, 2006) and an order of magnitude less than that observed in nearshore waters of Hawaii (0.0443 animals/km^2) (Mobley et al., 2000). The best data available abundance estimate is for spinner dolphins (1,015,059 animals) from the ETP (Ferguson and Barlow, 2003).

- Rough-toothed dolphin: The best available density estimate (0.00029/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is an order of magnitude less than those observed in the Hawaii EEZ (0.00355 animals/km^2; Barlow, 2006) and in nearshore Hawaii waters (0.0017 animals/km^2; Mobley et al., 2000).The best available data on for an

abundance estimate is from the eastern North Pacific (145,729 individuals) (Ferguson and Barlow, 2003).

4. Mission Area #7—South China Sea

- Fin whale: De Boer (2000) conducted a research cruise in the Indian Ocean Sanctuary and the South China Sea from 29 March to 17 April, 1999. Sightings of fin whales and a sperm whale west of the Balabac Strait suggest a possible migration route of these species between the South China Sea and the Sulu Sea. De Boer's cruise is the first record of fin whales in the South China Sea. The East China Sea population is thought to be resident and may represent a distinct population (Evans, 1987). Without any data on stock or density estimates for the South China Sea, it is roughly estimated that the data from the western North Pacific are appropriate. Density and stock estimates were derived from encounter rates of Japanese scouting boats in the northwest Pacific (Masaki, 1977, Ohsumi, 1977, Tillman, 1977). These data are comparable to density estimates in other areas of the ETP (Ferguson and Barlow, 2001, 2003) and around Hawaii (Barlow, 2006).
- Bryde's whale: Yoshida and Kato (1999) identified 3 stocks of Bryde's whales in the western North Pacific: Solomon Islands/Southeast Asia stock (mainly Philippine waters and the Gulf of Thailand), East China Sea, and offshore western North Pacific. Animals found in this area are considered part of the southeast Asia stock of Bryde's whales, which includes waters of the Philippine Sea and Gulf of Thailand (Yoshida and Kato, 1999) and which is separate from both the East China Sea and western North Pacific populations. Animals in this region are the offshore form of *Balaenoptera edeni*. De Boer (2000) sighted Bryde's whales during his cruise. No data specific to this stock were reported. The Ohsumi (1977) western North Pacific density estimate is most appropriate; comparable to DoN (2007) (0.00041 animals/km^2), Barlow (2006) (0.00019 animals/km^2) and Ferguson and Barlow (2001, 2003) for the ETP. The IWC provides the best available population estimate, 20,501 whales, for the western North Pacific Bryde's whale stock (IWC, 2009).
- Minke whale: As a cosmopolitan species, minke whales are expected to be present in the South China Sea, though De Boer (2000) did not observe them during his recent cruise through the area and Smith et al. (1997) did not document them during their cruises or from historical "whale temples." Whaling data from the East China Sea suggest that animals do not migrate through the Taiwan Strait, though other studies (Butterworth et al., 1996; Gong, 1988) indicate that individuals might be from the J-stock, migrating into the region in the winter. In either case, there are limited data on density and stock estimates. Therefore, estimated encounter rates and stock estimate similar to the favored whaling grounds of the western North Pacific were used (Buckland et al., 1992). These estimates are an order of magnitude higher than any calculated in the eastern North Pacific (Ferguson and Barlow, 2001, 2003).
- North Pacific right whale: There has been a limited search effort in the South China Sea, but no observations of right whales have ever been reported in the area (Clapham et al., 2004). In addition, right whales migrate further north during the spring, summer, and fall, and are not expected in the area at this time of year. The only possibility of a right whale encounter would be during the winter season. To account for the limited possibility of this species occurring during winter in this stipulation area, an abundance estimate of 922 animals derived from Japanese sighting cruises in the Okhotsk Sea (Best et al., 2001) was used. Although no density estimates are available for this very rare marine mammal species, a density estimate is necessary to compute the potential risk to this species. Thus, a density estimate of <0.0001 animals/km^2 was used in the risk analysis to reflect the very low probability of occurrence in this region.
- Gray whale: Gray whales would only be expected to be in this area during the winter season. Exact wintering grounds of this species are not known, though believed to winter in the South China Sea, in the vicinity of Korea and China (Evans, 1987; Omura, 1988). Presumably they maintain a shallow water/nearshore affinity throughout the southern portion of their range. The exact migration route is not known, but they are believed to migrate directly across the East China Sea, which is one of the few times that they leave their shallow, nearshore habitat (Omura ,1988). During this time, they may be found up to 400 nm (741 km) offshore (Weller et al., 2002). Currently, IWC reports an abundance estimate of 121 animals for the western Pacific stock (IWC, 2009). With no density estimate for this

rare species available, a minimal density of <0.0001 animals/km^2 was used in risk computation for this stipulation area to reflect the extremely low potential for this species occurring.

