REQUEST FOR A LETTER OF AUTHORIZATION FOR THE INCIDENTAL HARASSMENT OF MARINE MAMMALS RESULTING FROM NAVAL EXPLOSIVE ORDNANCE DISPOSAL SCHOOL (NEODS) TRAINING OPERATIONS

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LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

µPa	MicroPascal
AAC	Air Armament Center
AAC/EMSN	Air Armament Center/Natural Resources Branch
AFB	Air Force Base
AN/PQS-2A	Sonar Equipment
CFR	Code of Federal Regulations
dB	Decibels
dB re 1 µPa^2·s	Decibels Referenced to One MicroPascal Squared per Second
EFD	Energy Flux Density
EFDL	Energy Flux Density Level
EGTTR	Eglin Gulf Test and Training Range
EOD	Explosive Ordnance Disposal
ESA	Endangered Species Act
ft	Feet
GOM	Gulf of Mexico
HP	Horsepower
Hz	Hertz
in	Inch
in^2	Square Inch
in-lb	Inch-Pound
KHz	Kilohertz
km^2	Square Kilometers
lb	Pound
LOA	Letter of Authorization
m	Meters
MCM	Mine Countermeasures
MMPA	Marine Mammal Protection Act
NEOD	Navy Explosive Ordnance Disposal
NEODS	Naval Explosive Ordnance Disposal School
NEW	Net Explosive Weight
NM	Nautical Mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PBR	Potential for Biological Removal
Psi	Pounds per Square Inch
PTS	Permanent Threshold Shift
re	Referenced
s	Second
SAIC	Science Applications International Corporation
SERO	Southeast Regional Office
SRI	Santa Rosa Island
TM	Tympanic Membrane
TNT	2, 4, 6-trinitrotoluene
TTS	Temporary Threshold Shift
USAF	U.S. Air Force
USN	U.S. Navy
ZOI	Zone of Influence

EXECUTIVE SUMMARY

With this submittal, Eglin Air Force Base requests a Letter of Authorization (LOA) for the incidental taking (in the form of noise-related harassment), but not intentional taking, of small numbers of marine mammals incidental to the Naval Explosive Ordnance Disposal School (NEODS) testing within the Eglin Gulf Test and Training Range (EGTTR) over the next five years, as permitted by the Marine Mammal Protection Act (MMPA) of 1972, as amended. These tests may expose cetaceans that potentially occur within the EGTTR to noise. Because in-place mitigations would clear the area of any marine mammal before detonation, it is anticipated that no federally protected marine animal takes would result in the form of mortality or injury.

NEODS missions involve underwater detonations of small, live explosive charges adjacent to inert mines. Up to 30 charges (5 pounds net explosive weight per charge) per year would be detonated in the Gulf of Mexico (GOM) located approximately 3 nautical miles (NM) offshore of Eglin Air Force Base. Detonations would be conducted on the sea floor, adjacent to an inert mine, at a depth of approximately 60 feet.

The potential takes outlined in Section 6 represent the maximum expected number of animals that could be affected. Eglin Air Force Base (AFB) and NEODS have employed a number of mitigation measures in an effort to substantially decrease the number of animals potentially affected. Eglin AFB is committed to assessing the mission activity for opportunities to provide operational mitigations (i.e., visual clearance of the test area). Also, the use of conservative analyses (Section 11) serves as a functional mitigation technique.

Using a conservative density estimate for each species, the zone of influence (ZOI) of charges employed and the total number of events per year, an annual estimate of the potential number of animals exposed to noise (harassed, injured, or killed) was analyzed. Without any mitigation, up to one cetacean is estimated to be within the Level A 205 dB noise zone of influence. Level B noise would potentially affect up to eight cetaceans. No strategic marine mammal stocks would be affected. None of the marine mammal species that potentially could be taken are listed as threatened or endangered.

The information and analyses provided in this application are presented to fulfill the LOA requirements in Paragraphs (1) through (11) of 50 Code of Federal Regulations (CFR) 228.4(a).

