

Commander, U.S. Pacific Fleet Mariana Islands Range Complex Report

Prepared for and submitted to:

National Marine Fisheries Service  
Office of Protected Resources

Prepared by:

Department of the Navy

In accordance with the Letter of Authorization  
Under the MMPA and ITS authorization under  
the ESA 12 August 2012

# **Annual Range Complex Unclassified Exercise Report**

## **16 February 2014 to 3 August 2015**

**For The U.S. Navy  
Mariana Islands Range Complex (MIRC)**

**23 October 2015**

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# TABLE OF CONTENTS

## MARIANA ISLANDS RANGE COMPLEX

INTRODUCTION .....	3
(1) MIRC – MFAS/HFAS Major Training Exercises	
(i) Exercise information.....	4
(ii) Individual marine mammal sighting information by exercise .....	5
(iii) Evaluation (based on data gathered during all MTER) of effectiveness.....	7
(2) MIRC – ASW Summary	
(i) Total hours.....	9
(ii) Cumulative Impacts .....	10
(3) MIRC – SINKEX .....	11
(4) MIRC – IEER/ABER Summary .....	12
(5) MIRC – Explosives Summary .....	13

# MARIANA ISLANDS RANGE COMPLEX

## INTRODUCTION

The U.S. Navy prepared this Annual Range Complex Exercise Report covering the period from 16 February 2014 to 3 August 2015 in compliance with the National Marine Fisheries Service (NMFS) Final Rule under the Marine Mammal Protection Act (MMPA) for the Mariana Islands Range Complex (MIRC).

In the Mariana Islands Range Complex Letter of Authorization "Annual MIRC report", the following report subsections were specified and are present within this report for MIRC:

- (1) Mid-Frequency Active Sonar (MFAS)/High-Frequency Active Sonar (HFAS) Major Training Exercises for Reporting (MTER).
  - (i) Exercise Information (for each MTER).
  - (ii) Individual Marine Mammal Sighting Information (for each MTER).
  - (iii) Evaluation (based on data gathered during all MTER) of effectiveness of mitigation measures designed to avoid exposing marine mammals to MFAS. This evaluation shall identify the specific observations that support any conclusion the Navy reaches about the effectiveness of the mitigation.
- (2) Anti-submarine Warfare (ASW) Summary
  - (i) Total annual hours of each type of sonar source
  - (ii) Cumulative Impact Report
- (3) Sinking Exercises (SINKEX)
  - (i) Exercise information
  - (ii) Individual marine mammal observation information
- (4) Improved Extended Echo Ranging (IEER)/Advanced Extended Echo Ranging (AEER) Summary
  - (i) Total number of IEER and AEER events
  - (ii) Total expended/detonated rounds (buoys)
  - (iii) Total number of self-scuttled IEER rounds
- (5) Explosives Summary
  - (i) Total annual number of each type of explosive exercise
  - (ii) Total annual expended/detonated rounds for each explosive type

This Annual Report covers the period from 16 February 2014 to 3 August 2015, and the information represents the best practical data collection for this period. 3 August 2015 marks the final day of data collection and reporting under the MIRC EIS/OEIS. To provide accounting for the entire five year period of the authorization, the Navy is including the comprehensive totals of authorized source usage in the classified version of this final annual report. All authorized sonar and explosive sources were used at levels below the amount authorized by the National Marine Fisheries Service throughout the five years of this permit.

**(1) MIRC - MFAS/HFAS Major Training Exercise Summary**

This section summarizes authorized sonar use during MTER conducted in the Mariana Islands Range Complex (MIRC) during the reporting period.

