UPDATE #1 TO:

REQUEST FOR LETTER OF AUTHORIZATION FOR THE INCIDENTAL HARASSMENT OF MARINE MAMMALS RESULTING FROM TRAINING AND RESEARCH, DEVELOPMENT, TESTING AND EVALUATION ACTIVITIES CONDUCTED WITHIN THE MARIANA ISLANDS RANGE COMPLEX

Submitted to:

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

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EXECUTIVE SUMMARY

With this submittal, the United States (U.S.) Navy (Navy) updates the request for a five-year Letter of Authorization (LOA) for the incidental harassment of marine mammals during training events and research, development, test, and evaluation within the Mariana Islands Range Complex (MIRC) for the period January 2010 through December 2014. The original LOA application was submitted in August 2008 (DoN 2008). In order to estimate acoustic exposures from the MIRC training events, acoustic sources to be used were examined with regard to their operational characteristics. A detailed analysis of the training events for the most recent Joint Multi-Strike Group event in MIRC (a Valiant Shield 2007 exercise) was recently conducted and based on that analysis the number of sonar hours, dipping sonar or sonobuoy, torpedo deployments and underwater detonations used in the exposure modeling were significantly increased. Additionally, recent update and analysis of Seventh Fleet Sonar Positional Reporting Systems (SPORTS) data and Fleet Operator commentary and feedback supported other increases in sonar and underwater detonation training activity. This update provides revised exposure numbers based on changes in active sonar hours, number, and type of underwater detonation events.

This document has been prepared in accordance with the applicable regulations and the Marine Mammal Protection Act (MMPA), as amended by the National Defense Authorization Act for Fiscal Year 2004 (Public Law 108-136). The training events may expose certain marine mammals that may be present within the MIRC to sound from low-, mid- and high-frequency active (LFA/MFA/HFA) tactical sonar or to pressures from underwater detonations during training, testing and evaluation, research, and development.

The acoustic modeling and post-modeling analysis estimates that 78,661 marine mammals may be exposed to sonar resulting in Level B harassment. Of these, 77,415 would be from non-TTS and 1,246 would be from TTS. The modeling, without consideration of mitigation measures, estimates there will be two exposures to sound levels from sonar that may exceed the threshold for Level A harassment, one exposure for the pantropical spotted dolphin (*Stenella attenuata*) and one exposure for the sperm whale (*Physeter macrocephalus*). The sperm whale exposure estimate was the result of the annual accumulation of exposures which reached the threshold for Endangered Species Act animals although no one activity reached the exposure threshold. The sperm whale would have to be within 33 ft (10 m) of the sonar dome of a moving ship to be exposed to a sound level that could cause MMPA Level A harassment.

The potential explosive exposures outlined in Chapter 6 of this LOA update represent the maximum expected number of marine mammals that could be affected from underwater explosives for mine countermeasures (MCMs), demolition of underwater obstacles, missile exercises, bombing exercises, gunnery exercises and ship sinking exercise. For underwater detonations, the dual criteria threshold for potential Level B harassment is at 182 dB re 1 μPa^2-s or at 23 pounds per square inch (psi). For dual criteria, the criteria resulting in the greatest number of exposures is used. For multiple successive explosions potentially occurring during detonation events (when using other than inert weapons), the behavioral harassment threshold is 177 dB re 1 μPa^2-s. MMPA Level A thresholds for injury are 50 percent tympanic membrane rupture and onset of slight lung injury at 205 dB or 13 psi-ms. In addition to Level A and B harassment is the onset of extensive lung injury and mortality at a threshold of 31 psi-ms.

Without consideration of protective mitigation measures, modeling estimates that 148 marine mammals would be exposed to sound or pressure from underwater detonations that cause Level B Harassment. Of these, modeling predicts that 109 marine mammals may be exposed to sound or pressure from underwater detonations that could cause sub-TTS behavioral response, 39 marine mammals to TTS, and no marine mammals would be exposed to pressures that would cause injury (Level A harassment); or could cause mortality.

Based on the long history of conducting these ongoing training activities using the same basic equipment and in the same areas for decades without any indications of adverse effects to marine mammals (e.g. Hawaii and Southern California Range Complexes), the incidental harassment of marine mammals associated with the proposed Navy action will have no more than negligible impacts on marine mammal species or stocks. Five ESA species may be exposed to sound levels that may affect these species. The ESA Section 7 consultation will examine the anticipated responses and any associated fitness consequences for these ESA-listed species. However, given implementation of mitigation measures, it is unlikely that training activities would adversely affect these species. Based on the widely dispersed geography of the activities and evaluation of the potential for physiological and behavioral disturbance coupled with the reduction of potential effects attributed to the mitigation measures to be executed, the interpretation of the modeling estimates that only Level B harassment is anticipated for all marine mammal species in the MIRC. In all cases, the conclusions are that Level B harassment to a small number of marine mammals would have a negligible impact on marine mammal species or stocks.

The Navy does not anticipates that marine mammal strandings or mortality will result from the use of LFA, MFA or HFA sonar during Navy exercises within the MIRC. However, given the potential for naturally occurring marine mammal strandings in MIRC (e.g., natural mortality), it is conceivable that a stranding could co-occur with a Navy exercise even though the stranding is actually unrelated to and not caused by Navy activities. Accordingly, the Navy's LOA application will include requests for take, by mortality, of the most commonly stranded non ESA-listed species.

1. DESCRIPTION OF ACTIVITIES

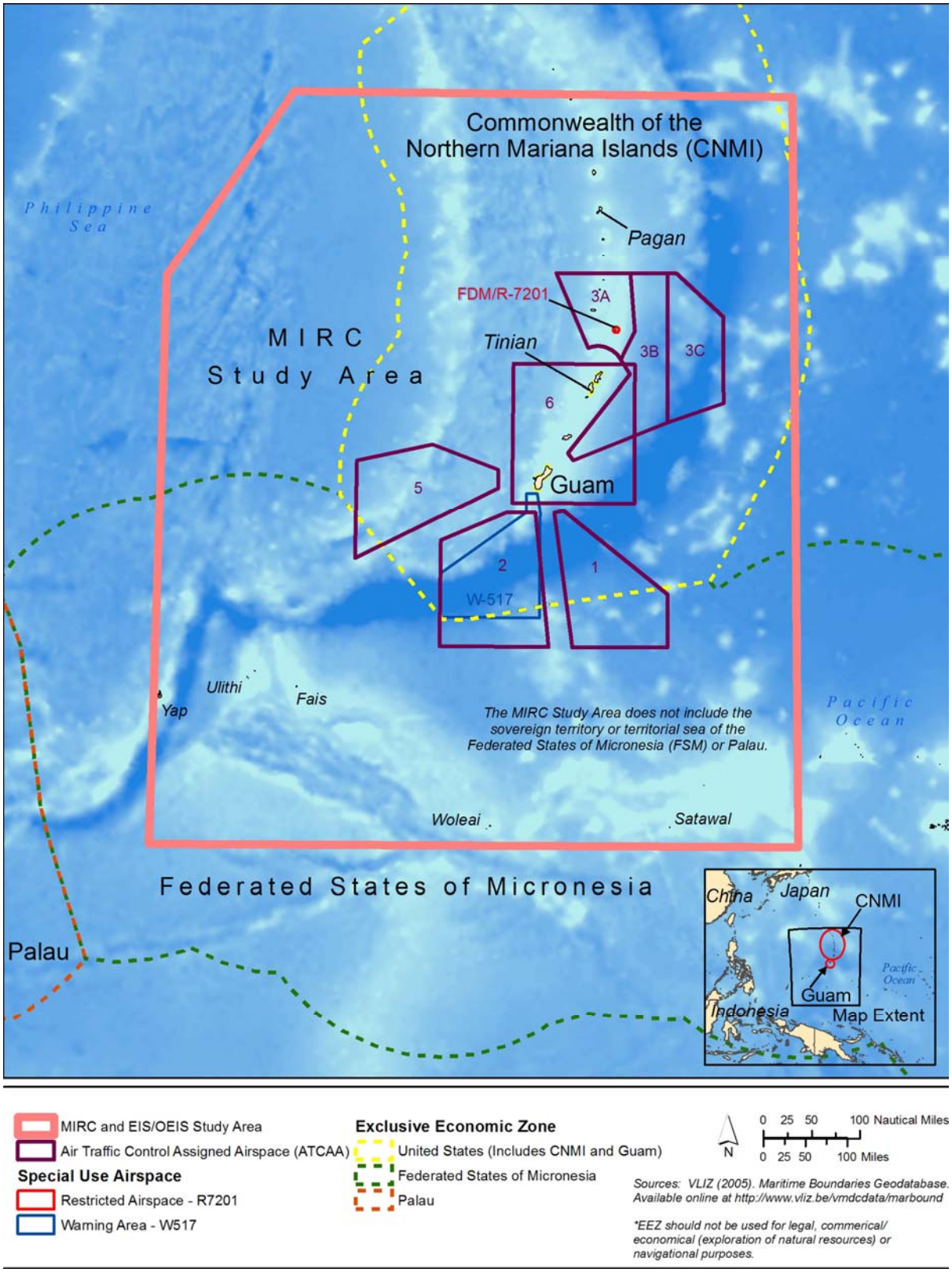
Figure 1-1 is included in this update to show the revised MIRC study area. The new modeling results incorporate the characteristics of the revised study area. The study area was enlarged to include additional open ocean areas north of the original study area.

1.3 PROPOSED ANTI-SUBMARINE WARFARE (ASW) ACTIVITIES

The number of active sonar hours used to model the predictive exposures to marine mammals were revised based on the recent availability of a detailed analysis (ARL-UT 2008 Study) of active sonar use during the most recent Joint Multi-Strike Group exercise conducted in 2007. This resulted in a significant increase in the number of active sonar hours predicted for future Mariana Islands Range Complex (MIRC) training activities in comparison to the previous SPORTS data. The sonar hours used in this revised exposure estimate represent the best available data based on actual active sonar hours, not exercise hours. Recent updates to and analysis of SPORTS data and Fleet Operator comments also contributed to increases in other ASW training activity. Table 1-3 provides a summary of the different active sonar training activities, sound source, and number of sonar hours, dipping events, and sonobuoy or torpedo deployments used in the modeling presented in this update to the Letter of Authorization (LOA) application of August 2008 (Department of the Navy [DoN] 2008).

1.4 PROPOSED NON-ASW SONAR ACTIVITIES

The number of underwater detonation events used to model the predictive exposures to marine mammals were revised as a result of detailed analysis available from the ARL-UT 2008 study, and from recent updates and analysis to SPORTS data and Fleet Operator comment. This resulted in only a small increase in the number of underwater detonation events predicted for future MIRC training activities in comparison to the previously used SPORTS data. The underwater detonation event data used in this revised exposure estimate represent the most recent and best available data. Table 1-3 provides a summary of the different underwater detonation training activities, type of explosives, and number of underwater detonation events used in the modeling presented in this update to the LOA application of August 2008 (DoN 2008).



Source: ManTech SRS

Figure 1-1: Mariana Islands Range Complex and EIS/OEIS Study Area

Table 1-3: Summary of Training Events within the MIRC

Exercise Type	SINKEX	EER/IEER	DEMO	BOMBEX	GUNEX	MISSILEX	Other ASW TRACKEX/TORPEX	Multi Strike Group [1]
Anticipated Takes	Yes	No	Yes[2]	Yes[2]	Yes[2]	Yes[2]	Yes	Yes
Sources/Weapons/ Rounds per year	See Table 1-4	SSQ-110A (4.1 pound [lb] NEW)	10 and 20 lb NEW	MK-82/GBU-12 MK-84/GBU-10 Bombs	5 in gun	AGM-88 Missile AGM-84 Missile SLAM Missile AGM-114 Missile Maverick Missile	AN/SQS-53 MFA Sonar BQQ-10 Submarine MFA Sonar AN/SSQ-62 DICASS MFA Sonobuoy AN/SSQ-125 AEER MFA Sonobuoy AN/ASQ-22/21/13 Track Mode (Dipping Sonar) MK-48 Torpedo HFA Sonar	AN/SQS-53 MFA Sonar AN/SQS-56 MFA Sonar BQQ-10 Submarine MFA Sonar AN/SSQ-62 DICASS Sonobuoy AN/SSQ-125 AEER Sonobuoy AN/ASQ-21/13 Track Mode (Diping Sonar) MK-48 Torpedo HFA Sonar
Explosion in or on water	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Length of Exercise	Variable	6 hours	Variable	Variable	Variable	Variable	8 hours reset for modeling	14 days (12 hours reset for modeling)
Detonations/hours /rounds/sonobuoy or torpedo deployments, or helicopter sonar dips per exercise or year	See Table 1-4	106 deploy/yr (non SINKEX)	50/yr (20 lb)	MK-82/ GBU-12 20 bombs MK-84/ GBU-10 8 bombs	320 Rounds (non SINKEX) 400 rounds per each SINKEX	4 AGM-88 Missiles 10 AGM-84 Missiles 2 SLAM Missiles 4 AGM-114 Missiles 16 Maverick Missiles	SQS-53 (Search Mode) =368 hrs/yr SQS-53 (Kingfisher) = 0 hrs/yr SQS -56 = 64 hrs/yr BQQ-10 = 12 hrs/yr SSQ-62 DICASS = 172 Sonobuoys/yr ASQ-21/13 Track Mode =304 Dips/yr MK 48 Torpedo = 40 torpedoes/yr	SQS-53 = 1,705 hrs/yr SQS-53 Kingfisher = 0 hrs/yr SQS -56 = 77 hrs/yr BQQ-10 = 0 hrs/yr SSQ-62 DICASS[1] = 1,282 Sonobuoys/yr ASQ-21/13 Track Mode = 288 Dips/yr MK 48 Torpedo[1] 0/yr
Number Exercises per Year (Note 2)	2-4	N/A	N/A	2	2	2	N/A	1
Area Used	South and East	General	Agat Bay/ Apra Harbor and Agat Bay/ Piti	South and East	South, East, and General	South and East	General	General
Months of Year conducted	Year Round	Year Round	Year Round	Year Round	Year Round	Year Round	Summer	Summer

SURTASS LFA activities will occur as part of the Joint Multi-strike Group exercises

[1] Cumulative hours of actual Multi-Strike Group sonar activities as recorded by the ARL-UT 2008 Study, were modeled as ASW TRACKEX/TORPEX training activity. Additional operational information on Multi-strike Group exercises can be found in Table 1-5.

