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Appendix E: Estimated Marine Mammal and Sea  
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Testing Activities



**Supplemental Environmental Impact Statement/  
Overseas Environmental Impact Statement  
Mariana Islands Training and Testing**

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## **APPENDIX E Estimated Marine Mammal and Sea Turtle Impacts from Exposure to Acoustic and Explosive Stressors Under Navy Training and Testing Activities**

Navy training and testing activities would result in the incidental takes of marine mammals and sea turtles within the Study Area. This appendix provides the estimated number of marine mammal and sea turtle impacts. Specifically, estimated impacts are derived from the quantitative analysis for activities under Alternatives 1 and 2 that involve the use of acoustic or explosive stressors. The quantitative analysis takes into account Navy activities, marine species density layers, acoustic modeling, and other environmental parameters. A detailed explanation of the quantitative analysis is provided in the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase III Training and Testing* (U.S. Department of the Navy, 2018). It is important to note that *impacts*, as discussed in this appendix, represent the estimated instances of take of marine mammals or sea turtles, not necessarily the number of individuals impacted (i.e., some marine mammals or sea turtles could be impacted several times, while others would not experience any impact). In addition, across training and testing activities, the seven-year total impacts in each table may be slightly more or less than seven times the maximum impact in any year.

### **E.1 ESTIMATED MARINE MAMMAL IMPACTS FROM SONAR AND OTHER TRANSDUCERS UNDER NAVY TRAINING AND TESTING ACTIVITIES**

Table E-1 provides a summary of the estimated number of marine mammal impacts from exposure to sonar and other transducers used during Navy training and testing activities under Alternatives 1 and 2 over the course of one year.

**Table E-1: Estimated Marine Mammals Impacts per Year from Sonar Training and Testing Activities**

<i>Species</i>	<i>Alternative 1 – Minimum</i>			<i>Alternative 1 – Maximum</i>			<i>Alternative 2 – Maximum</i>		
	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>
<b><i>Mysticetes</i></b>									
Blue whale*	4	19	0	4	19	0	4	20	0
Bryde’s whale	33	236	0	33	236	0	36	256	0
Fin whale*	4	18	0	4	18	0	5	20	0
Humpback whale*	46	387	0	46	387	0	51	419	0
Minke whale	8	78	0	8	78	0	9	84	0
Omura’s whale	3	23	0	3	23	0	3	25	0
Sei whale*	15	125	0	15	125	0	17	135	0
<b><i>Odontocetes</i></b>									
Blainville’s beaked whale	1,554	26	0	1,557	26	0	1,691	27	0
Cuvier’s beaked whale	599	4	0	600	4	0	642	4	0
Ginkgo-toothed beaked whale	3,366	63	0	3,373	63	0	3,659	65	0
Longman’s beaked whale	5,473	103	0	5,483	103	0	5,958	106	0
Bottlenose dolphin	104	21	0	104	21	0	116	21	0
Dwarf sperm whale	1,180	6,428	28	1,186	6,434	28	1,289	7,046	29
Pygmy sperm whale	463	2,593	11	465	2,595	11	508	2,840	11
False killer whale	571	117	0	573	117	0	641	121	0
Fraser’s dolphin	10,123	1,896	0	10,150	1,896	0	11,322	1,947	0

**Table E-1: Estimated Marine Mammals Impacts per Year from Sonar Training and Testing Activities (continued)**

<i>Species</i>	<i>Alternative 1 – Minimum</i>			<i>Alternative 1 – Maximum</i>			<i>Alternative 2 – Maximum</i>		
	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>
Killer whale	32	7	0	32	7	0	36	8	0
Melon-headed whale	2,058	488	0	2,064	488	0	2,305	508	0
Pantropical spotted dolphin	10,733	2,717	0	10,764	2,717	0	12,074	2,815	0
Pygmy killer whale	77	16	0	78	16	0	87	17	0
Risso’s dolphin	2,359	504	0	2,365	505	0	2,649	519	0
Rough-toothed dolphin	145	35	0	146	35	0	161	36	0
Short-finned pilot whale	873	172	0	876	172	0	986	176	0
Sperm whale*	184	11	0	184	11	0	192	11	0
Spinner dolphin	1,040	223	0	1,042	223	0	1,185	228	0
Striped dolphin	2,891	723	0	2,899	723	0	3,255	750	0