1. DESCRIPTION OF ACTIVITIES

This section describes the mission activities conducted in the Eglin Gulf Test and Training Range (EGTTR) that could result in takes under the Marine Mammal Protection Act (MMPA) of 1972, as amended. The actions are Navy test missions involving underwater detonations with the potential to affect cetaceans that may occur within the EGTTR.

1.1 BACKGROUND

Potential impacts to listed species and habitat from Naval Explosive Ordnance Disposal School (NEODS) testing are limited to the sites offshore of Eglin Air Force Base shown in Figure 1-1. The EGTTR encompasses approximately 86,000 square miles within the Gulf of Mexico (GOM) and consists of the airspace over the GOM, which is scheduled and operated by Eglin Air Force Base (AFB). NEODS test areas are located approximately 3 nautical miles (NM) from shore, in approximately 60 feet of water and in area W-151 of the EGTTR.

The mission of NEODS is to detect, recover, identify, evaluate, render safe, and dispose of unexploded ordnance (UXO) that constitutes a threat to people, material, installations, ships, aircraft, and operations. The U.S. Navy EOD force of approximately 1,000 men and women has the equipment, mobility, and flexibility to tackle the global spectrum of threats in all world environments. Mine Countermeasures (MCM) detonations is one function of the U.S. Navy EOD force, which involves mine-hunting and mine-clearance operations. The NEODS facilities are located at Eglin AFB, Florida. The proposed training at Eglin AFB involves focused training on basic EOD skills. Examples of these fundamental skills are recognizing ordnance, reconnaissance, measurement, basic understanding of demolition charges, and neutralization of conventional and chemical ordnance.

The NEODS at Eglin AFB proposes to use the Gulf waters off of Santa Rosa Island (SRI) for a portion of the NEODS class. The NEODS would utilize areas approximately 1 to 3 NM offshore of Test Site A-15, A-10 or A-3 for MCM training (Figure 1-1). The goal of the training is to give NEODS students the tools and techniques to implement MCM through real scenarios. The students would be taught established techniques for neutralizing mines by diving and hand-placing charges adjacent to the mines. The detonation of small, live explosive charges adjacent to the mine disables the mine function. Inert mines are utilized for training purposes. This training would occur offshore of SRI six times annually, at varying times within the year.