**(i) Exercise information (for each MTER)**

**Table MI-1. MTER conducted in MIRC.**

(A) Exercise designator	(B) Date exercise began and ended	(C) Locations	(D) # and types of active sources used													(E) # and types of passive sources used													(F) # and types of vessels and aircraft participating													(G) Total hours of observation by watchstanders	(H) Total hours of all active sources	(I) Total hours of each active source						(J) Wave height (high, low, and average) (ft)
			(D)a SOS-53	(D)b SOS-56	(D)c BQQ-10 or 5	(D)d AQS-22 or 13F	(D)e MK-48	(D)f SSO-62 Sonobuoys	(D)g SOS-53	(D)h TB-16 or 29	(D)i SSO-53 Sonobuoys	(E)a CG	(E)b DDG	(E)c FFG	(E)d SH-60F/MH-60R dipping helo	(E)e SH-60B non-dipping helo	(E)f Submarines	(E)g MPRA	(E)h Non-ASW surface ships	(E)i USNS	(C)	(H)	(I)a SOS-53	(I)b SOS-56	(I)c BQQ-10 or 5	(I)d AQS-22 or 13F	(I)e MK-48 (Torpedoes)	(I)f SSO-62 (Sonobuoys)	(J)																					
JMSG	15-23 Sep 2014	MIRC	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#	8,541	912	#	#	#	#	#	#	#	62.5																				

# Classified information provided to National Marine Fisheries Service (NMFS) in a classified exercise report.  
 JMSG - Joint Multi-Strike Group Exercise  
 MIRC - Mariana Islands Range Complex

(ii) Individual marine mammal sighting information by exercise

Table M1-ii. MIRC MTER – Individual Marine Mammal Sighting Information:

(A) Location of sighting	(B) Species	(C) # of individuals	(D) Calves observed (Y/N)	(E) Initial detection sensor	(F) Platform detection from	(G) Length of time observed (min)	(H) Wave height (ft)	(I) Visibility (nm)	(J) Sonar source in use (Y/N)	(K) Range (yds)	(L) Mitigation implemented	(M) If hull mounted source in use, true bearing and animal travel	(N) Observed behavior
MIRC	whale	1	N	ACO	SURTASS	1320	3	7	Y	>2000	none	Whale bearing 250, ship course 134, relative motion nr	nr
MIRC	whale	1	N	ACO	SURTASS	1260	2	10	N	na	none	na	Classified based on passive narrowband acoustics
MIRC	whale	1	N	ACO	SURTASS	271	2	7	N	na	none	na	nr
MIRC	whale	1	N	ACO	SURTASS	35	2	7	N	na	none	na	nr
MIRC	generic	3	N	VIS	SURTASS	2	2	7	Y	<200	Shut down sonar	Mammal bearing 030, ship course 340, relative motion nr	nr
MIRC	dolphin	1	N	ACO	DDG	17	2	9	N	na	none	na	Marine mammals heard via AN/WQC-2. Assessed to be dolphins/porpoises.
MIRC	whale	1	N	ACO	SURTASS	245	3	10	Y	>2000	none	Whale bearing 318, ship course 034, relative motion nr	nr
MIRC	generic	1	N	ACO	SURTASS	5	3	10	Y	501-1000	Shut down sonar	Mammal bearing 250, ship course 035, relative motion nr	nr
MIRC	whale	1	N	ACO	SURTASS	1321	2	10	N	na	none	na	nr

Commander, U.S. Pacific Fleet Mariana Islands Range Complex Report

MIRC	whale	1	N	ACO	SURTASS	10	2	10	N	na	none	na	nr
MIRC	whale	1	N	ACO	SURTASS	720	2	10	Y	na	none	Whale bearing 309, ship course 170, relative motion nr	nr
MIRC	generic	1	N	VIS	SURTASS	1	2	10	Y	1001-2000	Shut down sonar	Mammal bearing 000, ship course 180, relative motion nr	nr
MIRC	whale	1	N	ACO	SURTASS	720	2	10	Y	na	none	Whale bearing 303, ship course 177, relative motion nr	nr

MIRC=Mariana Islands Range Complex, VIS=Visual, ACO=Acoustic, na=Not Applicable, nr=Not Reported

**(iii) Evaluation of effectiveness (based on data gathered during all MTER)**

Between 16 February 2014 and 3 August 2015, there was a single major training exercise conducted within the Mariana Islands Range Complex. In support of this MTER, the Navy conducted over 3,599 hours of Marine Species Awareness Training for 2,209 Navy personnel prior to the beginning of the exercise.