\* ESA-listed species within the MITT Study Area

Notes: PTS = permanent threshold shift, TTS = temporary threshold shift

**E.2 ESTIMATED MARINE MAMMAL IMPACTS PER SEVEN-YEAR PERIOD FROM SONAR AND OTHER TRANSDUCERS UNDER NAVY TRAINING AND TESTING ACTIVITIES**

Table E-2 provides a summary of the estimated number of marine mammal impacts from exposure to sonar and other transducers used during Navy training and testing activities under Alternatives 1 and 2 over the course of seven years.

**Table E-2: Estimated Marine Mammals Impacts per Seven-Year Period from Sonar Training and Testing Activities**

Species	Alternative 1 – 7-Year			Alternative 2 – 7-Year		
	Behavioral Response	TTS	PTS	Behavioral Response	TTS	PTS
<b>Mysticetes</b>						
Blue whale*	26	103	0	29	140	0
Bryde’s whale	226	1,338	0	253	1,792	0
Fin whale*	30	100	0	34	139	0
Humpback whale*	318	2,199	0	357	2,933	0
Minke whale	56	453	0	63	590	0
Omura’s whale	21	130	0	23	172	0
Sei whale*	105	708	0	119	947	0
<b>Odontocetes</b>						
Blainville’s beaked whale	10,117	118	0	11,844	189	0
Cuvier’s beaked whale	3,923	19	0	4,498	31	0
Ginkgo-toothed beaked whale	21,937	282	0	25,626	454	0
Longman’s beaked whale	35,630	477	0	41,731	743	0
Bottlenose dolphin	674	92	0	811	150	0
Dwarf sperm whale	8,275	37,761	127	9,029	49,298	204
Pygmy sperm whale	3,247	15,230	50	3,560	19,868	79
False killer whale	3,700	531	0	4,487	844	0
Fraser’s dolphin	64,859	8,401	0	79,242	13,627	0
Killer whale	209	32	0	255	54	0
Melon-headed whale	13,364	2,179	0	16,127	3,552	0
Pantropical spotted dolphin	69,701	12,367	0	84,487	19,707	0
Pygmy killer whale	499	71	0	609	117	0
Risso’s dolphin	15,223	2,288	0	18,536	3,630	0
Rough-toothed dolphin	943	162	0	1,127	252	0
Short-finned pilot whale	5,639	792	0	6,901	1,235	0
Sperm whale*	1,087	47	0	1,344	76	0
Spinner dolphin	6,747	970	0	8,292	1,598	0
Striped dolphin	18,723	3,257	0	22,776	5,250	0

\* ESA-listed species within the MITT Study Area

Notes: PTS = permanent threshold shift, TTS = temporary threshold shift

### E.3 ESTIMATED MARINE MAMMAL IMPACTS FROM EXPLOSIVES UNDER NAVY TRAINING AND TESTING ACTIVITIES

Table E-3 provides a summary of the estimated number of marine mammal impacts from exposure to explosives used during Navy training and testing activities under Alternatives 1 and 2 over the course of one year.