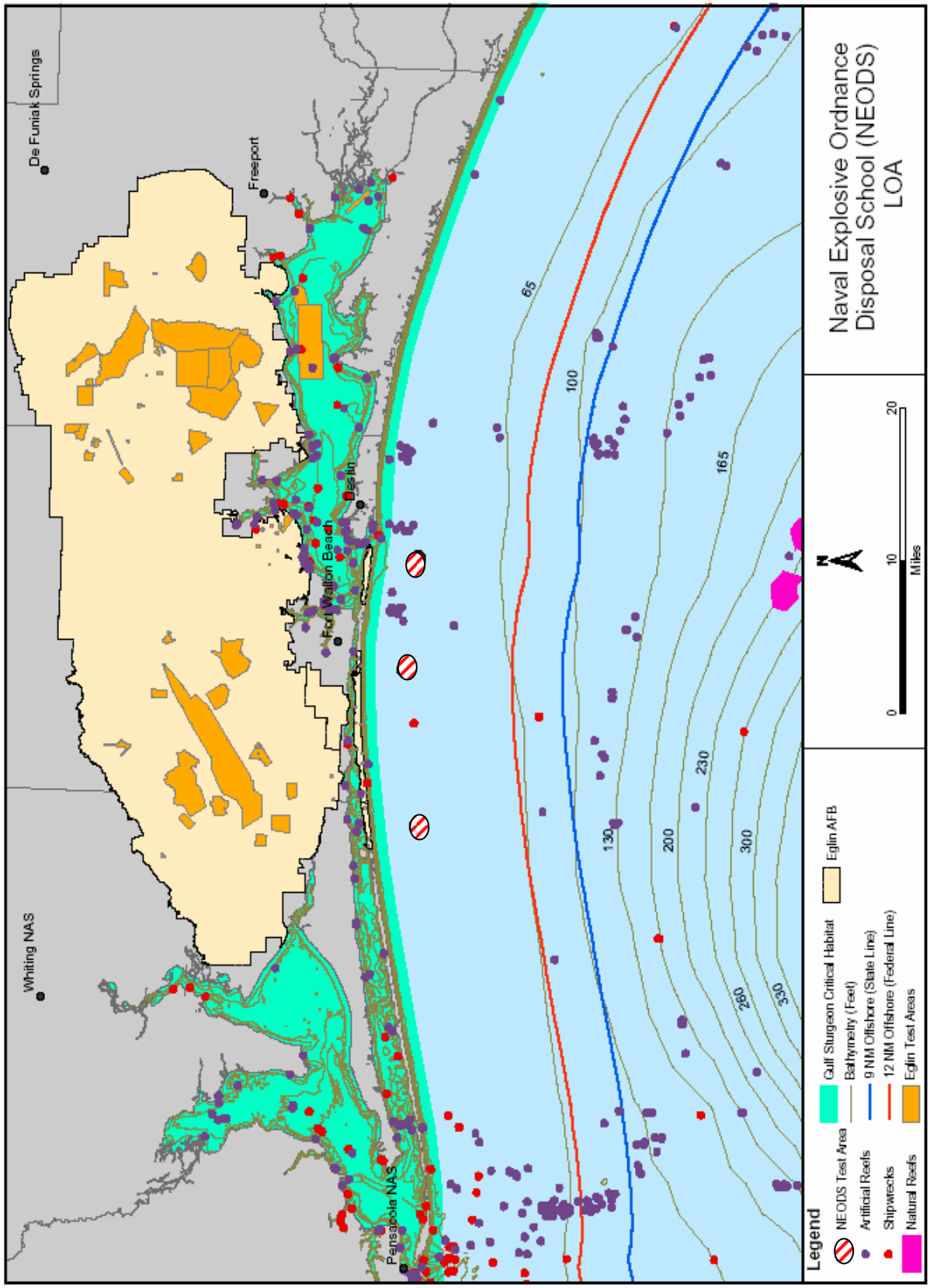

Figure 1-1. NEODS Test Locations in the Eglin Gulf Test and Training Range (EGTTR)

1.2 PROPOSED NEODS OPERATIONS

MCM training classes are 51 days in duration, with four days of on-site personnel in the Gulf of Mexico. Two of these four days will be utilized to lay the inert mines prior to the training. The other two days will require the use of live detonations in the Gulf of Mexico. One large safety vessel and five MK V inflatable 10-foot rubber boats with 50 horsepower (HP) engines would be used to access the Gulf of Mexico waters during training activities. The training procedures during the two "Live Demolition" days are described as follows.

First Live Demolition Day: Five inert mines will be placed in a compact area on the Gulf floor in approximately 60 feet of water. These five mines will be utilized for the one or two live demolition days. Divers will locate the mines by hand-held sonars (AN/PQS-2A acoustic locator and the Dukane Underwater Acoustic Locator System), which detect the mine casings (mine shape reacquisition). The hand-held sonar would not impact any protected marine species because the sonar ranges are below any current threshold for protected marine species (Table 1-1); therefore, potential noise impacts from sonars are not included in this analysis.

Five charges packed with C-4 explosive material will be set up adjacent to the mines. A charge includes detonation cord, non-electric caps, time fuses and fuse igniters with a total Net Explosive Weight (NEW) of nearly 6 pounds, with C-4 comprising 5 pounds of the total. No more than five charges will be utilized over the two-day period. Overpressure from the detonation is intended to disrupt the electrical charge on the mine, rendering it safe. The five 5-pound charges will be detonated individually with a maximum separation time of 20 minutes between each detonation. The time of detonation will be limited to an hour after sunrise and an hour before sunset. Mine shapes and debris will be recovered and removed from the Gulf waters when training is completed.

Second Live Demolition Day: The second day's efforts will follow the same procedure as the first day. This day will be utilized if the teams cannot complete their evolutions on day one. In other words, each team has two days to complete their entire evolution.

