



Virginia Capes (VACAPES) Range Complex

Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS)

Evaluating Potential Effects of Sound on Marine Life

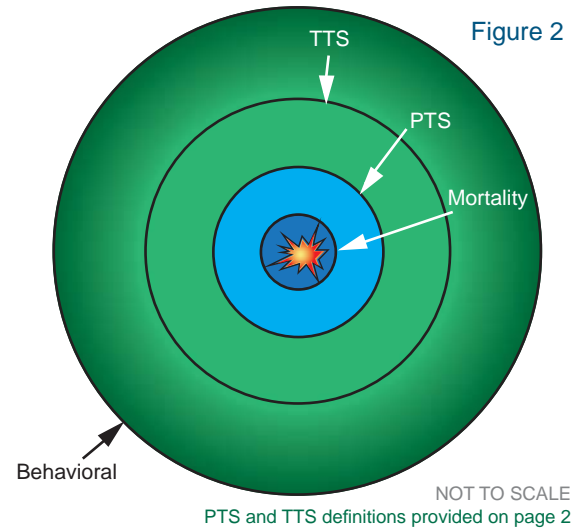
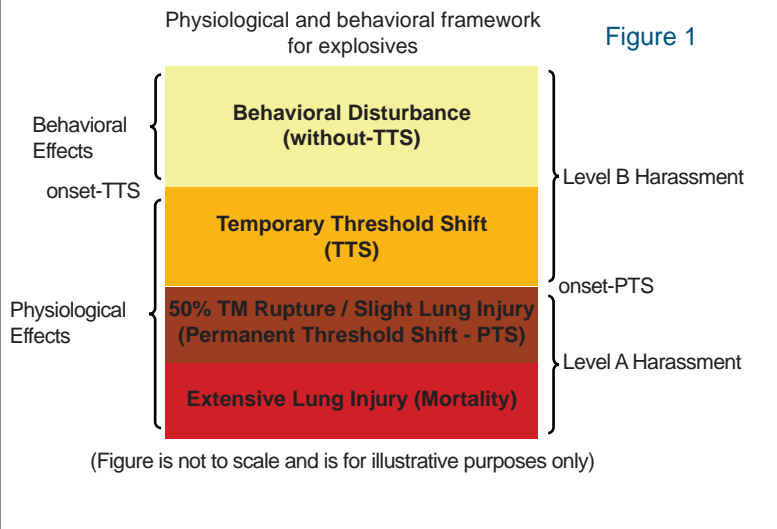
SOUND IN THE WATER

The VACAPES Range Complex EIS/OEIS analyzed Navy training and testing, including the use of explosives.

Navy training with explosives puts sound in the water that could lead to potential physiological effects or behavioral responses in marine animals.

As shown in Figures 1 and 2, sound radiates outward from the source. In general, the closer an animal is to the source, the louder the sound and greater the potential effects.

Sound in the water associated with explosives disperses or weakens as it move away from the source, consequently so does the potential for physiological or behavioral response in a marine animal.



EVALUATING THE EFFECTS OF SOUND IN THE WATER

The Navy evaluated potential effects of explosive sources on physical, biological, and human resources occurring within the VACAPES Range Complex. Resources considered include:

- Marine mammals
- Sea turtles
- Fish
- Sea birds
- Marine invertebrates

MODELING POTENTIAL EXPOSURES TO MARINE MAMMALS AND SEA TURTLES

The Navy's use of explosives puts sound into the marine environment.

The Navy modeled sounds from sources across various marine environments and seasons to determine the potential acoustic effects to marine animals. These sources include:

- Explosive 5 inch gun shells
- Explosive bombs
- Hellfire and Maverick missile warheads
- Underwater detonations associated with mine neutralization

Using the five general steps summarized below, the Navy was able to calculate the number of potential marine animal exposures to sound

- 1 Identify explosive source parameters
- 2 Determine sound propagation loss
- 3 Calculate the zone of influence
- 4 Determine marine mammal and sea turtle densities
- 5 Calculate potential exposures

MARINE MAMMALS

The softest sound a marine animal can hear at a specific frequency is called the hearing threshold at that frequency. Sounds above their hearing threshold are accommodated until a certain level of sound intensity or duration is reached. Too much exposure at a certain level might cause a temporary shift in the animal's hearing ability (similar to a rock concert effect), referred to as a temporary threshold shift (TTS). When exposure to sound ends, hearing is recovered over time. If the sound exposure further increases, a level can be reached at which the threshold shift will be permanent, called a permanent threshold shift (PTS).

The following table provides the estimated marine mammal exposures (mortality, physiological or behavioral) for all scenarios involving explosive sources under each alternative. Under Alternative 2 (Preferred), the possibility for mortality, physiological effects (PTS and TTS) and some altered behavior may occur as a result of sound in the water from Navy training and testing with explosive ordnance. The estimation of sound exposures does not consider the implementation of protective measures, which would reduce the likelihood of exposures at the highest sound levels.

Marine Mammals Total Annual Explosive Source Exposures (Physiological Effect and Behavioral Responses)				
Alternative	Predicted Physiological Exposures			Predicted Behavioral Exposures
	Mortality	PTS	TTS	
No Action Alternative	7	728	400	63,264
Alternative 1	7	729	422	63,264
Alternative 2 (PREFERRED)	1	36	166	3,586

SEA TURTLES

Based on the best available scientific data, the sensitive hearing ranges for sea turtles range from 200 Hz up to 700 Hz, with their sensitivity falling off considerably below 200 Hz. The following table provides the estimated sea turtle exposures (physiological or behavioral) for all scenarios involving explosive sources under each alternative. Under Alternative 2 (Preferred), the possibility for physiological effects (PTS and TTS) and some altered behavior may occur as a result of sound in the water from Navy training and testing with explosive ordnance. The estimation of sound exposures does not consider the implementation of protective measures, which would reduce the likelihood of exposures at the highest sound levels.

Sea Turtles Total Annual Explosive Source Exposures (Physiological Effect and Behavioral Responses)				
Alternative	Predicted Physiological Exposures			Predicted Behavioral Exposures
	Mortality	PTS	TTS	
No Action Alternative	2	97	106	11,234
Alternative 1	2	98	114	11,234
Alternative 2 (PREFERRED)	0	11	48	1,133

Public involvement is a fundamental part of the VACAPES Range Complex EIS/OEIS development and the Navy wants and appreciates your comments. The Navy has established several venues and informational resource areas for the public to learn more and provide input.

Comments on the Draft VACAPES Range Complex EIS/OEIS will be accepted via mail, fax, or the project Web site. All comments should be submitted no later than August 11, 2008 for consideration in the Final VACAPES Range Complex EIS/OEIS.

**THE NAVY
WANTS
YOUR
INPUT!**

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