**Mitigation Effectiveness Discussion**

The three categories of mitigation measures (Personnel Training, Lookout and Watchstander Responsibility, and Operating Procedures) outlined in the MIRC EIS/OEIS and approved by NMFS (DoN 2010, NMFS 2009, 2010, 2012) were effective in detecting and appropriately mitigating exposure of marine mammal to mid-frequency active sonar. Fleet commanders and ship watch teams continue to improve individual awareness and enhance reporting practices. This improvement can be attributed to the various pre-exercise conferences, mandatory marine species awareness training, and making adjustments based upon the lessons learned. The mitigation zones were adhered to, and vessels applied mitigation measures when marine mammals were visually observed within the requisite zones.

There were 2 sightings of marine mammals within 1,000 yards while MFAS was in use during the single major training exercise. There were 5 other sightings while MFAS was in use, but range from the ship was either outside 1,000 yards or unable to be determined (acoustic detection). 85 percent (11 of 13) of marine mammal detections observed during this exercise were initially made via passive acoustic monitoring.

**Table M1-iii-2. Breakdown of marine mammals sighted in MIRC during MTER at ranges less than 1000 yards concurrent with MFAS use.**

<b>Range of Marine Mammal Sighting</b>		
<b>&lt; 200 yards</b>	<b>200 – 500 yards</b>	<b>500 – 1000 yards</b>
1 sighting of 3 mammals	0 sightings	1 sighting of 1 mammal



Table M1-iii-3. MIRC MTER where sonar was on during detection of marine mammals at ranges less than 1,000 yards and mitigation conducted.

1) Range [MIRC (M)]	2) MTE	3) Month	4) Species sighted	5) # of marine mammals sighted	6) Platform	7) Length of time observed (min)	8) Range at which marine mammal sighted	9) Mitigation [secure (SD); power down (PD); maneuver ship (MAN)]	10) Estimate MAX exposure PRIOR to mitigation (dB re 1µPa)	11) Number of minutes sonar mitigation applied	12) Estimate exposure AFTER mitigation (dB re 1µPa)	13) DISTANCE ship would have moved given length of mitigation and nominal 10-knot ship speed (yds)	14) If hull mounted source in use, true bearing, animal travel	15) Observed behavior
MIRC	JMSG	Sep14	generic	3	SURTASS	2	<200	SD	180	2	None	667	Mammal bearing 030, ship course 340, relative motion nr	nr
MIRC	JMSG	Sep14	generic	1	SURTASS	5	501-1000	SD	180	20	None	6,667	Mammal bearing 250, ship course 035, relative motion nr	nr

(U) Estimated exposures within 2000 yards can be determined based on standard formulas of how sound propagates in water. Spherical spreading is generally valid within 1000 yards from the sound source, and can be expressed as spreading loss (in dB from a source) equals  $20 \log R$  [with "R" being range from the source in yards (Urick 1982)]. Spherical spreading loss in the first 1000 yards equates to 60 dB of loss. At ranges between 1000 and 2000 yards the sound waves can become trapped by the sea surface and bottom (depending on water depth and other sound propagation factors) and not expand vertically. The spreading wave then forms an expanding cylinder. Cylindrical spreading loss in dB between two points can be calculated by using the formula  $(10 \log R_2/R_1)$ . Cylindrical spreading loss between 1000 and 2000 yards equates to an additional 3 dB of loss. By the time the sound wave has propagated to 2000 yards, the sonar signal strength has decreased by a total of at least 63 dB. Using the AN/SQS-53 sonar as an example transmitting at 235 dB subtracting the 63 dB of spreading loss equates to an estimated sonar Receive Level (RL) of 172 dB at 2000 yards. The spreading loss formulas are used to make very conservative assumptions about potential exposure. The formula is an estimation of spreading losses only and does not take into account other factors that could increase the total propagation losses such as oceanographic conditions, attenuation losses, scattering losses, and Navy-unique MFAS operating parameters which would result in slightly lower sonar transmit levels. Use of this approach to estimate potential RL at any given animal assumes the horizontal range from a visual sighting accounts for an animal across all depths at which an animal travels to predict the maximum, worst case potential exposure. In other words, this estimated worst case exposure is presented independent of the animal's actual depth level, since a) time and depth of current and previous dives cannot be deduced from a limited surface sighting, and b) oceanographic and tactical conditions influence actual sound propagation at different depths. Given relative motion of ships and animals at sea, the time spent with any given exposure from surface ships is likely to be limited.