Table 1-1. Hand-held Sonar Characteristics

	AN/PQS-2A	Dukane
Frequency Operating Range	115 kHz – 145 kHz	30-45 kHz
Audible Frequency Range	n/a	250 Hz – 2500 Hz
Operating Frequency	115 kHz – 145 kHz	37.5 kHz +/- 1 kHz
Sound Pressure Level	178.5 re 1 microPascal @ 1 meter	157 – 160.5 re 1 microPascal @ 1 meter

2. DURATION AND LOCATION OF THE ACTIVITIES

NEODS missions would occur during the next five years utilizing resources within the Eglin Military Complex, including three sites in the EGTTR (Figure 1-1).

3. MARINE MAMMALS SPECIES AND NUMBERS

Marine mammal species that potentially occur within the EGTTR include several species of cetaceans and one sirenian, the West Indian manatee. During winter months, manatee distribution in the Gulf of Mexico is generally confined to southern Florida. During summer months, a few may migrate north as far as Louisiana. However, manatees primarily inhabit coastal and inshore waters and rarely venture offshore. NEODS missions would be conducted 1 to 3 NM from shore. Therefore, effects on manatees are considered very unlikely, and the discussion of marine mammal species is confined to cetaceans.

Cetacean abundance estimates for the study area are derived from GulfCet II aerial surveys of the continental shelf within the Minerals Management Service Eastern Planning Area, an area of 70,470 square kilometers (Davis et al., 2000). Texas A&M University and the National Marine Fisheries Service (NMFS) conducted the surveys from 1996 to 1998. Abundance and density data from the aerial survey portion of the survey best reflect the occurrence of cetaceans within the EGTTR, given that the survey area overlaps approximately one-third of the EGTTR and nearly the entire continental shelf region of the EGTTR where military activity is highest. The GulfCet II aerial surveys identified different density estimates of marine mammals for the shelf and slope geographic locations. Only the shelf data is used because NEODS missions will only be conducted on the shelf in nearshore waters. The dwarf and pygmy sperm whales are not included in this analysis because their chance of being found nearshore is remote. Even though Atlantic spotted dolphins do not normally inhabit nearshore waters, they are included in the analysis so that all possible encounters with marine mammals are covered and conservative measures are applied.

In order to provide better species conservation and protection, the species density estimate data were adjusted to reflect more realistic encounters of these animals in their natural environment and consider (1) temporal and spatial variations, (2) surface and submerged variations, and (3) overall density estimate confidence.

Temporal & Spatial Variations: The GulfCet II (1996–1998) aerial surveys have identified different density estimates of marine mammals between the winter and summer seasons, as well as between the shelf and slope geographic locations. Shelf density estimates are used in this document because of the nearshore nature of the missions.

Surface and Submerged Variations: The GulfCet II surveys focus on enumerating animals detected at the ocean surface and therefore do not account for submerged animals or animals missed by the observer. As such, GulfCet II surveys do not provide a relative density estimate for the entire potential population of any given species and are therefore negatively biased. To provide a more conservative impact analysis, density estimates have been adjusted to account for submerged individuals. The percent of time that an animal is submerged versus at the surface was utilized to determine an adjusted density for each species. The percent of time submerged for each species was obtained from Moore and Clarke (1998). Density estimates were adjusted to conservatively reflect the potential for undetected submerged animals.

Density Estimate Confidence: The density estimates of marine mammals from GulfCet II aerial surveys were determined with an associated standard deviation and resulting coefficient of

variation. Each of these analyses provides a measure of confidence about the resultant density estimate. An upper confidence value of 2.576 standard deviations (approximately a 99 percent confidence level) was utilized to further adjust the density estimate for each species.

Table 3-1 provides adjusted cetacean densities on the Gulf of Mexico shelf. Note that the adjusted density estimates are significantly greater than the GulfCet II estimates.

Table 3-1. Cetacean Densities for Gulf of Mexico Shelf Region

Species	Individuals/100 km^2 (From GulfCet II)	Individuals/km^2	Dive profile - % at surface	Adjusted density (Individuals/km^2)[a]
Bottlenose dolphin	14.798	0.148	30	0.810
Atlantic spotted dolphin	8.890	0.089	30	0.677
T. truncatus/S. frontalis	0.665	0.007	30	0.053
Totals	**24.4**	**0.245**		**1.553**

[a]Adjusted for undetected submerged animals to two standard deviations.