**Table E-3: Estimated Marine Mammals Impacts per Year from Explosive Training and Testing Activities**

Species	Alternative 1 – Minimum				Alternative 1 – Maximum				Alternative 2 – Maximum			
	Behavioral Response	TTS	PTS	Injury	Behavioral Response	TTS	PTS	Injury	Behavioral Response	TTS	PTS	Injury
<b>Mysticetes</b>												
Blue whale*	0	0	0	0	0	0	0	0	0	0	0	0
Bryde’s whale	3	1	0	0	3	2	0	0	4	2	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	5	3	0	0	6	3	0	0	6	3	0	0
Minke whale	1	1	0	0	1	1	0	0	1	1	0	0
Omura’s whale	0	0	0	0	0	0	0	0	1	0	0	0
Sei whale*	1	1	0	0	2	1	0	0	2	1	0	0
<b>Odontocetes</b>												
Blainville’s beaked whale	0	0	0	0	0	0	0	0	0	0	0	0
Cuvier’s beaked whale	0	0	0	0	0	0	0	0	0	0	0	0
Ginkgo-toothed beaked whale	0	1	0	0	0	1	0	0	1	1	0	0
Longman’s beaked whale	1	1	0	0	1	1	0	0	1	1	0	0
Bottlenose dolphin	0	0	0	0	0	0	0	0	0	0	0	0
Dwarf sperm whale	57	89	17	0	58	92	18	0	64	100	21	0
Pygmy sperm whale	23	32	7	0	23	33	8	0	25	37	8	0

**Table E-3: Estimated Marine Mammals Impacts per Year from Explosive Training and Testing Activities (continued)**

Species	Alternative 1 – Minimum				Alternative 1 – Maximum				Alternative 2 – Maximum			
	Behavioral Response	TTS	PTS	Injury	Behavioral Response	TTS	PTS	Injury	Behavioral Response	TTS	PTS	Injury
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0
Fraser’s dolphin	4	4	1	0	4	4	1	0	4	5	1	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	1	1	0	0	1	1	0	0	1	1	0	0
Pantropical spotted dolphin	4	2	1	0	4	2	1	0	4	3	1	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0
Risso’s dolphin	1	1	0	0	1	1	0	0	1	1	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	1	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0
Spinner dolphin	0	1	0	0	0	1	0	0	0	1	1	0
Striped dolphin	1	1	0	0	1	1	0	0	1	1	0	0

\* ESA-listed species within the MITT Study Area

Notes: PTS = permanent threshold shift, TTS = temporary threshold shift

#### E.4 ESTIMATED MARINE MAMMAL IMPACTS PER SEVEN-YEAR PERIOD FROM EXPLOSIVES UNDER NAVY TRAINING AND TESTING ACTIVITIES

Table E-4 provides a summary of the estimated number of marine mammal impacts from exposure to explosives used during Navy training and testing activities under Alternatives 1 and 2 over the course of seven years.

**Table E-4: Estimated Marine Mammals Impacts per Seven-Year Period from Explosive Training and Testing Activities**

<i>Species</i>	<i>Alternative 1 – 7-Year</i>				<i>Alternative 2 – 7-Year</i>			
	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>
<b><i>Mysticetes</i></b>								
Blue whale*	0	0	0	0	0	0	0	0
Bryde’s whale	21	11	0	0	22	11	0	0
Fin whale*	0	0	0	0	0	0	0	0
Humpback whale*	38	19	0	0	38	20	0	0
Minke whale	8	4	0	0	8	4	0	0
Omura’s whale	0	0	0	0	4	0	0	0
Sei whale*	11	5	0	0	12	5	0	0
<b><i>Odontocetes</i></b>								
Blainville’s beaked whale	0	0	0	0	0	0	0	0
Cuvier’s beaked whale	0	0	0	0	0	0	0	0
Ginkgo-toothed beaked whale	0	4	0	0	4	4	0	0
Longman’s beaked whale	5	7	0	0	5	8	0	0
Bottlenose dolphin	0	0	0	0	0	0	0	0
Dwarf sperm whale	403	635	125	0	446	686	137	0
Pygmy sperm whale	160	231	52	0	175	250	57	0
False killer whale	0	0	0	0	0	0	0	0
Fraser’s dolphin	28	30	7	0	29	33	8	0

**Table E-4: Estimated Marine Mammals Impacts per Seven-Year Period from Explosive Training and Testing Activities (continued)**