[2] Also modeled under SINKEX

For ASW TRACKEX and ASW TORPEX: 53C and 56 sonar numbers equates to annual hours of use; buoys number equates to annual number of sonobuoys used; AQS22 number equates to annual number of dips; MK48 number equates to annual number of MK48 torpedoes used.

NEW = Net explosive weight, SINKEX = Sinking exercise, DEMO = Demolition, GUNEX = Gunnery exercise, MISSILEX = Missile exercise

1 **Table 1-4: Major Exercises in the MIRC Study Area**

MIRC EIS/OEIS		Major Exercises							
Exercise		Joint Expeditionary Exercise (CSG + ESG)	Joint Multi-strike Group Exercise (3 CSG + USAF)	Fleet Strike Group Exercise (CSG)	Integrated ASW Exercise (CSG)	Ship Squadron ASW Exercise (CRU DES)	MAGTF Exercise (STOM/ NEO)	SPMAGTF Exercise (HADR/ NEO)	Urban Warfare Exercise
Exercise Sponsor		US PACOM	US PACOM	C7F	C7F	C7F	III MEF	III MEF; MEU/UDP	III MEF; MEU/ UDP
Alternative: No Action		1 of the above		0	0	0	1	0	2
Alternative 1		1	1	0	0	0	4	2	5
Alternative 2		1	1	1	1	1	4	2	5
Primary Training Site		Tinian	MI Maritime >12 nm	MI Maritime >12 nm	MI Maritime >3 nm	MI Maritime >3 nm	Tinian	Guam	Guam
Secondary Training Sites		Nearshore to OTH: Guam: Rota; Saipan; FDM	FDM	FDM	FDM	N/A	Nearshore to OTH: Guam: Rota; Saipan; FDM	Tinian, Rota, Saipan	Tinian, Rota, Saipan
Exercise Footprint	Activity Days per Exercise	10	10	7	5	5	10	10	7-21
NAVY SHIPS	CVN	1	3	1	1	0	0	0	0
	CG	1	3	1	1	1	0	0	0
	FFG	2	3	1	1	1	1	0	0
	DDG	5	12	3	3	3	2	0	0
	LHD/ LHA	1	0	1	0	0	1	1	1
	LSD	2	0	0	0	0	2	1	1
	LPD	1	0	0	0	0	1	1	1
	TAOE	1	3	1	0	0	0	0	N/A
	SSN	1	5	1	1	1	0	0	N/A
	SSGN	1	0	0	0	0	1	0	0
	TR	N/A	N/A	0	0	0	N/A	N/A	N/A
Partner National Ships	CG	1	0	0	0	0	0	0	N/A
	DDG	2	0	0	0	0	0	0	N/A
	SS	1	1	0	0	0	0	0	N/A
FIXED WING	F/A-18	4 Squadrons	12 Squadrons	4 Squadrons	4 Squadrons	N/A	N/A	N/A	N/A
	EA-6B	1 Squadron	3 Squadrons	1 Squadron	1 Squadron	N/A	N/A	N/A	N/A
	E-2	1 Squadron	3 Squadrons	1 Squadron	1 Squadron	N/A	N/A	N/A	N/A
	MPA (P-3)	3	5	3	3	3	N/A	N/A	N/A
	AV-8B	1 Squadron	N/A	1 Squadron	N/A	N/A	N/A	N/A	N/A
	C-130	2	N/A	N/A	N/A	N/A	1	1	1
	USAF Bomber	N/A	1 Squadron	N/A	N/A	N/A	N/A	N/A	N/A
	F-15/16/22	N/A	1 Squadron	1 Squadron	N/A	N/A	N/A	N/A	N/A
	A-10	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	E-3	1	1	1	N/A	N/A	N/A	N/A	N/A
	KC-10/135/130	1	2	1	N/A	N/A	N/A	N/A	N/A

Table 1-4: Major Exercises in the MIRC Study Area (Continued)

MIRC EIS/OEIS		Major Exercises							
Exercise		Joint Expeditionary Exercise (CSG + ESG)	Joint Multi-strike Group Exercise (3 CSG + USAF)	Fleet Strike Group Exercise (CSG)	Integrated ASW Exercise (CSG)	Ship Squadron ASW Exercise (CRU DES)	MAGTF Exercise (STOM/ NEO)	SPMAGTF Exercise (HADR/ NEO)	Urban Warfare Exercise
ROTARY	MH-60R/S	4	12	4	4	4	2	N/A	N/A
	SH-60H	4	12	4	4	4	N/A	N/A	N/A
	HH-60H	4	12	4	4	N/A	N/A	N/A	N/A
	SH-60F	3	9	3	3	N/A	N/A	N/A	N/A
	CH-53	4	N/A	4	N/A	N/A	4	4	4
	CH-46	12	N/A	12	N/A	N/A	12	12	12
	AH-1	4	N/A	4	N/A	N/A	4	4	4
	UH-1	2	N/A	2	N/A	N/A	2	2	2
	MV-22 FY10 (replace CH-46)	10	N/A	10	N/A	N/A	10	10	10
UAS	Ship Based	2	3	1	1	0	1	0	0
	Ground Based	2	1	0	0	0	2	1	1
Landing Craft	LCAC	3-5	N/A	N/A	N/A	N/A	3-5	3	N/A
	LCU	1-2	N/A	N/A	N/A	N/A	1-2	1	N/A
	CRRC	18	N/A	N/A	N/A	N/A	18	18	0
GCE	AAV	14	N/A	N/A	N/A	N/A	14	3	3
	LAV	13	N/A	N/A	N/A	N/A	5	5	5
	HMMWV	78	N/A	N/A	N/A	N/A	78	16	16
	Ground Personnel	1200	N/A	N/A	N/A	N/A	1200	250	250
LCE	Trucks	36	N/A	N/A	N/A	N/A	36	8	8
	Dozer	2	N/A	N/A	N/A	N/A	2	1	1
	Forklift	6	N/A	N/A	N/A	N/A	6	2	2
	ROWPU	2	N/A	N/A	N/A	N/A	2	1	1
	RHIB	2	N/A	N/A	N/A	N/A	2	2	2
	Ground Personnel	300	N/A	N/A	N/A	N/A	300	60	60

1.10 PROPOSED ACTION AND ALTERNATIVES

There are no changes to Chapter 1.10 as described in the original LOA application of August 2008.

2. DURATION AND LOCATION OF ACTIVITIES

There are no changes to Chapter 2 as described in the original LOA application of August 2008.

3. MARINE MAMMALS

3.1 SPECIES AND OCCURRENCE

3.1.1 INFORMATION SOURCES

Eldredge (1991) compiled the first list of published and unpublished records for the greater Micronesia area, reporting 19 marine mammal species. Some of these species accounts were based on unsubstantiated reports and may not reflect true species distribution in the region. Eldredge (2003) refined this list specifically for 13 cetacean species thought to occur around Guam (Eldredge 2003). The first comprehensive marine mammal survey of waters off the Mariana Islands was conducted from mid-January to mid April of 2007 (DoN 2007b). Given the survey's seasonal coverage and relatively low number of sightings, density estimates derived from the survey data are augmented by density and abundance estimates from the western North Pacific and the NOAA Fisheries Southwest Fisheries Science Center surveys of the eastern tropical Pacific and Hawaiian Islands (Ferguson and Barlow 2001, 2003; Barlow 2003, 2006). Guam references currently available are Kami and Lujan (1976), Donaldson (1983), and Eldredge (1991, 2003).

The Mariana Islands Marine Resource Assessment (MRA) (DoN 2005c) includes a summary of scientific literature on marine species occurrence within the MIRC. For this LOA update, MRA information was supplemented with additional citations derived from new survey efforts, and scientific publications. The worldwide marine mammal species guide by Jefferson et al. (2008) was reviewed as an additional source of recent marine mammal references. Literature searches were conducted using the search engines: Biosis, Cambridge Abstract's Aquatic Sciences, University of California Melvyl, Biosis, and Zoological Record Plus. Searches were also conducted on peer reviewed journals that regularly publish marine mammal related articles (e.g., Marine Mammal Science, Canadian Journal of Zoology, Journal of Acoustical Society of America, Journal of Zoology, and Aquatic Mammals). Additional references were also obtained from previous Navy environmental documents, and other regionally based reports.

Table 3-2 presents an updated summary of the marine mammal densities used in the sonar and underwater detonations effects modeling. The humpback density was revised to reflect that its orgin was Ferguson and Barlow (2001, 2003) instead of DoN 2007b as stated in the orginal LOA application.

1 **Table 3-2: Summary Of Marine Mammal Densities For Mariana Islands**

Common Name	Marine Mammal Densities (animals/km^2) [Densities In Bold Were Used In The Effects Modeling]			
	Navy 2007 Mariana Islands Survey	**Hawaii Offshore**	**Eastern Tropical Pacific**	**Japan/Western Pacific**
ESA Listed Species				
Blue whale *Balaenoptera musculus*	N/A	N/A	**0.0001 (CV = 0.43-1.00)**	N/A
Fin whale *Balaenoptera physalus*	N/A	N/A	**0.0003 (CV = 0.72)**	N/A
Humpback whale *Megaptera novaeangliae*	N/A	N/A	**0.0069 (CV = 1.00)**	N/A
Sei whale *Balaenoptera borealis*	**0.00029 (CV = 0.49)**	N/A	N/A	N/A
Sperm whale *Physeter macrocephalus*	**0.00123 (CV = 0.60)**	0.00282 (CV = 0.81)	0.0001-0.0035 (CV = 0.47–1.00)	N/A
Non ESA Listed Species				
Bryde's whale *Balaenoptera edeni*	**0.00041 (CV = 0.45)**	0.00019 (CV = 0.45)	0.0001-0.0029 (CV = 0.47-1.00)	N/A
Minke whale *Balaenoptera acutorostrata*	**N/A**	N/A	**0.0003 (CV = 0.71)**	N/A
Blainville's beaked whale *Berardius bairdii*	N/A	**0.00117 (CV = 1.25)**	0.0013 (CV = 0.71)	N/A
Bottlenose dolphin *Tursiops truncatus*	**0.00021 (CV = 0.99)**	0.00131 (CV = 0.59)	0.0001 -0.0311 (CV = 0.36-1.0)	0.0146
Cuvier's beaked whale *Ziphius cavirostris*	N/A	**0.00621 (CV = 1.43)**	0.0003-0.054 (CV = 0.55-1.00)	N/A
Dwarf sperm whale *Kogia sima*	N/A	**0.00714 (CV = 0.74)**	0.0017-0.0173 (CV = 0.52-1.00)	N/A
False killer whale *Pseudorca crassidens*	**0.00111 (CV = 0.74)**	0.0001 (CV = 1.13)	0.0004-0.0147 (CV = 0.58-1.00)	N/A
Fraser's dolphin *Lagenodelphis hosei*	N/A	**0.00417 (CV = 1.16)**	0.005-0.1765 (CV = 0.58-1.00)	N/A
Ginkgo-toothed beaked whale *Mesoplodon ginkgodens*	N/A	N/A	**0.0005 (CV = 0.45-1.00)**	N/A
Killer whale *Orcinus orca*	N/A	**0.00014 (CV = 0.98)**	0.0001-0.003 (CV = 0.58-1.00)	N/A
Longman's beaked whale *Indopacetus pacificus*	N/A	**0.00041 (CV = 1.26)**	0.0002-0.0004 (CV = 1.00)	N/A

1 **Table 3-2: Summary Of Marine Mammal Densities For Mariana Islands (Continued)**