A brief description of each marine mammal species observed during GulfCet II aerial surveys on the shelf that has the potential to be present in the NEODS test area is provided below.

Atlantic bottlenose dolphins (*Tursiops truncatus*) occur in slope, shelf, and inshore waters of the Gulf. The average herd or group size of Atlantic bottlenose dolphins in shelf and slope waters was approximately four and 10 individuals, respectively, as determined by GulfCet II surveys of eastern Gulf waters (Davis et al., 2000). The diet of Atlantic bottlenose dolphins consists mainly of fish, crabs, squid, and shrimp (Caldwell and Caldwell, 1983).

Atlantic spotted dolphins (*Stenella frontalis*) can attain lengths of up to 8 feet at adulthood. Their distribution in the Atlantic ranges from the latitude of Cape May, New Jersey, along mainland shores to Venezuela, including the Gulf of Mexico and Lesser Antilles (Caldwell and Caldwell, 1983). The diet of the Atlantic spotted dolphin consists of squid and fish.

4. AFFECTED SPECIES STATUS AND DISTRIBUTION

The marine mammal species potentially affected include the Atlantic bottlenose dolphin and Atlantic spotted dolphin. In fulfillment of the MMPA, the NMFS has identified certain cetacean stocks as strategic, meaning non-natural mortalities or serious injuries (e.g., from commercial fishing) exceed the predicted maximum that the stock can withstand or insufficient information exists to make such a determination. The "maximum number of animals that may be removed from a stock while allowing the stock to maintain its optimal sustainable population is termed *potential for biological removal*," or PBR (Code of Federal Regulations, 1994). This metric is included for two of the affected species described below.

Generally, distribution of cetaceans in the Gulf is primarily influenced by hydrographic features and ocean depth. The dominant hydrographic feature in the Gulf is the Loop Current that, though generally south of the continental slope, can generate anti-cyclonic (clockwise circulating) and cyclonic (counterclockwise) eddies that move onto or influence the slope and shelf regions. During 1997-98 surveys of the northern Gulf of Mexico, cetaceans were concentrated along the continental slope and in or near cyclonic eddies (Davis et al., 2000).

Atlantic bottlenose dolphins (*Tursiops truncatus*) are distributed worldwide in tropical and temperate waters. Atlantic bottlenose dolphins occur in slope, shelf, and inshore waters of the entire Gulf of Mexico, and several stocks have been identified. In addition, a coastal and an offshore form of the bottlenose dolphin have been suggested. Baumgartner et al. (2001) suggest a bimodal distribution in the northern Gulf of Mexico, with a shelf population occurring out to the 150-meter isobath and a shelf break population out to the 750-meter isobath. Occurrence in water with depth greater than 1,000 meters is not considered likely and not applicable to this assessment. Migratory patterns from inshore to offshore are likely associated with the movements of prey rather than a preference for a particular habitat characteristic (such as surface water temperature) (Ridgeway, 1972; Irving, 1973; Jefferson et al., 1992). Bottlenose stocks for the shelf edge and slope are not considered strategic. The PBR for shelf and slope stocks is 45 dolphins (Waring et al., 2001).

Atlantic spotted dolphins (*Stenella frontalis*) are endemic to the tropical and warm temperate Atlantic Ocean. This species can be found from the latitude of Cape May, New Jersey, along mainland shores to Venezuela, including the Gulf of Mexico and Lesser Antilles (Caldwell and Caldwell, 1983). Sightings of this species are concentrated along the continental shelf and shelf edge (Fritts et al. 1983), but they also occur farther offshore. At one time, Atlantic spotted dolphins were considered to be the most abundant species of dolphin in offshore waters (Schmidly, 1981), with most sightings occurring at an average of 168 kilometers offshore. The preferred depth of the spotted dolphin is believed to be associated with food availability and water temperature. This stock is not considered strategic and the PBR is 23 dolphins (Blaylock et al., 1995).