nr=Not Reported

**(2) MIRC – ASW Summary**

**(i) Total annual hours of each type of sonar source**

Total annual hours of each type of sonar source used within MIRC between 16 February 2014 and 3 August 2015 is presented below.

**Table M2-i. Sonar authorization within MIRC by source.**

Authorized MPAS sources §218.100 (c)(1) of NMFS MIRC Final Rule	Amount used from Feb 2014 – Feb 2015	Annually Authorized	% Total Used of Total Authorized Annually	Amount used from Feb 2014 – Aug 2015	Nominal 18-month Authorized	% Total Used of Nominal 18-month Authorized
(i) AN/SQS-53 (hours)	#	2,173 hours	#	#	3,260 hours	#
(ii) AN/SQS-56 (hours)	#	141 hours	#	#	212 hours	#
(iii) AN/SSQ-62 (# of buoys)*	#	1,654 buoys	#	#	2,481 buoys	#
(iv) AN/AQS-22 (# of dips)**	#	592 dips	#	#	888 dips	#
(v) AN/BQQ-10 (hours)	#	12 hours	#	#	18 hours	#
(vi) Mk-48/Mk-46/Mk-54 (# of torpedoes)	#	40 runs	#	#	60 runs	#
(vii) AN/SSQ-110 (IEER) (# of buoys)	#	106 buoys	#	#	159 buoys	#
(viii) AN/SSQ-125 (ABER) (# of buoys)	#	106 buoys	#	#	159 buoys	#
(ix) Range Pingers	#	280 hours	#	#	420 hours	#
(x) PUTR Transponder	#	280 hours	#	#	420 hours	#

# Sensitive information provided to National Marine Fisheries Service (NMFS) in a classified exercise report.

\*ULT data is a combination of the number of reported buoys deployed as well as reported duration of use. The DICASS SSQ-62 buoy totals in this table use a conservative estimate of 7.5 minutes of active sonar per buoy (equates to 8 buoys per hour) when only duration is given, therefore the actual number of buoys used during ULT events may differ.

\*\*ULT data does not report actual number of dips an aircraft conducted, only the sonar hours. The number of dips shown in this table is based on a conservative empirical estimate of 30 minutes (equates to two dips per hour) of active sonar per dip, therefore the actual number of dips conducted during ULT events may differ.

**(ii) Cumulative Impact Report**

From NMFS Final Rule: *"To the extent practical, the Navy, in coordination with NMFS, shall develop and implement a method of annually reporting non-major training (i.e. ULT) utilizing hull mounted sonar. The report shall present an annual (and seasonal where practicable) depiction of non-major training exercises geographically across MIRC. The Navy shall include (in the MIRC annual report) a brief annual progress update on the status of the development of an effective and unclassified method to report this information until an agreed-upon (with NMFS) method has been developed and implemented."*

The precise locations and frequency of ASW training is classified. There is currently no method to declassify the sensitivity of this data in order to publish this type of information in an unclassified report. For this reason the only method available for this information to be currently disseminated is in a classified version of the annual exercise report which is provided directly to the National Marine Fisheries Service (NMFS).