Common Name	Marine Mammal Densities (animals/km^2) [Densities In Bold Were Used In The Effects Modeling]			
	Navy 2007 Mariana Islands Survey	**Hawaii Offshore**	**Eastern Tropical Pacific**	**Japan/Western Pacific**
Melon-headed whale *Peponocephala electra*	**0.00428 (CV = 0.88)**	0.0012 (CV = 1.17)	0.0007-0.0167 (CV = 0.71-1.00)	N/A
Pantropical spotted dolphin *Stenella attenuata*	**0.0226 (CV = 0.70)**	0.00366 (CV = 0.48)	0.0574-0.4208 (CV = 0.24-0.95)	0.0137
Pygmy killer whale *Feresa attenuata*	**0.00014 (CV = 0.88)**	0.00039 (CV = 0.83)	0.0014-0.0156 (CV = 0.44-1.00)	N/A
Pygmy sperm whale *Kogia breviceps*	N/A	**0.00291 (CV = 1.12)**	0.0018-0.0031 (CV = 0.71-1.00)	N/A
Risso's dolphin *Grampus griseus*	N/A	**0.00097 (CV = 0.65)**	0.0006-0.0178 (CV = 0.39-1.0)	0.0106
Rough-toothed dolphin *Steno bredanensis*	**0.00029 (CV = 0.89)**	0.00355 (CV = 0.45)	0.0002-0.0576 (CV = 0.40-1.00)	N/A
Short-beaked common dolphin *Delphinus delphinus*	N/A	N/A	**0.0021 (CV = 0.28)**	N/A
Short-finned pilot whale *Globicephala macrorhynchus*	**0.00159 (CV = 0.68)**	0.00362 (CV = 0.38)	0.0007-0.0208 (CV = 0.36-1.00)	N/A
Spinner dolphin *Stenella longirostris*	**0.00314 (CV = 0.95)**	0.00137 (CV = 0.74)	0.0001-0.2191 (CV = 0.31-1.00)	N/A
Striped dolphin *Stenella coeruleoalba*	**0.00616 (CV = 0.54)**	0.00536 (CV = 0.48)	0.0019-0.3825 (CV = 0.24-1.46)	0.0329

Densities from the Mariana Islands area (MISTCS report; DoN 2007b) were primarily used. If no density estimates were available for a species from the MISTCS report then densities from the Hawaiian offshore survey (Barlow 2006) were used because of its similarity to the MIRC Study Area habitat and species.

Density Sources:
Mariana Islands Survey (MISTCS Report -DoN 2007b);
Hawaii Offshore (Barlow 2006);
Eastern Tropical Pacific (Ferguson and Barlow 2001, 2003);
Japan/Western Pacific (Miyashita et al. 1993)

CV = Coefficient of Variation

4. ASSESSMENT OF MARINE MAMMAL SPECIES OR STOCKS THAT COULD POTENTIALLY BE AFFECTED

There are no changes to Chapter 4 as described in the original LOA application of August 2008.

5. HARASSMENT AUTHORIZATION REQUESTED

The Navy is providing an update to the Letter of Authorization (LOA) application submitted to the National Marine Fisheries Service (NMFS) pursuant to Section 101 (a)(5)(A) of the MMPA for harassment of marine mammals incidental to training in the MIRC. The request is updated based on revised sonar hours, sonobuoy deployment or dipping sonar events, and the number of underwater detonation events. The only change to this request is in the revised number of active sonar and underwater detonation exposures predicted to occur within the MIRC.

The Navy requests a Letter of Authorization (LOA) pursuant to Section 101 (a)(5)(A) of the MMPA for harassment of marine mammals incidental to training in the MIRC. It is understood that an LOA is applicable for up to 5 years, and is appropriate where authorization for serious injury or mortality of marine mammals is requested. Based on the modeling results, the Navy requests 78,809 annual Level B harassment exposures (78,661 from MFA and HFA sonar and 148 from underwater detonations) and two annual Level A harassments (two from MFA and HFA sonar). The Navy modeling results predict one sperm whale (*Physeter macrocephalus*) and one pantropical spotted dolphin (*Stenella attentuata*) would be exposed to mid-frequency active sonar that may result in Level A harassment.

The Navy requests the take, by serious injury or mortality, of nine beaked whales and one pantropical spotted dolphin, although the Navy does not anticipate that marine mammal strandings or mortality will result from conducting MIRC training activities within the study area. The request is for mid- and high frequency active sonar (does not include low frequency active), underwater detonation and training events within the MIRC Study Area. The request is for a 5-year period commencing in January 2010. These numbers may be modified through the MMPA process based on the availability of new data and/or emergent science.

The acoustic modeling approach taken in the MIRC EIS/OEIS and this LOA request attempts to quantify potential exposures to marine mammals resulting from the use of MFA and HFA sonar and underwater detonations. Results from this modeling approach are presented without consideration of mitigation measures employed per Navy standard operating procedures. For example, securing or turning off an active sonar when an animal approaches closer than a specified distance reduces potential exposure since the sonar is no longer transmitting; and range clearance procedures and safety requirements having long set-up times for events using explosives make it very unlikely any marine mammals will be in the vicinity undetected.

The history of Navy activities in the MIRC Study Area and analysis in this document indicate that military readiness activities are not expected to result in any sonar or underwater detonation –induced Level A harassment or mortalities to marine mammals.

There are natural and manmade sources of mortality other than active sonar and underwater detonation that may contribute to stranding events as described in the Cetacean Stranding Section (Section 6.5 of the original LOA application). The actual cause of a particular stranding may not be immediately apparent when there is little evidence of physical trauma, especially in the case of disease or age-related mortalities. These events require careful scientific investigation by a collaborative team of subject matter experts to determine actual cause of death.

Given the frequency of naturally occurring marine mammal strandings (e.g., the 30 August 2007 live stranding of a single Cuvier's beaked whale at Piti, Guam [NMFS 2007o]), it is conceivable that a stranding could co-occur with a Navy exercise even though the stranding is actually unrelated to and not caused by Navy activities. The Navy's LOA application will include requests for take, by mortality, of nine beaked whales and one pantropical spotted dolphin.

Evidence from five beaked whale strandings, all of which have taken place outside of the MIRC Study Area, and have occurred over approximately a decade, suggests that the exposure of beaked whales to

mid-frequency sonar in the presence of certain conditions (e.g., multiple units using tactical sonar, steep bathymetry, constricted channels, strong surface ducts, etc.) may result in strandings, potentially leading to indirectly caused mortality. Although these physical factors believed to contribute to the likelihood of beaked whale strandings are not present, in their aggregate, in the MIRC Study Area, scientific uncertainty exists regarding what other factors, or combination of factors, may contribute to beaked whale strandings.

6. NUMBERS AND SPECIES EXPOSED

6.7 ESTIMATED EFFECTS ON MARINE MAMMALS

6.7.1 MODEL RESULTS EXPLANATION

Acoustic exposures are evaluated based on their potential direct effects on marine mammals. These effects are assessed in the context of species biology and ecology to determine if there is a mode of action that may result in the acoustic exposure warranting consideration as a harassment level effect.

Table 6-6: Summary Of Predicted Annual Usage For The Different Sonar Sources Including the SQS-53C, SQS-56, Submarine BQQ-10, AN/AWS-22 Dipping Sonar, SSQ-62 Sonobuoys, and MK-48 Torpedo Sonar

Exercise	SQS-53C Sonar Hours[1]	SQS-56 Sonar Hours[1]	BQQ-10 Sub Sonar Hours[1]	Total Sonar Hours[1]	AQS-22, 21 & 13 Number of Dips	DICASS/AEER Number of Sonobuoys Deployments	MK-48 Torpedo Events
Major	1,705	77	0	1,782	288	1,282	0
Other ASW	368	64	12	444	304	172	40
Total Hours, Number of Events	**2,073**	**141**	**12**	**2,226**	**592**	**1,454**	**40**

[1] Sonar hours represent the period that active sonar is used. The actual sonar signal or "pings" may only occur at a rate of several pings per minute, therefore the actual time sonar is used is only a small fraction the sonar hour presented .

The acoustic modeling and post-modeling analysis estimates that 78,661 marine mammals may be exposed to sonar resulting in Level B harassment. Of these, 77,415 would be from non-TTS and 1,246 would be from TTS. There will be two annual exposures that could result in Level A harassment to a sperm whale (*Physeter macrocephalus*) and a pantropical spotted dolphin (*Stenella attenuata*), and none would result in fatalities. The modeled sonar exposure numbers by species are presented in Table 6-7. These exposure modeling results are estimates of marine mammal sonar exposures without consideration of standard mitigation and monitoring procedures. The implementation of the mitigation and monitoring procedures, as addressed in Chapter 11 of the original LOA application, will minimize the potential for marine mammal exposures to MFA and HFA sonar.

6.7.2 Exposures Summary

This Section includes summary tables for sonar and underwater detonation exposures. Tables 6-7 and 6-8 represent the total number of Level A and Level B harassment without mitigation measures. Note that Table 6-7 sums the Level B harassment authorization requested based on the risk function methodology (non-TTS), and the 195 dB onset TTS and 205 dB Level B harassment are based on energy flux density level. Only species expected to be present in the MIRC were evaluated for this LOA request.

1 **Table 6-7: Summary of Estimated Level A and B Annual Exposures from All ASW Sonar**

Species	Level B Sonar Exposures			Level A Sonar Exposures
	Total Level B Exposures	Non-TTS Exposures (SPL)	TTS Exposures (SEL)	PTS Exposures (SEL)
ESA Species				
Blue whale	131	129	2	0
Fin whale	181	179	2	0
Humpback whale	0	0	0	0
Sei whale	323	317	6	0
Sperm whale	817	807	10	1
Sei/Bryde's whale	62	61	1	0
Unidentified Balaenopterid whale	73	72	1	0
Mysticetes				
Bryde's whale	456	448	8	0
Minke whale	444	437	7	0
Odontocetes				
Blainville's beaked whale	770	758	12	0
Bottlenose dolphin	173	169	4	0
Bottlenose/Rough-toothed dolphin	74	73	1	0
Cuvier's beaked whale	3,615	3,570	45	0
Dwarf/Pygmy sperm whale	6,667	6,563	104	0
False killer whale	1,287	1,264	23	0
Fraser's dolphin	4,588	4,513	75	0
Ginkgo-toothed beaked whale	428	421	7	0
Killer whale	232	228	4	0
Longman's beaked whale	208	206	2	0
Melon-headed whale	2,845	2,798	47	0
Pantropical spotted dolphin	32,449	31,935	514	1
Pygmy killer whale	162	159	3	0
Risso's dolphin	6,718	6,608	110	0
Rough-toothed dolphin	241	236	5	0
Short-beaked common dolphin	932	915	17	0
Short-finned pilot whale	2,272	2,236	36	0
Spinner dolphin	2,132	2,096	36	0
Striped dolphin	8,845	8,705	140	0
Unidentified delphinid	1,536	1,512	24	0
Total	78,661	**77,415**	**1,246**	**2**

MFA and HFA Sonar Risk Function Curve 120-195 dB Sound pressure level (SPL)
TTS for cetaceans = 195 dB – TTS 195-215 dB re 1 μPa^2-s or sound exposure level (SEL)
PTS for cetaceans = 215 dB- PTS >215 dB re 1 μPa^2-s or SEL
TTS = temporary threshold shift
PTS = permanent threshold shift

Table 6-8: Summary of Estimated Level A and Level B Annual Exposures from Underwater Detonations (includes BOMEX, GUNEX, MISSILEX, SINKEX, IEER, and DEMO)

Species	Level B Exposures			Level A Exposures	Onset Massive Lung Injury or Mortality 31 psi-ms
	Total Level B Exposures	Sub-TTS 177 dB SEL	TTS 182 dB SEL /23 psi	50% TM Rupture 205 dB or Slight Lung Injury 13 psi-ms	
ESA Species					
Blue whale	0	0	0	0	0
Fin whale	0	0	0	0	0
Humpback whale	0	0	0	0	0
Sei whale	0	0	0	0	0
Sei/Bryde's whale	0	0	0	0	0
Unidentified Balaenopterid whale	0	0	0	0	0
Sperm whale	8	6	2	0	0
Mysticetes					
Bryde's whale	0	0	0	0	0
Minke whale	0	0	0	0	0
Odontocetes					
Blainville's beaked whale	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	0
Bottlenose/rough-toothed dolphin	0	0	0	0	0
Cuvier's beaked whale	16	12	4	0	0
Dwarf/Pygmy sperm whale	26	20	6	0	0
False killer whale	0	0	0	0	0
Fraser's dolphin	16	12	4	0	0
Ginkgo-toothed beaked whale	0	0	0	0	0
Killer whale	0	0	0	0	0
Longman's beaked whale	0	0	0	0	0
Melon-headed whale	8	6	2	0	0
Pantropical spotted dolphin	19	12	7	0	0
Pygmy killer whale	0	0	0	0	0
Risso's dolphin	35	26	9	0	0
Rough-toothed dolphin	0	0	0	0	0
Short-beaked common dolphin	8	6	2	0	0
Short-finned pilot whale	0	0	0	0	0
Spinner dolphin	8	6	2	0	0
Striped dolphin	4	3	1	0	0
Unidentified Delphinid	0	0	0	0	0
Total	**148**	**109**	**39**	**0**	**0**

dB – decibel
psi = pounds per square inch
ms = milli second
M = Tympanic Membrane
SEL = Sound exposure level (dB re 1 μPa^2-s or sound exposure level)

When analyzing the results of acoustic exposure modeling to provide an estimate of effects, it is important to understand that there are limitations to the ecological data used in the model, and that the model results must be interpreted within the context of a given species' ecology. When reviewing the acoustic effects modeling results, it is also important to understand that estimates of marine mammal sound exposures are presented without consideration of standard mitigation operating procedures or the fact that there have been no confirmed acoustic effects on any marine species in previous MIRC exercises or from any other MFA/HFA sonar training events within the MIRC.