5. TAKE AUTHORIZATION REQUESTED

A Letter of Authorization (LOA) for the incidental taking (but not intentional taking) of small numbers of marine mammals is requested. It is understood that an LOA is applicable to activities that may cause mortality, injury, and harassment to marine mammal species. The subsequent analyses in this request will identify Level B noise harassment as the primary form of take; however, there is a slight potential, before any mitigations, that small numbers of marine mammals may be injured or killed due to the energy generated from an explosive source on the sea floor.

6. NUMBERS AND SPECIES TAKEN

Marine mammals potentially may be harassed due to noise from NEODS missions involving underwater detonations. The potential numbers and species taken by noise are assessed in this

section. A NEODS mission has been described in Section 1. Three key sources of information are necessary for estimating potential noise effects on marine resources: (1) the number of distinct firing or test events; (2) the zone of influence (ZOI) for noise exposure; and (3) the density of animals that potentially reside within the zone of influence.

For the acoustic analysis, the exploding charge is characterized as a point source. The impact thresholds used for marine mammals relate to potential effects on hearing from underwater detonation noise. All marine mammals are protected under the MMPA. The same noise thresholds will also be applied to Endangered Species Act (ESA)-listed species of sea turtles. No ESA-listed marine mammals would be affected given the location of the Proposed Action in nearshore waters. The only ESA-listed marine mammal likely to be found in the northeastern Gulf of Mexico, the federal and state-listed endangered sperm whale, occurs farther out on the continental slope in water generally deeper than 600 meters. Manatees very rarely migrate into the area off of SRI and are not considered in this analysis.

For the explosives in question, actual detonation depths would occur at 60 feet near the sand bottom. Potentially, the inert mines and sea floor may interact with the propagation of noise into the water. However, effects on the propagation of noise into the water column cannot be determined without in-water noise monitoring at the time of detonation. Potential exposure of a sensitive species to detonation noise could theoretically occur at the surface or at any number of depths with differing consequences. A conservative acoustic analysis was selected to ensure the greatest direct path for the harassment ranges and to give the greatest impact range for the injury thresholds.

Criteria and Thresholds for Impact of Noise on Protected Species

Criteria and thresholds that are the basis of the analysis of NEODS noise impacts to cetaceans were initially used in U.S. Navy Environmental Impact Statements for ship shock trials of the SEAWOLF submarine and the WINSTON S. CHURCHILL vessel (DoN, 1998; DoN, 2001) and adopted by the National Marine Fisheries Service (NMFS, 2001). Supplemental criteria and thresholds have been introduced in the Eglin Gulf Test and Training (EGTTR) Programmatic Environmental Assessment (U.S. Air Force, 2002) and subsequent EGTTR LOA (U.S. Air Force, 2003) permit request.

Metrics

Standard impulsive and acoustic metrics were used for the analysis of underwater pressure waves in this document.

- *Energy flux density (EFD)* is the time integral of the squared pressure divided by the impedance. EFD levels have units of dB re 1 $\mu Pa^2 \cdot s$.
- *1/3-Octave EFD* is the energy flux density in a 1/3-octave frequency band; the 1/3 octave selected is the hearing range at which the subject animals' hearing is believed to be most sensitive.

Criteria and Thresholds: Injury (Level A Harassment)

Non-lethal injurious impacts are defined in this document as eardrum rupture (i.e., tympanic-membrane (TM) rupture) and the onset of slight lung injury. These are considered indicative of the onset of injury. The threshold for TM rupture corresponds to a 50 percent rate of rupture (i.e., 50 percent of animals exposed to the level are expected to suffer TM rupture); this is stated in terms of an EFD value of 1.17 in-lb/in^2, which is about 205 dB re 1 $\mu Pa^2 \cdot s$. This recognizes that TM rupture is not necessarily a life-threatening injury, but is a useful index of possible injury that is well-correlated with measures of permanent hearing impairment (e.g., Ketten (1998) indicates a 30 percent incidence of permanent threshold shift (PTS) at the same threshold).