- Sperm whale: De Boer (2000) sighted sperm whales in the South China Sea (March through April) and suggested that animals seen west of the Balabac Strait might be migrating between the South China and Sulu Seas. Miyashita et al. (1996) also observed sperm whales in the winter in the South China Sea, very close to the Philippines. No data on density estimates or stock estimates were derived from either study. The only available abundance estimate for the western North Pacific population of sperm whales is 102,112 animals (CV=0.155) (Kato and Miyashita, 1998). The best available density estimate, 0.00123 animals/km^2, for use in this region was derived from recent survey in waters of Guam and the Mariana Islands (DoN, 2007). This density is comparable to the sperm whale density, 0.0010 animals/km^2, derived from Hawaiian surveys, where sperm whales were generally seen in the outer 5% of the survey effort (Mobley et al., 2000).

- *Kogia* spp.: Smith et al. (1997) reported that *Kogia* were found in "whale temples" in nations surrounding the South China Sea. No density or abundance estimates are available. No sightings of *Kogia* spp. were made by De Boer (2000). Summing the abundances of *Kogia* spp. in the geographic strata defined by Ferguson and Barlow (2001), an overall abundance of 350,553 animals is computed in the ETP. Both *Kogia breviceps* and *Kogia simus* potentially may occur in this region. Reviewing density estimates calculated in the eastern Pacific Ocean at about 20°N (Ferguson and Barlow, 2003), a density estimate of 0.0017 animals/km^{2}was modeled. This is comparable to the density estimates for pygmy sperm whale (0.00291 animals/km^2 CV=1.12) and dwarf sperm whale (0.00714 animals/km^2 CV=0.74) observed within the Hawaii EEZ (Barlow, 2006).

- Cuvier's beaked whale: De Boer (2000) sighted Cuvier's beaked whales during his cruise through the South China Sea. No density or stock estimate data are available for this region. Considering habitat preferences (e.g., water temperature, bathymetry), it was determined that best data available are a density estimate (0.0003 animals/km^2) and an abundance estimate of 90,725 animals from the same latitude in the eastern Pacific (Ferguson and Barlow, 2003). This is comparable to that estimated for the Hawaii EEZ (0.00621 animals/km^2; Barlow, 2006) and the mean predicted density estimate for the ETP (0.00455 animals/km^2; Ferguson et al., 2006).

- Blainville's beaked whale: Miyazaki et al. (1987) did not report any strandings of *M. densirostris* from the South China Sea. De Boer (2000) and Miyashita et al. (1996) did not observe any *M. densirostris* during their research cruises. Without any data on stock or density estimates for the western North Pacific, the data from the ETP (Ferguson and Barlow, 2001, 2003) are most appropriate for this region. The *Mesoplodon densirostris* estimate added to one-fifth of the *Mesoplodon* spp. abundance estimate is 8,032 animals and the *Mesoplodon* spp. density estimate, 0.0005/km^2, are best for use at this area (Ferguson and Barlow, 2001, 2003). This density estimate can be compared to that for Blainville's beaked whales in the Hawaii EEZ (0.00117 animals/km^2; Barlow 2006), in the main Hawaiian Islands (0.0012 animals/km^2; Mobley et al., 2001), and the mean predicted density estimate for the ETP *Mesoplodon* spp. (0.000296 animals/km^2; Ferguson et al., 2006).