All Level B harassment would be short term and temporary in nature. In addition, the short-term non-injurious exposures predicted to cause TTS or temporary behavioral disruptions are considered Level B harassment in this LOA even though it is highly unlikely that the disturbance would be to a point where behavioral patterns are abandoned or significantly altered. The modeling for MIRC analyzed the potential interaction of MFA/HFA tactical sonar and underwater detonations with marine mammals that occur in the MIRC.

The annual estimated number of exposures for MFA/HFA sonar and underwater detonations (mine neutralization, MISSILEX, BOMBEX, SINKEX and GUNEX) are given for each species. The modeled exposure is the probability of a response that NMFS would classify as harassment under the MMPA. These exposures are calculated for all activities modeled and represent the total exposures per year and are not based on a per day basis.

Due to wind and swell conditions in the MIRC and the cryptic nature of some marine mammal species, detection of marine mammals during training events can be challenging. A detailed description of the mitigation measures for mid-frequency sonar and underwater detonation activities are presented in Sections 11.1 and 11.3 of the MIRC LOA application (DoN 2008).

6.7.3 Sonar Exposure Summary

The acoustic modeling and post-modeling analysis estimates that 78,661 marine mammals may be exposed to sonar resulting in Level B harassment. Of these, 77,415 would be from non-TTS and 1,246 would be from TTS. The model predicts one annual exposure for a sperm whale and a pantropical spotted dolphin that may result in Level A Harassment. The summary of modeled sonar exposure harassment numbers by species are presented in Table 6-7 and represent potential harassment without implementation of mitigation measures.

For each type of exercise, marine mammals are exposed to mid-frequency sonar from several sources. Table 6-7 provides the number of sonar exposures modeled based on the risk function methodology or non-TTS (120-195 dB SPL), the TTS threshold (195 dB SEL), and the PTS threshold (215 dB SEL). The values given for non-TTS and TTS are further subdivided based on the type of sonar (Table 6-9). For PTS, the numbers are so small that only the total values are given. Each source is modeled separately and then the exposures are summed to get the number of exposures requested in this LOA. This is a conservative approach in that if the more powerful 53 sonar overlaps one of the other sonars then the lesser sonar would not produce an exposure. However, for modeling purposes all sonar exposures were counted.

Table 6-9: Sonar Exposures by Sonar Source Type

Source	Level B Exposures			Level A Exposures
	Total Level B Exposures	Non-TTS (SPL)	TTS (SEL)	PTS (SEL)
AN-SQS-53 (Search mode)	77,936	76,691	1,245	2
AN-SQS-53 (Kingfisher mode)	0	0	0	0
AN-SQS-56	249	249	0	0
BQQ-10 Submarine sonar	48	48	0	0
ASQ-22 Dipping Sonar	228	228	0	0
SSQ-62 DICASS Sonobuoy	123	123	0	0
MK-48 Torpedo Sonar	77	76	1	0
Total	**78,661**	**77,415**	**1,246**	**2**

Note: DICASS Sonobuoy modeling parameters were used to model exposures associated with AEER use. Once AEER parameters are defined, additional modeling will be conducted and results will be provided in an addendum to this LOA.

6.7.4 Explosive Exposure Summary

The modeled exposure harassment numbers for all training activities involving explosives are presented by species in Table 6-8. The modeled exposure harassment numbers for each underwater detonation source are presented in Table 6-10. Training activities involving explosives include MISSILEX, BOMBEX, SINKEX, GUNEX, SSQ-110-A sonobuoy (Extended Echo Ranging and Improved Extended Echo Ranging [EER/IEER] Systems), and DEMO. In a SINKEX, weapons are typically fired in order of decreasing range from the source with weapons fired until the target is sunk. Since the target may sink at any time during the exercise, the actual number of weapons used can vary widely. In the representative case, however, all of the ordnances are assumed expended; this represents the worst case of maximum exposure. The modeling indicates 109 annual exposures to pressure from underwater detonations that could result in Level B harassment from successive detonations and 39 annual exposures to pressure from underwater detonations that could result in Level B harassment from TTS. Level B harassment from successive detonations only occurs during SINKEX. The modeling indicates no exposures from pressure from underwater detonations that could cause slight injury (Level A Harassment). The modeling indicates that no marine mammals would be exposed to pressure from underwater detonations that could cause severe injury or mortality.

Table 6-10: Underwater Detonation Exposures by Source Type

Source	Level B Exposures			Level A Exposures	Onset Massive Lung Injury
	Total Level B Exposures	Sub-TTS 177 dB SEL	TTS 182 dB SEL /23 psi	50% TM Rupture 205 dB or Slight Lung Injury 13 psi-ms	Mortality 31 psi-ms
5 in	2	0	2	0	0
76 mm	0	0	0	0	0
HARPOON	0	0	0	0	0
Maverick	0	0	0	0	0
MK 48	0	0	0	0	0
MK 82	0	0	0	0	0
MK 83	0	0	0	0	0
MK 84	0	0	0	0	0
SINKEX	144	109	35	0	0
IEER	0	0	0	0	0
DEMO	2	0	2	0	0
Total	**148**	**109**	**39**	**0**	**0**

All exposures are added up in this table but exposures of less than 0.5 are not considered in the Level A and Mortality exposures for each species.

It is highly unlikely that a marine mammal would experience any long-term effects because the large MIRC training areas makes individual mammals' repeated and/or prolonged exposures to high-level sonar signals unlikely. Specifically, MFA/HFA sonars have limited marine mammal exposure ranges and relatively high platform speeds. Therefore, long-term effects on individuals, populations or stocks are unlikely.

When analyzing the results of the acoustic exposure modeling to provide an estimate of effects, it is important to understand that there are limitations to the ecological data (diving behavior, migration or movement patterns and population dynamics) used in the model, and that the model results must be interpreted within the context of a given species' ecology.

When reviewing the acoustic exposure modeling results, it is also important to understand that the estimates of marine mammal sound exposures are presented without consideration of standard protective measure operating procedures. Section 11.1 of the MIRC LOA application (DoN 2008) presents details of the mitigation measures currently used for ASW activities including monitoring of marine mammals and power down procedures if marine mammals are detected within one of the safety zones. The Navy will work through the MMPA incidental harassment regulatory process to discuss the mitigation measures and their potential to reduce the likelihood for incidental harassment of marine mammals.

As described previously, this LOA request assumes that short-term non-injurious sound exposure levels predicted to cause TTS or temporary behavioral disruptions qualify as Level B harassment. This approach is conservative, as there is currently no established scientific correlation between MFA/HFA sonar use and long term abandonment or significant alteration of behavioral patterns in marine mammals.

Due to time delay between pings, and platform speed, an animal encountering sonar will accumulate energy for a few pings during the course of a few minutes. Therefore, exposure to sonar would be a short-term event, minimizing any single animal's exposure to sound levels approaching harassment thresholds.

6.8.2 Estimated Effects on ESA Species

Endangered species that may be affected as a result of implementation of the MIRC activities include the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephalus*). The modeling estimated that no humpback whales (*Megaptera novaeangliae*) would be exposed to sound or pressure that would reach the threshold of a behavioral response. The north Pacific right whale (*Eubalaena japonica*), Hawaiian monk seal (*Monachus schauinslandi*) and dugong (*Dugong dugon*) were not considered because they are extralimital in the area and are not expected to occur in the MIRC.

6.8.2.1 Blue Whale

The acoustic modeling and post-modeling analysis estimates that 131 blue whales may be exposed to sonar resulting in Level B harassment. Of these, 129 would be from non-TTS and two would be from TTS (Table 6-7). No blue whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold, and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

Based on model results, behavioral patterns, low-frequency hearing range of blue whales, results of past training, and the implementation of mitigation measures presented in Section 11.1 (active sonar) and Section 11.3 (underwater detonations) of the MIRC LOA application (DoN 2008), the Navy finds that the MIRC training events may affect but are not likely to adversely affect blue whales. It is unlikely that MIRC training activities would result in any death or injury to blue whales. Modeling does indicate the potential for Level B harassment, indicating the proposed ASW exercises may affect blue whales but are not likely to cause long-term effects on their behavior or physiology or abandonment of areas that are regularly used by blue whales.

An ESA consultation has been initiated, and included the finding that the proposed ASW exercises may affect blue whales. Should consultation under the ESA conclude that the estimated exposures of blue whales can be avoided using mitigation measures or that the received sound is not likely to adversely affect blue whales, authorization for the predicted exposures would not be requested under MMPA. At this time, this application requests authorization for the annual harassment of 131 blue whales by Level B harassment (131 from MFA/HFA sonar and none from underwater detonations) and no blue whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation.

6.8.2.2 Fin Whale

The acoustic modeling and post-modeling analysis estimates that 181 fin whales may be exposed to sonar resulting in Level B harassment. Of these, 179 would be from non-TTS and two would be from TTS (Table 6-7). No fin whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold, and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

Based on the model results, behavioral patterns, low-frequency hearing range of fin whales, results of past training, and the implementation of mitigation measures presented in Section 11.1 (active sonar) and Section 11.3 (underwater detonations) of the MIRC LOA application (DoN 2008), the Navy finds that the MIRC training events may affect but are not likely to adversely affect fin whales. It is unlikely that MIRC training activities would result in any death or injury to fin whales. Modeling does indicate the potential for Level B harassment, indicating the proposed ASW exercises may affect fin whales but are not likely

to cause long-term effects on their behavior or physiology or abandonment of areas that are regularly used by fin whales.

An ESA consultation has been initiated, and included the finding that the proposed ASW exercises may affect fin whales. Should consultation under the ESA conclude that the estimated exposures of fin whales can be avoided using mitigation measures or that the received sound is not likely to adversely affect fin whales, authorization for the predicted exposures would not be requested under MMPA. At this time, this application requests authorization for the annual harassment of 181 fin whales by Level B harassment (181 from MFA/HFA sonar and none from underwater detonations) and no fin whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation.

6.8.2.3 Humpback Whale

Although humpback whales are known to occur in the MIRC (DoN 2007b), their seasonal migration does not coincide with major exercises; therefore, acoustic modeling and post-modeling analysis estimates that no humpback whales will be exposed to sonar resulting in Level B harassment (Table 6-7). No humpback whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold, and no exposures that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

An ESA consultation has been initiated, and included the finding that the proposed sonar activity and underwater detonations will not affect humpback whales. At this time, this application does not request authorization for the annual harassment of humpback whales by Level B harassment or by Level A harassment from potential exposure to active sonar or underwater detonation.

6.8.2.4 Sei Whale

The acoustic modeling and post-modeling analysis estimates that 323 sei whales may be exposed to sonar resulting in Level B harassment. Of these, 317 would be from non-TTS and six would be from TTS (Table 6-7). No sei whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold, and no exposures that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

Based on the model results, behavioral patterns, acoustic abilities of sei whales, results of past training, and the implementation of mitigation measures presented in Section 11.1 (active sonar) and Section 11.3 (underwater detonations) of the MIRC LOA application (DoN 2008), the Navy finds that the MIRC training events may affect but are not likely to adversely affect sei whales. It is unlikely that MIRC training would result in any death or injury to sei whales. Modeling does indicate the potential for Level B harassment, indicating the proposed ASW exercises may affect sei whales but are not likely to cause long-term effects on their behavior or physiology or abandonment of areas that are regularly used by sei whales.

An ESA consultation has been initiated, and included the finding that the proposed ASW exercises may affect sei whales. Should consultation under the ESA conclude that the estimated exposures of sei whales can be avoided using mitigation measures or that the received sound is not likely to adversely affect sei whales, authorization for the predicted exposures would not be requested under MMPA. At this time, this application requests authorization for the annual harassment of 323 sei whales by Level B harassment (323 from MFA/HFA sonar and none from underwater detonations) and no sei whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation.

6.8.2.5 Sperm Whale

The acoustic modeling and post-modeling analysis estimates that 817 sperm whales may be exposed to sonar resulting in Level B harassment. Of these, 807 would be from non-TTS and 10 would be from TTS (Table 6-7). It is estimated that one sperm whale would be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures there would be eight exposures from impulsive sound or pressures from underwater detonations that may result in Level B harassment. Of these, six would be from sub-TTS and two would be from TTS. There are no exposures that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

Based on the model results, behavioral patterns, acoustic abilities of sperm whales, results of past training, and the implementation of mitigation measures presented in Section 11.1 (active sonar) and Section 11.3 (underwater detonations) of the MIRC LOA application (DoN 2008), the Navy finds that the MIRC training events may affect but are not likely to adversely affect more than one sperm whale. Modeling indicates the potential for Level B harassment, indicating the proposed ASW exercises may affect sperm whales, but other than the one estimated Level A take, are not likely to cause long-term effects on their behavior or physiology or abandonment of areas that are regularly used.