Criterion and Thresholds: Non-Injurious Impacts (Level B Harassment)

The CHURCHILL criterion for non-injurious harassment is temporary (auditory) threshold shift (TTS), a slight, recoverable loss of hearing sensitivity (DoN, 2001). The criterion for TTS used in this document is 182 dB re 1 $\mu Pa^2 \cdot s$ maximum EFD level in any 1/3-octave band at frequencies above 100 Hz for toothed whales (e.g., dolphins). A 1/3-octave band above 10 Hz is used for impact assessments on baleen whales, which are not part of the affected environment of this project.

The CHURCHILL effort also introduced a second (dual) criterion for estimating TTS: 12 psi. The appropriate application of the dual TTS criteria is currently under debate by both the USAF and the USN. This 12-psi criterion was originally established for estimating the impact of a 10,000-pound explosive to be employed for the Navy's shock trial. It was introduced to provide a more conservative range for TTS when the explosive or the animal approaches the sea surface, in which case the explosive energy is reduced but the peak pressure is not.

For large explosives (2000 to 10,000 pounds) and animals not too close to the surface, the impact ranges for the two thresholds are about the same. However, for small-shot detonations, the ranges for the two TTS thresholds become quite different, with ranges for the peak pressure threshold several times greater than those for energy. Eglin endorses the Navy's proposal for appropriately "scaling" the peak pressure threshold, in order to more accurately estimate TTS for smaller shots while preserving the safety feature provided by the peak pressure threshold. As such, the energy-based criterion for TTS, 182 dB re 1 $\mu Pa^2 \cdot s$ (maximum EFD level in any 1/3-octave band), conservatively estimates non-injurious harassment for marine mammals.

Criterion and Thresholds: Behavioral Modification (Sub-TTS)

The scientific information necessary to adopt threshold criteria for assessing behavioral modifications is currently under debate and remains uncertain. Behavioral modification has been defined to address a noise level or other activities that may potentially cause marine mammals to alter normal biological behavior. NMFS defines these behavior responses as modifications resulting from repeated noise exposures (below TTS) to the same animals (i.e., resident) over a relatively short period of time. One recommendation (but not necessarily, nor exclusively, the only one) for a reasonable assessment criterion might consider a level of 6 dB below TTS, presently identified at 182 dB re 1 $\mu Pa^2 \cdot s$, as a threshold to assess potential behavioral responses. The behavioral threshold would then be 176 dB re 1 $\mu Pa^2 \cdot s$.

Table 6-1 provides a summary of threshold criteria and metrics for potential noise impacts to sensitive species.

Table 6-1. Threshold Criteria and Metrics Utilized for Impact Analyses

Level A Harassment	Level B Harassment	
Injurious; eardrum rupture (for 50% of animals exposed)	Non-injurious; temporary threshold shift (TTS) (temporary hearing loss)	Non-injurious behavioral response (for extended exposure times)
205 dB re 1 μPa^2•s EFD	182 dB re 1 μPa^2•s EFD* and/or 12 psi	176 dB re 1 μPa^2•s EFD*

* Note: In greatest 1/3-octave band above 10 Hz or 100 Hz

Risk Estimates

Methodology for Take Estimation

Noise ZOIs were calculated for bottom detonation scenarios at 60 feet for both lethality and harassment (Level A and Level B). To determine the number of potential "takes" or animals affected, cetacean population information from surveys was applied to the various ZOIs. The impact calculations for this section utilize marine mammal density estimates that have been derived from GulfCet II (1996–1998) surveys. In order to provide better species conservation and protection, the species density estimate data were adjusted to reflect more realistic encounters of these animals in their natural environment and consider temporal and spatial variations as well as surface and submerged variations. These calculations and estimates are explained in detail in Section 3, and adjusted density estimates are provided in Table 3-1.

Table 6-2 gives the estimated impact ranges for various explosive weights for summer and wintertime scenarios. The proposed test locations are 1 to 3 NM south of Santa Rosa Island. NEODS detonations were modeled for bottom detonations at 60 feet.

Although analyses also evaluated the potential for animals to experience a sub-TTS behavioral modification, no behavioral impacts (176 dB re 1 μPa^2•s) are anticipated with the NEODS test activities. Repetitive exposures (below TTS) to the same resident animals are highly unlikely due to the infrequent test events, the potential variability in target locations, and the continuous movement of marine mammals in the northern Gulf.