- Ginkgo-toothed beaked whale: Miyazaki et al. (1987) report no strandings of *M. ginkgodens* from the South China Sea. De Boer (2000) and Miyashita et al. (1996) did not observe *M. ginkgodens* during their research cruises. Since no data on density or stock estimates are available for this species, it was roughly estimated that the density (0.0005 animals/km^2) and abundance estimates (22,799 animals) for *Mesoplodon* spp. at the same latitude in the eastern Pacific (Ferguson and Barlow, 2001, 2003) are approximate. This density estimate is comparable to that for unidentified beaked whales in the Hawaii EEZ (0.00015 animals/km^2; Barlow, 2006) and the mean predicted density estimate for the ETP *Mesoplodon* spp. (0.000296 animals/km^2; Ferguson et al., 2006).

- False killer whale: Miyashita (1993) suggests that animals summering in the Sea of Japan are probably from a different stock, by analogy of Pacific white-sided dolphins. Animals in the East and South China seas are probably part of this inshore Archipelago stock. Kishiro and Kasuya (1993) cited Miyashita (1986) as estimating the population wintering in the East China Sea at 3,259 animals. Since these data represent only about one-third of the habitat of false killer whales in the South China Sea, the population estimate is multiplied by 3 for the inshore Archipelago stock estimate (9,777 individuals). False killer whales are sighted infrequently in the South China Sea (De Boer, 2000;

Miyashita et al., 1996; Smith et al., 1997). There are no data on density estimates for the South China Sea. The best available density estimate (0.00111 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is an order of magnitude larger than the density estimate (0.0001 animals/km^2) calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006) and comparable to nearshore Hawaii waters (0.0017 animals/km^2) during the spring, summer, and fall (Mobley et al., 2000).

- Pygmy killer whale: Leatherwood and Reeves (1983) stated that this species is not abundant in any particular area, but is widely distributed in tropical waters. Pygmy killer whales are seen relatively frequently in the ETP, especially near Hawaii. Pygmy killer whales were seen by De Boer (2000) during his research cruise through the South China Sea, known from historical "whale temples" (Smith et al., 1997), but not seen by Miyashita et al. (1996). No mention of these animals exists in Japanese whaling records (Kishiro and Kasuya, 1993). There are no data on density or stock estimates off Japan or Taiwan (Miyashita, 1993), or nearshore Hawaii (Mobley et al., 2000). The best available density estimate (0.00014 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is comparable to the density estimate (0.00039 animals/km^2) calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006). An abundance estimate (30,214 animals) from the eastern Pacific (Ferguson and Barlow, 2003) was used.

- Melon-headed whale: Leatherwood and Reeves (1983) stated that melon-headed whales are rare except in the Philippine Sea. Distributed in tropical and subtropical waters, preferring equatorial water masses, they have been observed in the South China Sea (De Boer, 2000) and in "whale temples" on islands surrounding the South China Sea (Smith et al., 1997). However, they were not observed by Miyashita et al. (1996). The best available density estimate (0.00428 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is comparable to the density estimate (0.0012 animals/km^2) calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006) and in nearshore Hawaii waters (0.0021 animals/km^2) during the spring, summer and fall (Mobley et al., 2000). An abundance estimate in the eastern North Pacific (36,770) (Ferguson and Barlow, 2003) was used.

- Short-finned pilot whale: Smith et al. (1997) reported that short-finned pilot whales are found in "whale temples" on islands surrounding the South China Sea. De Boer (2000) did not observe pilot whales during his research cruise, but Miyashita et al. (1996) did observe them in the western North Pacific. With limited data for this particular region, data from the Pacific coast of Japan were used. Miyashita (1993) estimated abundance of short-finned pilot whales from 34 sighting cruises associated with the Japanese drive fishery (53,608 individuals, CV=0.224). He also derived density estimates in 1° latitude by 1° longitude boxes. Kishiro and Kasuya (1993) reported a southern limit to the short-finned pilot whale range of approximately 20°N; therefore, a density estimate was derived as one-half the density estimate of the area south of Japan. Kasuya et al. (1988) suggest that there might be more than one stock of short-finned pilot whales off the Pacific coast of Japan and Taiwan, since there is a southern form found south of the Kuroshio Current front (south of 35°N) and a northern form found between the Kuroshio Current front and the Oyashio Current front (from approximately 35-43°N). However, the northern form has not been harvested by Japanese drive fisheries (Kishiro and Kasuya, 1993), and therefore, it was not included in the above analyses (Miyashita, 1993). The best available density estimate (0.00159 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is comparable to the density estimate (0.0036 animals/km^2) calculated from the summer/fall survey in the Hawaii EEZ (Barlow, 2006) and an order of magnitude less than in nearshore Hawaii waters (0.0237 animals/km^2) during the spring, summer and fall (Mobley et al., 2000).