**(3) MIRC – Sinking Exercises (SINKEX)**

**(i) Exercise information**  
**Table M3-i. Summary of SINKEX conducted in MIRC.**

(A) Location	(B) Date and time exercise began and ended	(C) Total hours of observation before, during, and after exercise	(D) Total number and types of rounds expended/explosives detonated	(E) Number and types of passive acoustic sources used in exercise	(F) Total hours of passive acoustic search time	(G) Number and types of vessels and aircraft participating	(H) Wave height in ft (High, Low, Avg)	(I) Narrative description of sensors and platforms used for marine mammal detection and timeline illustrating how marine mammal detection was conducted
MIRC	15 Sep 2014 Start: 0751 Stop: 1515	8 Hours and 45 minutes	#	0	0	#	High: 4 Low: 1 Average: 2	P-3 and F-18 aircraft conducted visual marine mammal surveillance starting prior to event on 15 September 2014 and continuing until 30 minutes after the vessel sank at 1515. No sightings of wildlife/marine mammals were reported in the vicinity of the impact area or mitigation zone during this exercise.

# Sensitive information provided to National Marine Fisheries Service (NMFS) in a classified exercise report.

**(ii) Individual marine mammal observation information**

**Table M3-ii-1. Mammal sighting information for SINKEX.**

(A) Location	(B) Species	(C) Number of individuals	(D) Calves observed (y/n)	(E) Initial detection sensor	(F) Length of observation (min)	(G) Wave height	(H) Visibility	(I) Sighted before/during/after exercise, and time (min)	(J) Distance of mammal from detonation	(K) Observed behavior	(L) Mitigation implementation	(M) If observation occurs during detonation, indicate munitions type
No sightings of wildlife/marine mammals were reported in the vicinity of the impact area or mitigation zone during this exercise.												

**(4) MIRC – IEER/AEER Summary**

Improved Extended Echo-Ranging System (IEER) and Advanced Extended Echo-Ranging System (AEER) sonobuoy use reported within MIRC during the reporting period 16 Feb 2014 through 3 Aug 2015 is shown in Table M4-1. AEER uses Multi-static Active Coherent (MAC) buoys which are non-explosive, tonal sonobuoys.

**Table M4-1. IEER/AEER events conducted and buoys expended, detonated, and self-scuttled.**

Period	# Events (i)	# Expended(ii)	# Detonated (ii)	# Self-scuttled (iii)
16 Feb 2014 to 3 Aug 2015	#	#	#	#
<b>Total Annual</b>	#	#	#	#

# Sensitive information provided to National Marine Fisheries Service (NMFS) in a classified exercise report.

**(5) MIRC – Explosives Summary**

**Table M5-1. Explosives usage in MIRC.**

<b>(i) Total annual number of each type of explosive exercise</b>			
<b>Authorized Exercise</b>	<b>Total Exercise Amount Feb14-Aug15</b>	<b>Amt. Annual Authorized</b>	<b>% Total Used To Total Authorized</b>
(A) Gunnery Exercises (S-S GUNEX)	#	12	#
(B) Bombing Exercise (BOMBEX)	#	4	#
(C) Sinking Exercise (SINKEX)	#	2	#
(D) Extended Echo Ranging and Improved Echo Ranging (IEER/AEER) Systems	#	106	#
(E) Demolitions (Underwater Demolition)	#	50	#
(F) Air to Surface Missile Exercises (A-S MISSILEX)	#	2	#
<b>(ii) Total annual expended/detonated rounds for each explosive type</b>			
<b>Category</b>	<b>Authorized quantity/year</b>	<b>Total Amount Used Feb 2014-Aug 2015</b>	
(A) 5" and 76 mm naval gunfire rounds	440	#	
(B) Bombs (Mk-82,83, 84, GBU-38, 32, 31)	4	#	
(C) SINKEX	HARPOON (10), 5" Rounds (800), HELLFIRE (4), MAVERICK (16), GBU-12 (20), GBU-10 (8), MK-48 (2), Underwater Demolitions (4)	#	
(D) IEER/AEER Systems	106	#	
(E) Demolitions	50	#	
(F) Maverick missiles	2	#	

# Sensitive information provided to National Marine Fisheries Service (NMFS) in a classified exercise report.