An ESA consultation has been initiated, and included the finding that the proposed ASW exercises may affect sperm whales. Should consultation under the ESA conclude that the estimated exposures of sperm whales can be avoided using mitigation measures or that the received sound is not likely to adversely affect sperm whales, authorization for the predicted exposures would not be requested under MMPA. At this time, this application requests authorization for the annual harassment of 825 sperm whales by Level B harassment (817 from MFA/HFA sonar and eight from underwater detonations) and one sperm whale by Level A harassment from potential exposure to MFA/HFA sonar.

The estimated PTS exposures for sperm whales presented in this LOA application update are the accumulation of all exposures that exceeded the threshold of 215 dB re 1µPa^2 -s for an entire year and, therefore, rises to the threshold of one Level A exposure from active sonar (0.05 exposure threshold for ESA species). When analyzing the exposures of individual activities, including the multi-strike group (0.04 PTS exposure), TRACKEX (0.01 PTS exposures), and TORPEX (0 exposures), the exposures associated with each activity do not reach the threshold of a Level A exposure, only the annual accumulation of all activities reach the threshold. The sperm whale would have to be within 33 ft (10 m) of SQS-53C sonar dome to be exposed to a sound level that would cause MMPA Level A harassment. It is unlikely that a sperm whale, which can detect mid-frequency active sonar, would be that close to a moving ship using sonar. The predicted exposures are presented without consideration of mitigation measures that may reduce exposure to active sonar by detecting this large species at the surface although due to their deep (maximum of 3,910 ft [1,192 m]) and long duration (30-40 min) diving behavior, their presence at the surface would be infrequent (Amano and Yoshioka; Watwood et al. 2006).

6.8.2.6 Sei/Bryde's Whale

Bryde's whales and sei whales are often difficult to differentiate at sea and the Navy's 2007 MISTCS survey had three sightings which were classified as Bryde's/sei whales (DoN 2007b). Therefore, estimates were also made using the density for this group. The acoustic modeling and post-modeling analysis estimates that 62 sei/Bryde's whales may be exposed to sonar resulting in Level B harassment. Of these, 61 would be from non-TTS and one would be from TTS (Table 6-7). No sei whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B

harassment, none that would exceed the onset of slight injury threshold; and no exposures that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

Based on the model results, behavioral patterns, acoustic abilities of sei/Bryde's whales, results of past training, and the implementation of mitigation measures presented in Section 11.1 (active sonar) and Section 11.3 (underwater detonations) of the MIRC LOA application (DoN 2008), the Navy finds that the MIRC training events may affect but are not likely to adversely affect sei whales. It is unlikely that MIRC training would result in any death or injury to sei/Bryde's whales. Modeling does indicate the potential for Level B harassment, indicating the proposed ASW exercises may affect sei whales but are not likely to cause long-term effects on their behavior or physiology or abandonment of areas that are regularly used by sei whales.

An ESA consultation has been initiated, and included the finding that the proposed ASW exercises may affect sei/Bryde's whales. Should consultation under the ESA conclude that the estimated exposures of sei/Bryde's whales can be avoided using mitigation measures or that the received sound is not likely to adversely affect sei/Bryde's whales, authorization for the predicted exposures would not be requested under MMPA. At this time, this application requests authorization for the annual harassment of 62 sei/Bryde's whales by Level B harassment (62 from MFA/HFA sonar and none from underwater detonations) and no sei/Bryde's whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation.

6.8.3 Estimated Exposures for Non-ESA Species

6.8.3.1 Bryde's Whale

The acoustic modeling and post-modeling analysis estimates that 456 Bryde's whales may be exposed to sonar resulting in Level B harassment. Of these, 448 would be from non-TTS and eight would be from TTS. No Bryde's whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 456 Bryde's whale by Level B harassment (456 from MFA/HFA sonar and none from underwater detonations) and no Bryde's whale by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of Bryde's whales, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to Bryde's whales.

6.8.3.2 Minke Whale

The acoustic modeling and post-modeling analysis estimates that 444 minke whales may be exposed to sonar resulting in Level B harassment. Of these, 437 would be from non-TTS and seven would be from TTS (Table 6-7). No minke whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 444 minke whales by Level B harassment (444 from MFA/HFA sonar and none from underwater detonations) and no minke

whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of minke whales, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to minke whales.

6.8.3.3 Unidentified Balaenopterid Whale

Unidentified Balaenopterid whales (*Balaenoptera* spp.) would include those species, blue, fin, sei, Bryde's, and minke whales that could not be distinguished due to distance from the survey ship and sea conditions. The acoustic modeling and post-modeling analysis estimates that 73 unidentified Balaenopterid whales may be exposed to sonar resulting in Level B harassment. Of these, 72 would be from non-TTS and one would be from TTS (Table 6-7). No Balaenopterid whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 73 unidentified Balaenopterid whales by Level B harassment (73 from MFA/HFA sonar and none from underwater detonations) and no unidentified Balaenopterid whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of unidentified Balaenopterid whales, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to unidentified Balaenopterid whales.

6.8.3.4 Blainville's Beaked Whale

The acoustic modeling and post-modeling analysis estimates that 770 Blainville's beaked whales may be exposed to sonar resulting in Level B harassment. Of these, 758 would be from non-TTS and 12 would be from TTS (Table 6-7). No Blainville's beaked whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 770 Blainville's beaked whales by Level B harassment (770 from MFA/HFA sonar and none from underwater detonations) and no Blainville's beaked whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to Blainville's beaked whales.

6.8.3.5 Bottlenose Dolphin

The acoustic modeling and post-modeling analysis estimates that 173 bottlenose dolphins may be exposed to sonar resulting in Level B harassment. Of these, 169 would be from non-TTS and four would be from

TTS (Table 6-7). No bottlenose dolphins are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 173 bottlenose dolphins by Level B harassment (173 from MFA/HFA sonar and none from underwater detonations) and no bottlenose dolphins by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of bottlenose dolphins, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to bottlenose dolphin.

6.8.3.6 Cuvier's Beaked Whale

The acoustic modeling and post-modeling analysis estimates that 3,615 Cuvier's beaked whales may be exposed to sonar resulting in Level B harassment. Of these, 3,570 would be from non-TTS and 45 would be from TTS (Table 6-7). No Cuvier's beaked whale are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be 16 exposures from impulsive sound or pressures from underwater detonations that may result in Level B harassment. Of these, 12 would be from sub-TTS and four would be from TTS. There are no exposures that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 3,631 Cuvier's beaked whales by Level B harassment (3,615 from MFA/HFA sonar and 16 from underwater detonations) and no Cuvier's beaked whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of Cuvier's beaked whales, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to Cuvier's beaked whales.

6.8.3.7 Dwarf/Pygmy Sperm Whale

Dwarf and pygmy sperm whales are difficult to distinguish from each other at sea, and sightings are usually grouped by genus as *Kogia spp*.; therefore, the two species were combined for acoustic exposure modeling. The acoustic modeling and post-modeling analysis estimates that 6,667 dwarf/pygmy sperm whales may be exposed to sonar resulting in Level B harassment. Of these, 6,563 would be from non-TTS and 104 would be from TTS (Table 6-7). No dwarf/pygmy sperm whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be 26 exposures from impulsive sound or pressures from underwater detonations that may result in Level B harassment. Of these, 20 would be from sub-TTS and six would be from TTS. There are no exposures that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 6,693 dwarf/pygmy sperm whales by Level B harassment (6,667 from MFA/HFA sonar and 26 from underwater detonations) and no dwarf/pygmy sperm whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of dwarf/pygmy sperm whales, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to dwarf sperm whales.

6.8.3.8 False Killer Whale

The acoustic modeling and post-modeling analysis estimates that 1,287 false killer whales may be exposed to sonar resulting in Level B harassment. Of these, 1,264 would be from non-TTS and 23 would be from TTS (Table 6-7). No false killer whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 1,287 false killer whales by Level B harassment (1,287 from MFA/HFA sonar and none from underwater detonations) and no false killer whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of false killer whales, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death or injury to false killer whales.

6.8.3.9 Fraser's Dolphin

The acoustic modeling and post-modeling analysis estimates that 4,588 Fraser's dolphins may be exposed to sonar resulting in Level B harassment. Of these, 4,513 would be from non-TTS and 75 would be from TTS (Table 6-7). No Fraser's dolphins are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, modeling indicates there would be 16 exposures from impulsive sound or pressures from underwater detonations that may result in Level B harassment. Of these, 12 would be from sub-TTS and four would be from TTS. There are no exposures that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality (Table 6-8).

At this time, this application requests authorization for the annual harassment of 4,604 Fraser's dolphins by Level B harassment (4,588 from MFA/HFA sonar and 16 from underwater detonations) and no Fraser's dolphins by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of Fraser's dolphins, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to Fraser's dolphins.

6.8.3.10 Ginkgo-toothed Beaked Whale

The acoustic modeling and post-modeling analysis estimates that 428 ginkgo-toothed beaked whales may be exposed to sonar resulting in Level B harassment. Of these, 421 would be from non-TTS and seven would be from TTS (Table 6-7). No ginkgo-toothed beaked whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 428 ginkgo-toothed beaked whales by Level B harassment (428 from MFA/HFA sonar and none from underwater detonations) and no ginkgo-toothed beaked whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of ginkgo-toothed beaked whale, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to ginkgo-toothed beaked whales.

6.8.3.11 Killer Whale

The acoustic modeling and post-modeling analysis estimates that 232 killer whales may be exposed to sonar resulting in Level B harassment. Of these, 228 would be from non-TTS and four would be from TTS (Table 6-7). No killer whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold, and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 232 killer whales by Level B harassment (232 from MFA/HFA sonar and none from underwater detonations) and no killer whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of killer whales, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to killer whales.

6.8.3.12 Longman's Beaked Whale

The acoustic modeling and post-modeling analysis estimates that 208 Longman's beaked whales may be exposed to sonar resulting in Level B harassment. Of these, 206 would be from non-TTS and two would be from TTS (Table 6-7). No Longman's beaked whale are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold, and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 208 Longman's beaked whales by Level B harassment (208 from MFA/HFA sonar and none from underwater detonations) and

no Longman's beaked whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of Longman's beaked whale, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to Longman's beaked whales.

6.8.3.13 Melon-headed Whale

The acoustic modeling and post-modeling analysis estimates that 2,845 melon headed whales may be exposed to sonar resulting in Level B harassment. Of these, 2,798 would be from non-TTS and 47 would be from TTS (Table 6-7). No melon-headed whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, modeling indicates there would be eight exposures from impulsive sound or pressures from underwater detonations that may result in Level B harassment. Of these, six would be from sub-TTS and two would be from TTS. There are no exposures that would exceed the onset of slight injury threshold and no exposures that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 2,853 melon-headed whales by Level B harassment (2,845 from MFA/HFA sonar and eight from underwater detonations) and no melon-headed whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonations. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of melon-headed whales, observations made during past training events, and the planned implementation of mitigation measures (11.1 for sonar and 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to melon-headed whales.

6.8.3.14 Pantropical Spotted Dolphin

The acoustic modeling and post-modeling analysis estimates that 32,449 pantropical spotted dolphins may be exposed to sonar resulting in Level B harassment. Of these, 31,935 would be from non-TTS and 514 would be from TTS (Table 6-7). One pantropical spotted dolphin would be exposed to sound levels that could cause MMPA Level A harassment.

Without consideration of clearance procedures, modeling indicates there would be 19 exposures that may result in Level B harassment. Of these, 12 would be from sub-TTS and seven would be from TTS. There are no exposures that would exceed the onset of slight injury threshold and no exposures that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 32,468 pantropical spotted dolphins by Level B harassment (32,449 from MFA/HFA sonar and 19 from underwater detonations) and one pantropical spotted dolphin by Level A harassment from potential exposure to active sonar. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of pantropical spotted dolphins, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects to pantropical spotted dolphins. The exposures presented in this LOA application update are the accumulation of all exposures for the entire year and therefore rises to the threshold of one PTS exposure (0.93 modeled exposure for active sonar) for a pantropical spotted dolphin.

6.8.3.15 Pygmy Killer Whale

The acoustic modeling and post-modeling analysis estimates that 162 pygmy killer whales may be exposed to sonar resulting in Level B harassment. Of these, 159 would be from non-TTS and three would be from TTS (Table 6-7). No pygmy killer whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold, and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 162 pygmy killer whales by Level B harassment (162 from MFA/HFA sonar and none from underwater detonations) and no pygmy killer whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonations. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of pygmy killer whales, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to pygmy killer whales.

6.8.3.16 Risso's Dolphin

The acoustic modeling and post-modeling analysis estimates that 6,718 Risso's dolphins may be exposed to sonar resulting in Level B harassment. Of these, 6,608 would be from non-TTS and 110 would be from TTS (Table 6-7). No Risso's dolphins are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, modeling indicates there would be 35 exposures from impulsive sound or pressures from underwater detonations that may result in Level B harassment. Of these, 26 would be from sub-TTS and nine would be from TTS. There are no exposures that would exceed the onset of slight injury threshold and no exposures that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 6,753 Risso's dolphins by Level B harassment (6,718 from MFA/HFA sonar and 35 from underwater detonations) and no Risso's dolphins by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonations. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of Risso's dolphins, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to Risso's dolphins.