- Risso's dolphin: Smith et al. (1997) reported that Risso's dolphin bones were found in "whale temples" in nations along the South China Sea, but this species was not seen by Miyashita et al. (1996) or De Boer (2000) during their surveys. Miyashita (1993) suggests by analogy to bottlenose dolphins and Pacific white-sided dolphins that animals summering in Sea of Japan are a separate stock from the western North Pacific. There have been no separate data reported for the Sea of Japan, East China Sea, or South China Sea, though. Therefore, the western North Pacific stock estimate (83,289 animals, CV=0.179) and the density estimate (0.0106 animals/km^2 derived for

southeast Pacific coast of Japan/east of Taiwan (Miyashita, 1993) were used. This is within the range of densities estimated in the eastern North Pacific (Ferguson and Barlow, 2001, 2003) and higher than those around Hawaii (not observed by Mobley et al. (2000) or DoN (2007); 0.0010 animals/km^2 (Barlow, 2006).

- Common dolphin: Common dolphin has been found in "whale temples" in nations along the South China Sea (Smith et al., 1997). There are no data on density or stock estimates (Miyashita, 1993). This is a gregarious species, not unusual to find associated with Pacific white-sided dolphins in eastern North Pacific feeding grounds. These dolphins are pelagic, offshore creatures encountered along or seaward of the 183-m (100-fm) contour, and found in waters of temperature 10-28°C (50-82.4°F). They are very widely distributed, occurring in all oceans to the limits of tropical and warm temperate waters (Leatherwood and Reeves, 1983). Without any data on stock or density estimates for the western North Pacific, population estimates from the ETP of 0.0461 animals/km^2 and 3,286,163 (Ferguson and Barlow, 2001, 2003) were used. Common dolphins were not sighted around Hawaii in recent surveys (Barlow, 2006; Mobley et al., 2000) or around Guam or the Mariana Islands (DoN, 2007).

- Fraser's dolphin: Highly gregarious groups of a hundred to a thousand dolphins have been observed, and occasionally have been found mixed in herds of spotted dolphins. Fraser's dolphins have also been observed in the company of false killer whales, sperm whales, striped dolphins, and spinner dolphins. Their diet consists of squid, crustaceans, and deep-sea fish (Leatherwood and Reeves, 1983). Comparing the feeding ecology of spinner and Fraser's dolphins, spinner dolphins feed primarily in upper 200 m (656 ft), but maybe as deep as 400 m (1312 ft), whereas Fraser's are more diverse, feeding from the surface to as deep as 600 m (1968 ft). Kishiro and Kasuya (1993) report catches off the Pacific coast of Japan in drive fisheries. Dolar et al. (2003) report Fraser's and spinners found together in the eastern Sulu Sea, Philippines. Without any data on stock or density estimates for the western North Pacific, it is roughly estimated that the estimates (0.0040 animals/km^2 and 220,789 animals) from the ETP (Ferguson and Barlow, 2001, 2003) are appropriate. This is comparable to that observed in the Hawaii EEZ (0.00417 animals/km^2; Barlow, 2006).

- Bottlenose dolphin: Smith et al. (1997) reported that bottlenose dolphins are found in "whale temples" in South China Sea nations. Miyashita (1993) reports that reproductive differences suggest that animals from the Pacific and East China Sea are different stocks. Kishiro and Kasuya (1993) cite Miyashita (1986) as estimating the abundance of the stock in the East China Sea as 35,046. Since these data represent only about one-third of the habitat of bottlenose dolphins in the East China Sea, the population estimate is multiplied by 3 for the inshore Archipelago stock estimate (105,138 animals). It is assumed that animals found in the Sea of Japan and South China Sea are of the same stock. No density estimates are available for this stock; therefore, a density estimate was derived from the southeast Pacific coast of Japan/east of Taiwan (Miyashita, 1993) (0.0146 animals/km^2). This is within the range of densities estimated in the eastern North Pacific (Ferguson and Barlow, 2001, 2003) and higher than those around Hawaii, 0.0103 animals/km^2 (Mobley et al. 2000), 0.0013 animals/km^2 (Barlow, 2006), and around Guam and the Mariana Islands, 0.00021 animals/km^2 (DoN, 2007).