<i>Species</i>	<i>Alternative 1 – 7-Year</i>				<i>Alternative 2 – 7-Year</i>			
	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>	<i>Behavioral Response</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>
Melon-headed whale	8	4	0	0	8	4	0	0
Killer whale	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	28	17	6	0	30	18	7	0
Pygmy killer whale	0	0	0	0	0	0	0	0
Risso’s dolphin	7	5	0	0	7	6	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	4	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0
Spinner dolphin	0	6	0	0	0	6	4	0
Striped dolphin	5	5	0	0	6	6	0	0

\* ESA-listed species within the MITT Study Area

Notes: PTS = permanent threshold shift, TTS = temporary threshold shift

**E.5 ESTIMATED SEA TURTLE IMPACTS FROM SONAR AND OTHER TRANSDUCERS UNDER NAVY TRAINING AND TESTING ACTIVITIES**

Based on the quantitative analysis, no sea turtle impacts are anticipated from exposure to sonar and other transducers used during Navy training and testing activities under Alternatives 1 and 2 over the course of one year or seven years.

**E.6 ESTIMATED SEA TURTLE IMPACTS FROM EXPLOSIVES UNDER NAVY TRAINING AND TESTING ACTIVITIES**

Table E-5 provides a summary of the estimated number of sea turtle impacts from exposure to explosives used during Navy training and testing activities under Alternatives 1 and 2 over the course of one year.

**Table E-5: Estimated Sea Turtle Impacts per Year from Explosive Training and Testing Activities**

<i>Species</i>	<i>Alternative 1 – Minimum</i>			<i>Alternative 1 – Maximum</i>			<i>Alternative 2 – Maximum</i>		
	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>
<b><i>Explosive Training and Testing Activities</i></b>									
<b><i>Family Cheloniidae (hardshell turtles)</i></b>									
Green turtle*	6	3	0	6	3	0	6	3	0
Hawksbill turtle*	0	0	0	0	0	0	0	0	0
Loggerhead turtle*	0	0	0	0	0	0	0	0	0
<b><i>Family Dermochelyidae (scuteless turtles)</i></b>									
Leatherback turtle*	0	0	0	0	0	0	0	0	0

\* ESA-listed species within the MITT Study Area

Notes: PTS = permanent threshold shift, TTS = temporary threshold shift

**E.7 ESTIMATED SEA TURTLE IMPACTS PER SEVEN-YEAR PERIOD FROM EXPLOSIVES UNDER NAVY TRAINING AND TESTING ACTIVITIES**

Table E-6 provides a summary of the estimated number of sea turtle impacts from exposure to explosives used during Navy training and testing activities under Alternatives 1 and 2 per seven-year period.

**Table E-6: Estimated Sea Turtle Impacts per Seven-Year Period from Explosive Training and Testing Activities**

<i>Species</i>	<i>Alternative 1 – 7-Year</i>			<i>Alternative 2 – 7-Year</i>		
	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>	<i>TTS</i>	<i>PTS</i>	<i>Injury</i>
<b><i>Explosive Training and Testing Activities</i></b>						
<b><i>Family Cheloniidae (hardshell turtles)</i></b>						
Green turtle*	40	20	0	40	20	0
Hawksbill turtle*	0	0	0	0	0	0
Loggerhead turtle*	0	0	0	0	0	0
<b><i>Family Dermochelyidae (scuteless turtles)</i></b>						
Leatherback turtle*	0	0	0	0	0	0

\* ESA-listed species within the MITT Study Area

Notes: PTS = permanent threshold shift, TTS = temporary threshold shift

## **REFERENCES**

U.S. Department of the Navy. (2018). *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase III Training and Testing* (Technical Report prepared by NUWC Division Newport, Space and Naval Warfare Systems Center Pacific, G2 Software Systems, and the National Marine Mammal Foundation). Newport, RI: Naval Undersea Warfare Center.

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