6.8.3.17 Rough-toothed Dolphin

The acoustic modeling and post-modeling analysis estimates that 241 rough-toothed dolphins may be exposed to sonar resulting in Level B harassment. Of these, 236 would be from non-TTS and five would be from TTS (Table 6-7). No rough-toothed dolphins are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold, and no exposures that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 241 rough-toothed dolphins by Level B harassment (241 from MFA/HFA sonar and none from underwater detonations), no rough-toothed dolphins by Level A harassment or that could cause severe lung injury or mortality. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of rough-toothed dolphins, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to rough-toothed dolphins.

6.8.3.18 Short-Beaked Common Dolphin

The acoustic modeling and post-modeling analysis estimates that 932 short-beaked common dolphins may be exposed to sonar resulting in Level B harassment. Of these, 915 would be from non-TTS and 17 would be from TTS (Table 6-7). No short-beaked common dolphins are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, modeling indicates there would be eight exposures from impulsive sound or pressures from underwater detonations that may result in Level B harassment. Of these, six would be from sub-TTS and two would be from TTS. There are no exposures that would exceed the onset of slight injury threshold and no exposures that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 940 short-beaked common dolphins by Level B harassment (932 from MFA/HFA sonar and eight from underwater detonations), no short-beaked common dolphins by Level A harassment, and no exposures to underwater detonations that could cause severe lung injury or mortality. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of short-beaked common dolphins, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to short-beaked common dolphins.

6.8.3.19 Short-finned Pilot Whale

The acoustic modeling and post-modeling analysis estimates that 2,272 short-finned pilot whales may be exposed to sonar resulting in Level B harassment. Of these, 2,236 would be from non-TTS and 36 would be from TTS (Table 6-7). No short-finned pilot whales are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold, and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 2,272 short-finned pilot whales by Level B harassment (2,272 from MFA/HFA sonar and none from underwater detonations) and no short-finned pilot whales by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonations. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of short-finned pilot whales, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to short-finned pilot whales.

6.8.3.20 Spinner Dolphin

The acoustic modeling and post-modeling analysis estimates that 2,132 spinner dolphins may be exposed to sonar resulting in Level B harassment. Of these, 2,096 would be from non-TTS and 36 would be from TTS (Table 6-7). No spinner dolphins are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, modeling indicates there would be eight exposures from impulsive sound or pressures from underwater detonations that may result in Level B harassment. Of these, six would be from sub-TTS and two would be from TTS. There are no exposures that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 2,140 spinner dolphins by Level B harassment (2,132 from MFA/HFA sonar and eight from underwater detonations) and no spinner dolphins by Level A harassment from potential exposures from MFA/HFA sonar or underwater detonations. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of spinner dolphins, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to spinner dolphins.

6.8.3.21 Striped Dolphin

The acoustic modeling and post-modeling analysis estimates that 8,845 striped dolphins may be exposed to sonar resulting in Level B harassment. Of these, 8,705 would be from non-TTS and 140 would be from TTS (Table 6-7). No striped dolphins are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, modeling indicates there would be four exposures from impulsive sound or pressures from underwater detonations that may result in Level B harassment. Of these, three would be from sub-TTS and one would be from TTS. There are no exposures that would exceed the onset of slight injury threshold and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 8,849 striped dolphins by Level B harassment (8,845 from MFA/HFA sonar and four from underwater detonations) and no striped dolphins by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonations. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of striped dolphins, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to striped dolphins.

6.8.3.22 Unidentified Delphinids

The acoustic modeling and post-modeling analysis estimates that 1,536 unidentified delphinids may be exposed to sonar resulting in Level B harassment. Of these, 1,512 would be from non-TTS and 24 would be from TTS (Table 6-7). No unidentified dephinids are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold, and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 1,536 unidentified dephinids by Level B harassment (1,536 from MFA/HFA sonar and none from underwater detonations) and no unidentified dephinids by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonations. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of unidentified dephinids, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to unidentified dephinids.

6.8.3.22 Bottlenose/Rough-toothed Dolphin

Bottlenose and rough-toothed dolphins can be difficult to distinguish at sea depending on the sea surface conditions and distance from the survey ship (DoN 2007), therefore a mixed group was modeled. The acoustic modeling and post-modeling analysis estimates that 74 bottlenose/rough-toothed dolphins may be exposed to sonar resulting in Level B harassment. Of these, 73 would be from non-TTS and one would be from TTS (Table 6-7). No bottlenose/roughtooth dolphins are expected to be exposed to sonar resulting in Level A harassment.

Without consideration of clearance procedures, there would be no exposures from impulsive sound or pressures from underwater detonations that would exceed the sub-TTS or TTS threshold for Level B harassment, none that would exceed the onset of slight injury threshold, and no exposure that would exceed the onset of massive lung injury or mortality threshold (Table 6-8).

At this time, this application requests authorization for the annual harassment of 74 bottlenose/rough-toothed dolphins by Level B harassment (74 from MFA/HFA sonar and none from underwater detonations) and no bottlenose/rough-toothed dolphins by Level A harassment from potential exposure to MFA/HFA sonar or underwater detonation. Based on the model results, the nature of the Navy's MFA/HFA sonar, behavioral patterns and acoustic abilities of bottlenose/rough-toothed dolphins, observations made during past training events, and the planned implementation of mitigation measures (Section 11.1 for sonar and Section 11.3 for underwater detonations in the MIRC LOA application [DoN 2008]), the Navy finds that the MIRC training events would not result in any population level effects, death, or injury to bottlenose/rough-toothed dolphin.

6.9 SURTASS LFA

SURTASS LFA sonar systems are long-range sonars that operate day or night in most weather conditions in the low frequency range of 100 to 500 hertz (Hz). The SURTASS LFA system consists of an active component and a passive component. The active component of the system, LFA, is a set of low frequency acoustic transmitting source elements (called projectors) suspended by cable from underneath the ship. These projectors produce the active sonar signal or "ping." The passive or listening component of the system is SURTASS, which detects returning echoes from submerged objects, such as OPFOR submarines. The returning signals are received through hydrophones that are towed behind the ship on a receiving array. The long-range capability of the sensitive receiving array and onboard acoustic processing provides a large geographic area of protection and submarine detection (DoN 2001). Potential harassment from SURTASS LFA sonar has been evaluated for the MIRC area in the 2007 SURTASS LFA Supplemental EIS (Department of the Navy [DoN] 2007a) and for synergistic affects of use of the systems for training in this LOA request.

The potential cumulative impact issue associated with SURTASS LFA sonar operations is the addition of underwater sound to oceanic ambient noise levels and its use during the operation of MFA/HFA sonar in the MIRC area. While the operation of LFA and MFA/HFA sonar together in the MIRC area have the

potential to expose marine mammals to these sources, there should not be any cumulative or synergistic effects given the differences in the systems frequencies as detailed below.

Anthropogenic sources of ambient noise that are most likely to contribute to increases in ambient noise levels are commercial shipping, offshore oil and gas exploration and drilling, and naval and other use of sonar (International Council for the Exploration of the Sea, 2005). Increases in ambient noise levels have the potential to cause masking, and decrease in distances that underwater sound can be detected by marine animals. These effects have the potential to cause a long-term decrease in a marine mammal's efficiency at foraging, navigating, or communicating (International Council for the Exploration of the Sea, 2005). National Research Council (2003) discussed acoustically-induced stress in marine mammals. National Research Council stated that sounds resulting from one-time exposure are less likely to have population-level effects than sounds that animals are exposed to repeatedly over extended periods of time.

Broadband, continuous low-frequency shipping noise is more likely to affect marine mammals than narrowband, low duty cycle SURTASS LFA sonar or the brief and intermittent signals from MFA/HFA sources. SURTASS LFA sonar bandwidth is limited (approximately 30 Hz), the average maximum pulse length is 60 seconds, signals do not remain at a single frequency for more than 10 seconds, and during an operation the system is off nominally 90 to 92.5 percent of the time. Most mysticete vocalizations are in the low frequency band below 1 kHz. No direct auditory measurements have been made for any mysticete, but it is generally believed that their frequency band of best hearing is below 1,000 Hz, where their calls have the greatest energy (Clark, 1990; Edds-Walton, 2000; Ketten, 2000). However, with the nominal duty cycle of 7.5 to 10 percent, masking would be temporary. For these reasons, any masking effects from SURTASS LFA sonar are expected to be negligible and extremely unlikely.

Odontocetes have a broad acoustic range and hearing thresholds measure between 400 Hz and 100 kHz (Richardson, et al., 1995a; Finneran et al., 2002). It is believed that odontocetes communicate above 1,000 Hz and echolocate above 20 kHz (Würsig and Richardson, 2002). While the upward spread of masking is known to exist, the phenomenon has a limited range in frequency. Yost (2000) showed that magnitude of the masking effect decreases as the difference between signal and masking frequency increase; i.e., the masking effect is lower at 3 times the frequency of the masker than at 2 times the frequency. Gorga et al. (2002) demonstrated that for a 1.2-kHz masking signal, the upward spread of masking was extinguished at frequencies of 6 kHz and higher. Therefore, while the phenomenon of upward spread of masking does exist, it is unlikely that LFA would have any significant effect on the hearing of higher frequency animals. Gorga et al. (2002) also demonstrated that the upward spread of masking is a function of the received level of the masking signal. Therefore, a large increase in the masked bandwidth due to upward masking would only occur at high received levels of the LFA signal. In a recent analysis for the Policy on Sound and Marine Mammals: An International Workshop sponsored by the Marine Mammal Commission (United States) and the Joint Nature Conservation Committee (United Kingdom) in 2004, Dr. John Hildebrand provided a comparison of anthropogenic underwater sound sources by their annual energy output. On an annual basis, four SURTASS LFA systems are estimated to have a total energy output of 6.8×10^{11} Joules/yr. Seismic air gun arrays were two orders of magnitude greater with an estimated annual output of 3.9×10^{13} Joules/year. MFA and super tankers were both greater at 8.5×10^{12} and 3.7×10^{12} Joules/year, respectively (Hildebrand, 2004). Hildebrand concluded that increases in anthropogenic sources most likely to contribute to increased noise in order of importance are commercial shipping, offshore oil and gas exploration and drilling, and naval and other uses of sonar. The use of SURTASS LFA sonar is not scheduled to increase past the originally analyzed four systems during the next 5-year regulation under the Marine Mammal Protection Act (MMPA). The percentage of the total anthropogenic acoustic energy budget added by each LFA source is actually closer to 0.5 percent per system (or less), when other man-made sources are considered (Hildebrand, 2004). When combined with the naturally occurring and other manmade sources of noise in the oceans, the intermittent LFA signals barely contribute a measurable portion of the total acoustic energy.

In a recently released report entitled "Ad-Hoc Group on the Impact of Sonar on Cetaceans," the International Council for the Exploration of the Sea (International Council for the Exploration of the Sea, 2005) concluded that shipping accounts for more than 75 percent of all human sound in the sea, and sonar amounts to no more than 10 percent or so. It further stated that sonar (noise budget) would probably never exceed 10 percent, but that sonar deployment seems likely to increase in the future. Therefore, the SURTASS LFA Final Supplemental Environmental Impact Statement (SEIS) dated April 2007 concluded that because LFA transmissions would not significantly increase anthropogenic oceanic noise, cumulative impacts and synergistic effects from the proposed four SURTASS LFA sonar systems for masking would not be a reasonably foreseeable significant adverse impact on marine animals.

6.9.1 Synergistic Effects

The potential for synergistic effects of the operation of SURTASS LFA sonar with overlapping sound fields from other anthropogenic sound sources was initially analyzed based on two LFA sources (U.S. Department of the Navy, 2007). In order for the sound fields to converge, the multiple sources would have to transmit exactly in phase (at the same time), requiring similar signal characteristics, such as time of transmissions, depth, vertical steering angle, waveform, wavetrain, pulse length, pulse repetition rate, and duty cycle. In the very unlikely event that this ever occurred, the analysis demonstrated that the "synergistic" sound field generated would be 75 percent or less of the value obtained by adding the results. Therefore, adding the results conservatively bounds the potential effects of employing multiple LFA sources. In the areas where marine mammals would potentially be affected by significant behavioral changes, they would be far enough that they would discern each LFA sonar as an individual source. Standard operational employment of two SURTASS LFA sonars calls for the vessels to be nominally at least 185 km (100 nm) apart (U.S. Department of the Navy, 2007). Moreover, LFA sources would not normally operate in proximity to each other and would be unlikely to transmit in phase as noted above. Based on this and the coastal standoff restriction, it is unlikely that LFA sources, under any circumstances, could produce a sound field so complex that marine animals would not know how to escape it if they desired to do so.

Because of the potential for seismic surveys to interfere with the reception of passive signals and return echoes, SURTASS LFA sonar operations are not expected to be close enough to these activities to have any synergistic effects. Because of the differences between the LFA coherent signal and seismic air gun impulsive "shots," there is little chance of producing a "synergistic" sound field. Marine animals would perceive these two sources of underwater sound differently and any addition of received signals would be insignificant. This situation would present itself only rarely, as LFA testing and training operations have not been, and are not expected to be conducted in proximity to any seismic survey activity.