- Pantropical spotted dolphin: These animals have been reported during the De Boer (2000) research cruise, observed in winter (Jan-Feb) in South China Sea (Miyashita et al., 1996), and reported from historical "whale temples" (Smith et al., 1997). Gilpatrick et al. (1987) summarized one report from west of Taiwan in the northern portion of the South China Sea. Miyashita (1993) summarized data from 34 sighting cruises conducted as part of the Japanese drive fishery. There is no discontinuity in sightings to suggest different stocks, though based on data from the ETP, it is possible that multiple populations exist in the western North Pacific (Miyashita, 1993). In the western North Pacific, total population size was 438,064 animals (CV=0.174); density estimate was 0.0137 animals/km^2. It was estimated that the population in South China Sea was one-half the abundance of the western North Pacific stock (219,032 animals) with the same density estimate of 0.0137 animals/km^2. This is comparable to those observed in the Hawaii EEZ (0.00366 animals/km^2; Barlow, 2006) and in nearshore Hawaii waters (0.0407 animals/km^2; Mobley et al., 2000).

- Striped dolphin: These animals were not reported during the De Boer (2000) research cruise in March-April, but seen by Miyashita et al. (1996) in the South China Sea are Jan-Feb cruise. No data on density or abundance estimates for the South China Sea is available. Two concentrations of striped dolphin are recognized in the western North Pacific: one south of 30°N and the other in the offshore waters north of 30°N. There is the potential for three populations in the area: one south of 30°N, one inshore north of 30°N, one offshore north of 30°N, east of 145°E though the boundaries between these populations have not been resolved (Miyashita, 1993). Therefore, Miyashita (1993) derived a total population estimate (570,038 animals, CV=0.186). One-half of the density estimate off southern Japan/east Taiwan for this site (0.0164 animals/km^2) was used. This is an order of magnitude greater than the density estimates from the Hawaii EEZ (0.00536 animals/km^2; Barlow, 2006), from nearshore Hawaii (0.0016 animals/km^2; Mobley et al., 2000), and from Guam and the Mariana Islands (0.00616 animals/km^2; DoN, 2007).
- Spinner dolphin: Gilpatrick et al. (1987) reported a high density of sightings in the Korea Strait and adjacent waters to the north, but none were reported from the South China Sea or Philippine Sea. Spinner dolphins are not mentioned in historical Japanese whaling records (Kishiro and Kasuya, 1993), reported during the De Boer (2000) research cruise, or encountered in historical "whale temples" (Smith et al., 1997). There are no data on density or stock estimates available (Miyashita, 1993). The best available density estimate (0.00314 animals/km^2) is calculated from the winter/spring survey around Guam and the Mariana Islands (DoN, 2007). This is comparable to that observed in the Hawaii EEZ (0.00137 animals/km^2; Barlow, 2006) and an order of magnitude less than that observed in nearshore waters of Hawaii (0.0443 animals/km^2) (Mobley et al., 2000). The best data available abundance estimate is for whitebelly spinner dolphins (1,015,059 animals) from the ETP (Ferguson and Barlow, 2003).
- Rough-toothed dolphin: Rough-toothed dolphins have a primarily pelagic distribution in tropical to warm temperate waters. They are seen from time to time with bottlenose dolphins and short-finned pilot whales, and are reportedly rare off Japan and in the heavily studied ETP. These animals have been found in "whale temples" in South China Sea nations (Smith et al., 1997). The best available data are a density (0.0040 animals/km^2) and abundance estimate (145,729 animals) from eastern Pacific (Ferguson and Barlow, 2001, 2003) was used. This is comparable to those observed in the Hawaii EEZ (0.00355 animals/km^2; Barlow, 2006) and in nearshore Hawaii waters (0.0017 animals/km^2; Mobley et al., 2000) and an order of magnitude larger than that observed around Guam and the Mariana Islands (0.00029 animals/km^2; DoN, 2007).

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