If SURTASS LFA sonar operations were to occur concurrent with other military (including MFA/HFA sonars) and commercial sonar systems, synergistic effects are not probable because of differences between these systems (U.S. Department of the Navy, 2007). For the sound fields to converge, the multiple sources would have to transmit exactly in phase (at the same time), requiring similar signal characteristics, such as time of transmissions, depth, frequency, bandwidth, vertical steering angle, waveform, wavetrain, pulse length, pulse repetition rate, and duty cycle. The potential for this occurring is negligible.

Another area for potential cumulative effects would be those associated with marine mammal populations. To evaluate the effects of MIRC area sonar operations, it is necessary to place it in perspective with other anthropogenic impacts on marine resources.

6.9.2 Bycatch

Increases in ambient noise levels have the potential to mask an animal's ability to detect objects, such as fishing gear, thus increasing their susceptibility to becoming bycatch. Because LFA/MFA/HFA transmissions are intermittent and would not significantly increase anthropogenic oceanic noise,

cumulative impacts and synergistic effects from masking by MIRC activities signals are not a reasonably foreseeable significant adverse impact on marine animals.

6.9.3 SHIP STRIKES

Increases in ambient noise levels have the potential to mask an animal's ability to detect approaching vessels, thus increasing their susceptibility to ship strikes. Because LFA/MFA/HFA transmissions are intermittent and will not significantly increase anthropogenic oceanic noise, cumulative impacts and synergistic effects from ship strikes due to masking are not a reasonably foreseeable significant adverse impact on marine animals from MIRC activities.

7. IMPACTS TO MARINE MAMMAL SPECIES OR STOCKS

There are no changes to Chapter 7 as described in the original LOA application of August 2008.

8. IMPACT ON SUBSISTENCE USE

There are no changes to Chapter 8 as described in the original LOA application of August 2008.

9. IMPACTS TO THE MARINE MAMMAL HABITAT AND THE LIKELIHOOD OF RESTORATION

There are no changes to Chapter 9 as described in the original LOA application of August 2008.

10. IMPACTS TO MARINE MAMMALS FROM LOSS OR MODIFICATION OF HABITAT

There are no changes to Chapter 10 as described in the original LOA application of August 2008.

11. MEANS OF EFFECTING THE LEAST PRACTICABLE ADVERSE IMPACTS – MITIGATION MEASURES

Section 11.1.4 has been updated to reflect the information developed in the AFAST Final EIS. Section 11.3 has been revised to update Underwater Detonations; to include Sink Exercises. Section 11.3.4, *Measures for Specific Training Events* have been added.

11.1.4 CURRENT MITIGATION MEASURES ASSOCIATED WITH EVENTS USING EER/IEER SONOBUOYS

11.1.4.1 MITIGATION MEASURES RELATED TO ACOUSTIC EFFECTS BEYOND THOSE PREVIOUSLY DESCRIBED

The Navy recognizes that the proposed action might cause behavioral disruption of some marine mammal species in the Study Area and is therefore seeking a Biological Opinion and incidental take statement from NMFS. This section describes the Navy's proposed mitigation measures that would be implemented to protect marine mammals during the proposed active sonar activities.

The typical ranges, or distances – from the most powerful and common active sonar sources used in MIRC to received sound energy levels associated with a temporary threshold shift (TTS) and permanent threshold shift (PTS) – are shown in Figure 11-1. In addition, the range-to-effects for explosive source sonobuoys (AN/SSQ-110A) are shown in Figure 11-2. Due to spreading loss, sound attenuates logarithmically from the source, so the area in which an animal could be exposed to PTS is small. Because the most powerful sources would typically be used in deep water and the range to effect is limited, spherical spreading is assumed for 195 decibels referenced to 1 micro-Pascal squared second (dB re 1μPa^2-s) and above. Also, due to the limited ranges, interactions with the bottom or surface ducts are rarely an issue.

11.1.4.2 MITIGATION MEASURES RELATED TO EXPLOSIVE SOURCE SONOBUOYS (AN/SSQ-110A)

- Crews will conduct visual reconnaissance of the drop area prior to laying their intended sonobuoy pattern. This search should be conducted below 500 yd (457 m) at a slow speed, if operationally feasible and weather conditions permit. In dual aircraft operations, crews may conduct coordinated area clearances.
- Crews shall conduct a minimum of 30 minutes of visual and aural monitoring of the search area prior to commanding the first post (source/receiver sonobuoy pair) detonation. This 30-minute observation period may include pattern deployment time.
- For any part of the briefed pattern where a post will be deployed within 1,000 yd (914 m) of observed marine mammal activity, crews will deploy the receiver ONLY and monitor while conducting a visual search. When marine mammals are no longer detected within 1,000 yd (914 m) of the intended post position, crews will co-locate the explosive source sonobuoy (AN/SSQ-110A) (source) with the receiver.
- When operationally feasible, crews will conduct continuous visual and aural monitoring of marine mammal activity, including monitoring of their aircraft sensors from first sensor placement to checking off-station and out of RF range of these sensors.

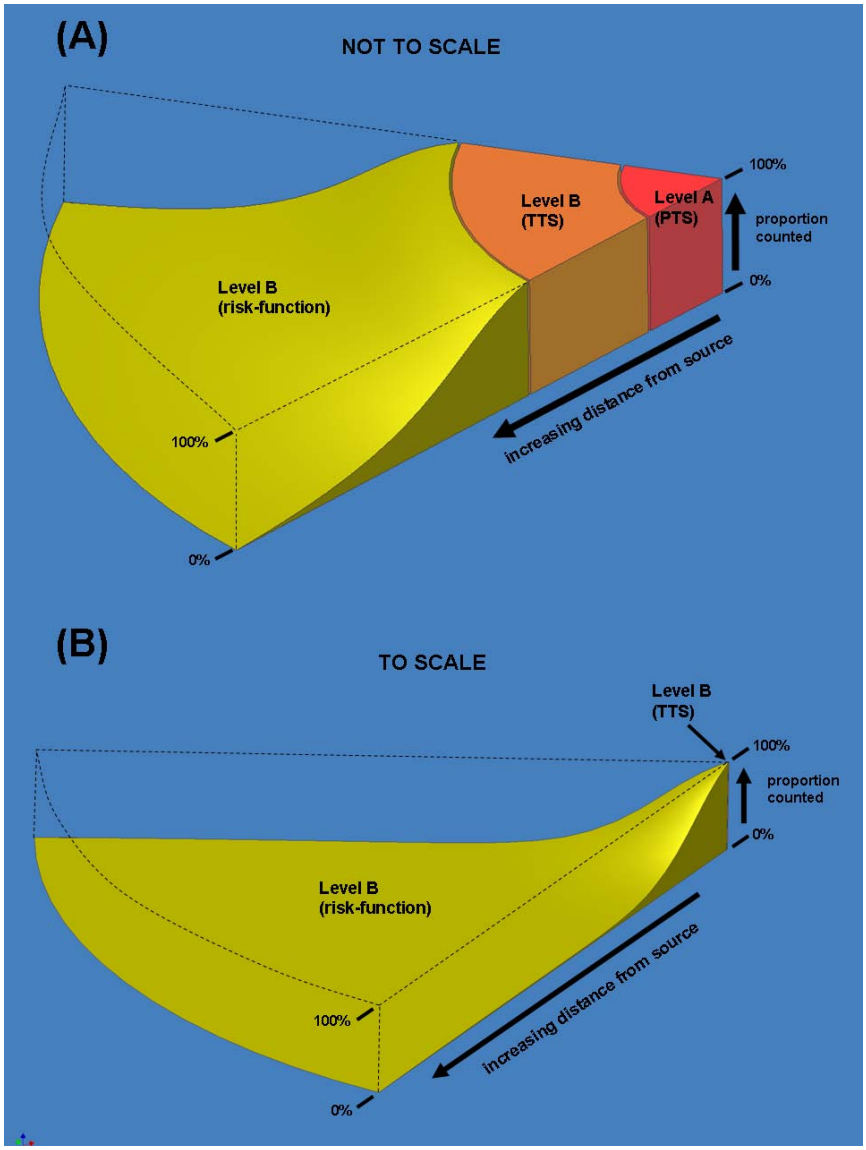


Figure 11-1: Range to Effects for the Most Powerful Active Sonar, AN/SQS-53

(A) General relationships between PTS, TTS, and risk function harassment zones. Image is not scaled, which allows each zone to be visible. (B) Scaled representation of harassment zone areas. Scaled distances were based on a single, 1-second ping with source level of 235 dB re 1 µPa.

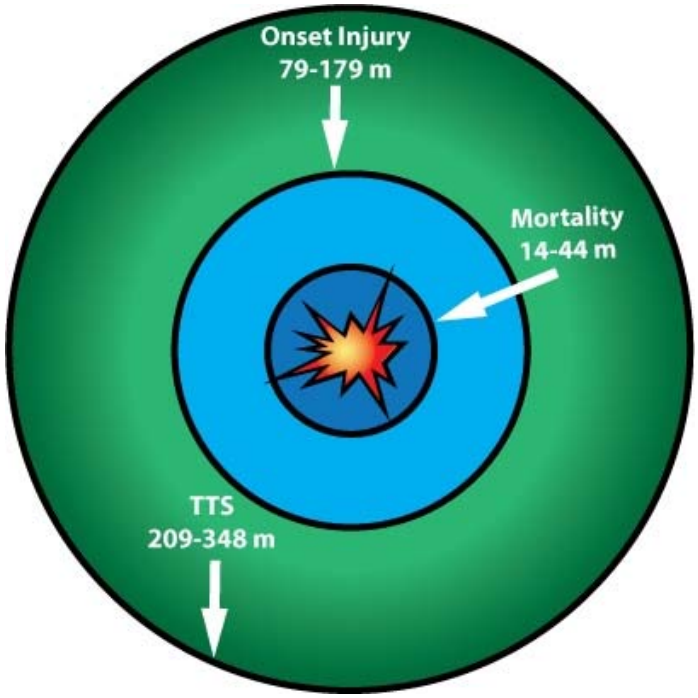


Figure 11-2: Range to Effects for Explosive Source Sonobuoys (AN/SSQ-110A)

Note: Range to mortality conservatively based on dolphin calf criteria

- Aural Detection:
  - Aural detection of marine mammals cues the aircrew to increase the diligence of their visual surveillance.
  - If, following aural detection, no marine mammals are visually detected, then the crew may continue active search.
- Visual Detection:
  - If marine mammals are visually detected within 1,000 yd (914 m) of the explosive source sonobuoy (AN/SSQ-110A) intended for use, then that payload shall not be detonated. Aircrews may utilize this post once the marine mammals have not been re-sighted for 30 minutes or are observed to have moved outside the 1,000 yd (914 m) safety zone.
  - Aircrews may shift their active search to another post, where marine mammals are outside the 1,000 yd (914 m) safety zone.
- Aircrews shall make every attempt to manually detonate the unexploded charges at each post in the pattern prior to departing the operations area by using the "Payload 1 Release" command followed by the "Payload 2 Release" command. Aircrews shall refrain from using the "Scuttle" command when two payloads remain at a given post. Aircrews will ensure a 1,000 yd (914 m) safety zone, visually clear of marine mammals, is maintained around each post as is done during active search operations.
- Aircrews shall only leave posts with unexploded charges in the event of a sonobuoy malfunction, an aircraft system malfunction, or when an aircraft must immediately depart the area due to issues such as fuel constraints, inclement weather, and in-flight emergencies. In these cases, the sonobuoy will self-scuttle using the secondary or tertiary method.

- Aircrews ensure all payloads are accounted for. Sonobuoys that can not be scuttled shall be reported as unexploded ordnance via voice communications while airborne and, upon landing via naval message.
- Marine mammal monitoring shall continue until out of own aircraft sensor range.

11.3.1 Underwater Detonations (up to 20-lb charges)

To ensure protection of marine mammals and sea turtles during underwater detonation training and mining activities, the surveillance area must be determined to be clear of marine mammals and sea turtles prior to detonation. Implementation of the following mitigation measures continue to ensure that marine mammals would not be exposed to temporary threshold shift (TTS) of hearing, permanent threshold shift (PTS) or hearing, or injury from physical contact with training mine shapes during Major Exercises.

11.3.1.1 Exclusion Zones

All Mine Warfare and Mine Countermeasures training activities involving the use of explosive charges must include exclusion zones for marine mammals and sea turtles to prevent physical and/or acoustic effects on those species. These exclusion zones shall extend in a 700-yard arc radius around the detonation site.

11.3.1.2 Pre-exercise Surveillance

For Demolition and Ship Mine Countermeasures training activities, pre-exercise surveillance shall be conducted within 30 minutes prior to the commencement of the scheduled explosive event. The surveillance may be conducted from the surface, by divers, and/or from the air, and personnel shall be alert to the presence of any marine mammal or sea turtle. Should such an animal be present within the surveillance area, the exercise shall be paused until the animal voluntarily leaves the area.

11.3.1.3 Post-Exercise Surveys

Surveillance within the same radius shall also be conducted within 30 minutes after the completion of the explosive event.

11.3.1.4 Reporting

If there is evidence that a marine mammal or sea turtle may have been stranded, injured or killed by the action, Navy training activities will be immediately suspended and the situation immediately reported by the participating unit to the Officer in Charge of the Exercise (OCE), who will follow Navy procedures for reporting the incident to the Commander, Navy Marianas who will contact Commander, Pacific Fleet.

11.3.2 Sink Exercise (SINKEX)

The selection of sites suitable for Sinking Exercises (SINKEXs) involves a balance of operational suitability, requirements established under the Marine Protection, Research and Sanctuaries Act (MPRSA) permit granted to the Navy (40 Code of Federal Regulations §229.2), and the identification of areas with a low likelihood of encountering ESA listed species. To meet operational suitability criteria, locations must be within a reasonable distance of the target vessels' originating location. The locations should also be close to active military bases to allow participating assets access to shore facilities. For safety purposes, these locations should also be in areas that are not generally used by non-military air or watercraft. The MPRSA permit requires vessels to be sunk in waters which are at least 2,000 yds (1,839 m) deep and at least 50 nm from land.

In general, most listed species prefer areas with strong bathymetric gradients and oceanographic fronts for significant biological activity such as feeding and reproduction. Typical locations include the shelf-edge.

11.3.2.1 SINKEX Mitigation Plan

The Navy has developed range clearance procedures to maximize the probability of sighting any ships or protected species in the vicinity of an exercise, which are as follows:

- All weapons firing would be conducted during the period 1 hour after official sunrise to 30 minutes before official sunset.
- Extensive range clearance operations would be conducted in the hours prior to commencement of the exercise, ensuring that no shipping is located within the hazard range of the longest-range weapon being fired for that event.
- An exclusion zone with a radius of 1.0 nm would be established around each target. This exclusion zone is based on calculations using a 990-pound (lb) H6 net explosive weight high explosive source detonated 5 feet (ft) below the surface of the water, which yields a distance of 0.85 nm (cold season) and 0.89 nm (warm season) beyond which the received level is below the 182 decibels (dB) re: 1 micropascal squared-seconds (μPa^2-s) threshold established for the *WINSTON S. CHURCHILL* (DDG 81) shock trials (DoN 2001b). An additional buffer of 0.5 nm would be added to account for errors, target drift, and animal movements. Additionally, a safety zone, which extends from the exclusion zone at 1.0 nm out an additional 0.5 nm, would be surveyed. Together, the zones extend out 2 nm from the target.
- A series of surveillance over-flights would be conducted within the exclusion and the safety zones, prior to and during the exercise, when feasible. Survey protocol would be as follows:
  - Overflights within the exclusion zone would be conducted in a manner that optimizes the surface area of the water observed. This may be accomplished through the use of the Navy's Search and Rescue Tactical Aid, which provides the best search altitude, ground speed, and track spacing for the discovery of small, possibly dark objects in the water based on the environmental conditions of the day. These environmental conditions include the angle of sun inclination, amount of daylight, cloud cover, visibility, and sea state.
  - All visual surveillance activities would be conducted by Navy personnel trained in visual surveillance. At least one member of the mitigation team would have completed the Navy's marine mammal training program for lookouts.
  - In addition to the overflights, the exclusion zone would be monitored by passive acoustic means, when assets are available. This passive acoustic monitoring would be maintained throughout the exercise. Potential assets include sonobuoys, which can be utilized to detect vocalizing marine mammals (particularly sperm whales) in the vicinity of the exercise. The sonobuoys would be re-seeded as necessary throughout the exercise. Additionally, passive sonar onboard submarines may be utilized to detect any vocalizing marine mammals in the area. The Officer Conducting the Exercise (OCE) would be informed of any aural detection of marine mammals and would include this information in the determination of when it is safe to commence the exercise.
  - On each day of the exercise, aerial surveillance of the exclusion and safety zones would commence 2 hours prior to the first firing.
  - The results of all visual, aerial, and acoustic searches would be reported immediately to the OCE. No weapons launches or firing would commence until the OCE declares the safety and exclusion zones free of marine mammals and threatened and endangered species.
  - If a protected species observed within the exclusion zone is diving, firing would be delayed until the animal is re-sighted outside the exclusion zone, or 30 minutes have elapsed. After 30 minutes, if the animal has not been re-sighted it would be assumed to have left the exclusion

zone. This is based on a typical dive time of 30 minutes for traveling listed species of concern. The OCE would determine if the listed species is in danger of being adversely affected by commencement of the exercise.

- During breaks in the exercise of 30 minutes or more, the exclusion zone would again be surveyed for any protected species. If protected species are sighted within the exclusion zone, the OCE would be notified, and the procedure described above would be followed.
- Upon sinking of the vessel, a final surveillance of the exclusion zone would be monitored for 2 hours, or until sunset, to verify that no listed species were harmed.

- Aerial surveillance would be conducted using helicopters or other aircraft based on necessity and availability. The Navy has several types of aircraft capable of performing this task; however, not all types are available for every exercise. For each exercise, the available asset best suited for identifying objects on and near the surface of the ocean would be used. These aircraft would be capable of flying at the slow safe speeds necessary to enable viewing of marine vertebrates with unobstructed, or minimally obstructed, downward and outward visibility. The exclusion and safety zone surveys may be cancelled in the event that a mechanical problem, emergency search and rescue, or other similar and unexpected event preempts the use of one of the aircraft onsite for the exercise. The exercise would not be conducted unless the exclusion zone could be adequately monitored visually.
- Every attempt would be made to conduct the exercise in sea states that are ideal for marine mammal sighting, Beaufort Sea State 3 or less. In the event of a 4 or above, survey efforts would be increased within the zones. This would be accomplished through the use of an additional aircraft, if available, and conducting tight search patterns.
- The exercise would not be conducted unless the exclusion zone could be adequately monitored visually.
- In the unlikely event that any listed species are observed to be harmed in the area, a detailed description of the animal would be taken, the location noted, and if possible, photos taken. This information would be provided to National Oceanic and Atmospheric Administration (NOAA) Fisheries via the Navy's regional environmental coordinator for purposes of identification.
- An after action report detailing the exercise's time line, the time the surveys commenced and terminated, amount, and types of all ordnance expended, and the results of survey efforts for each event would be submitted to NMFS.

11.3.4 Measures for Specific Training Events

11.3.4.1 Surface-to-Surface Gunnery (up to 5-inch Explosive Rounds)

- For exercises using targets towed by a vessel, target-towing vessels shall maintain a trained lookout for marine mammals and sea turtles when feasible. If a marine mammal or sea turtle is sighted in the vicinity, the tow vessel will immediately notify the firing vessel, which will suspend the exercise until the area is clear.
- A 600 yard (585 m) radius buffer zone will be established around the intended target.
- From the intended firing position, trained lookouts will survey the buffer zone for marine mammals and sea turtles prior to commencement and during the exercise as long as practicable. Due to the distance between the firing position and the buffer zone, lookouts are only expected to visually detect breaching whales, whale blows, and large pods of dolphins and porpoises.
- The exercise will be conducted only when the buffer zone is visible and marine mammals and sea turtles are not detected within it.

11.3.4.2 Surface-to-Surface Gunnery (Non-explosive Rounds)

- A 200 yard (183 m) radius buffer zone will be established around the intended target.
- From the intended firing position, trained lookouts will survey the buffer zone for marine mammals and sea turtles prior to commencement and during the exercise as long as practicable. Due to the distance between the firing position and the buffer zone, lookouts are only expected to visually detect breaching whales, whale blows, and large pods of dolphins and porpoises.
- If applicable, target towing vessels will maintain a lookout. If a marine mammal or sea turtle is sighted in the vicinity of the exercise, the tow vessel will immediately notify the firing vessel in order to secure gunnery firing until the area is clear.
- The exercise will be conducted only when the buffer zone is visible and marine mammals and sea turtles are not detected within the target area and the buffer zone.

11.3.4.3 Surface-to-Air Gunnery (Explosive and Non-explosive Rounds)

- Vessels will orient the geometry of gunnery exercises in order to prevent debris from falling in the area of sighted marine mammals and sea turtles.
- Vessels will expedite the recovery of any parachute deploying aerial targets to reduce the potential for entanglement of marine mammals and sea turtles.
- Target towing aircraft shall maintain a lookout if feasible. If a marine mammal or sea turtle is sighted in the vicinity of the exercise, the tow aircraft will immediately notify the firing vessel in order to secure gunnery firing until the area is clear.

11.3.4.4 Air-to-Surface Gunnery (Explosive and Non-explosive Rounds)

- A 200 yard (183 m) radius buffer zone will be established around the intended target.
- If surface vessels are involved, lookout(s) will visually survey the buffer zone for marine mammals and sea turtles prior to and during the exercise.
- Aerial surveillance of the buffer zone for marine mammals and sea turtles will be conducted prior to commencement of the exercise. Aerial surveillance altitude of 500 feet to 1,500 feet (152 – 456 m) is optimum. Aircraft crew/pilot will maintain visual watch during exercises. Release of ordnance through cloud cover is prohibited; aircraft must be able to actually see ordnance impact areas.
- The exercise will be conducted only if marine mammals and sea turtles are not visible within the buffer zone.

11.3.4.5 Small Arms Training (Grenades, Explosive and Non-explosive Rounds)

Lookouts will visually survey for marine mammals and sea turtles. Weapons will not be fired in the direction of known or observed marine mammals or sea turtles.

11.3.4.6 Air-to-Surface At-Sea Bombing Exercises (Explosive Bombs and Rockets)

- Ordnance shall not be targeted to impact within 1,000 yards (914 m) of known or observed sea turtles or marine mammals.
- A buffer zone of 1,000 yards (914 m) radius will be established around the intended target.
- Aircraft will visually survey the target and buffer zone for marine mammals and sea turtles prior to and during the exercise. The survey of the impact area will be made by flying at 1,500 feet or lower, if safe to do so, and at the slowest safe speed. Release of ordnance through cloud cover is

prohibited; aircraft must be able to actually see ordnance impact areas. Survey aircraft should employ most effective search tactics and capabilities.

- The exercises will be conducted only if marine mammals and sea turtles are not visible within the buffer zone.

11.3.4.7 Air-to-Surface At-Sea Bombing Exercises (Non-explosive Bombs and Rockets)

- If surface vessels are involved, trained lookouts will survey for sea turtles and marine mammals. Ordnance shall not be targeted to impact within 1,000 yards (914 m) of known or observed sea turtles or marine mammals.
- A 1,000 yard (914 m) radius buffer zone will be established around the intended target.
- Aircraft will visually survey the target and buffer zone for marine mammals and sea turtles prior to and during the exercise. The survey of the impact area will be made by flying at 1,500 feet (152 m) or lower, if safe to do so, and at the slowest safe speed. Release of ordnance through cloud cover is prohibited; aircraft must be able to actually see ordnance impact areas. Survey aircraft should employ most effective search tactics and capabilities.
- The exercise will be conducted only if marine mammals and sea turtles are not visible within the buffer zone.

12. MINIMIZATION OF ADVERSE EFFECTS ON SUBSISTENCE USE

There are no changes to Chapter 12 as described in the original LOA application of August 2008.

13. MONITORING AND REPORTING MEASURES

There are no changes to Chapter 13 as described in the original LOA application of August 2008.

14. RESEARCH

The Navy provides a significant amount of funding and support to marine research. The agency provided 26 million dollars in Fiscal Year 2008 (100 million dollars over the past 5 years) to universities, research institutions, Federal laboratories, private companies, and independent researchers around the world to study marine mammals.

15. LIST OF PREPARERS

Government Contributors/Reviewers

Edward J. Lynch, CDR JAGC USN (ret), KAYA Associates, Inc.
U.S. Pacific Fleet EIS Project Manager
Juris Doctor, 1978

Julie Rivers, U. S. Pacific Fleet
Natural/Marine Resources Program Manager
B.S. Biology

Randy Vavra, LCDR JAGC USN, U.S. Pacific Fleet
Deputy Fleet Environmental Counsel

Nora Macariola-See, P.E., Naval Facilities Engineering Command Pacific
Navy Technical Representative
B.S. Chemical Engineering

Lori Mazzuca, Naval Facilities Engineering Command Pacific
Marine Resource Specialist
M.S. Marine Affairs

Naval Facilities Engineering Command ContractorPreparers

Conrad Erkelens, Senior Scientist, KAYA Associates, Inc
M.A., Anthropology, 1993, University of Hawaii
B.A., Anthropology, 1989, University of Hawaii
Years of Experience: 13

Wesley S. Norris, Managing Senior, KAYA Associates, Inc.
B.S., 1976, Geology, Northern Arizona University
Years of Experience: 30

John Pitcher, Director, ESD Business Ops, ManTech SRS Technologies
M.B.A., Management, University of Virginia
B.S., Chemical Engineering, Massachusetts Institute of Technology
Years of Experience: 19

Philip H. Thorson, Senior Research Biologist, ManTech SRS Technologies
Ph.D., 1993, Biology, University of California at Santa Cruz
Years of Experience: 27

Karen M. Waller, Senior Program Manager, ManTech SRS Technologies
B.S., 1987, Environmental Affairs, Indiana University
Years of Experience: 19

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