Table 6-2. Zones of Influence for Underwater Explosions

Ordnance	NEW (TNT in lbs)	Depth of Explosion (m)	Ranges for 182 dB EFDL in 1/3-Octave Band (m)	Ranges for EFDL > 205 dB (m)
Summer				
NEODS MCM charge	5	18	227.5	52.1
Winter				
NEODS MCM charge	5	18	229.8	52.2

EFDL = Energy Flux Density Level

Applying the harassment (182 and 205 dB) ranges in Table 6-2 to the species densities of Table 3-1, the number of animals potentially occurring within the zones of influence was estimated. These results are presented in Tables 6-3 and 6-4. The total number of animals potentially exposed is in bold. A whole animal (and potential take) is defined as 0.5 or greater, where calculation totals result in fractions of an animal. Where less than 0.5 animals are affected, no take is assumed.

Table 6-3. Marine Mammal Densities and Risk Estimates for Level A Harassment (205 dB EFD 1/3-Octave Band) Noise Exposure

Species	Density (km^2)	ZOI (m)	Number of Animals Exposed from 30 Detonations per Year
Summer			
Bottlenose dolphin	0.81	52.1	0.21
Atlantic spotted dolphin	0.677	52.1	0.18
T. truncatus/S. frontalis	0.053	52.1	0.01
TOTAL			**0.40**
Winter			
Bottlenose dolphin	0.81	52.2	0.21
Atlantic spotted dolphin	0.677	52.2	0.18
T. truncatus/S. frontalis	0.053	52.2	0.01
TOTAL			**0.40**

Table 6-4. Marine Mammal Densities and Risk Estimates for Level B Harassment (182 dB EFD 1/3-Octave Band) Noise Exposure

Species	Density (km^2)	ZOI (m)	Number of Animals Exposed from 30 Detonations per Year
Summer			
Bottlenose dolphin	0.81	227.5	3.96
Atlantic spotted dolphin	0.677	227.5	3.30
T. truncatus/S. frontalis	0.053	227.5	0.27
TOTAL			**7.53**
Winter			
Bottlenose dolphin	0.81	229.8	4.02
Atlantic spotted dolphin	0.677	229.8	3.36
T. truncatus/S. frontalis	0.053	229.8	0.27
TOTAL			**7.65**

Noise Effects Summary

The tables above indicate that the potential for non-injurious (Level B) harassment, as well as the onset of injury (Level A) harassment to cetaceans is possible but unlikely even without any mitigation measures. Wintertime ZOIs are slightly larger but do not significantly affect the

numbers of animals potentially exposed to noise. Summer and winter impact calculations are independent and should not be cumulative.

Less than one cetacean is estimated to be exposed to a Level A Harassment (205 dB re 1 $\mu Pa^2 \cdot s$) zone of influence. Level B Harassment (182 dB re 1 $\mu Pa^2 \cdot s$) noise would potentially affect less than eight cetaceans. None of the above impact estimates consider mitigation measures that will be employed by the proponent to minimize potential impacts to protected species. These mitigation measures are described in Section 11 and are anticipated to greatly reduce potential impacts to marine mammals.

7. IMPACTS TO MARINE MAMMAL SPECIES OR STOCKS

Based on the analyses and results provided in Section 6, no strategic marine mammal stocks would be affected, and none of the marine mammal species that could potentially be taken is listed as threatened or endangered. The PBR for each species is: bottlenose dolphin (45) and Atlantic spotted dolphin (23). No strategic marine mammal stocks would be affected.

8. IMPACT ON SUBSISTENCE USE

Potential impacts resulting from the Proposed Action will be limited to individuals of marine mammal species located in the Gulf of Mexico that have no subsistence requirements. Therefore, no impacts on the availability of species or stocks for subsistence use are considered.

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

The primary source of marine mammal habitat impact is noise resulting from live NEODS missions. However, the noise does not constitute a long-term physical alteration of the water column or bottom topography, as the occurrences are of limited duration and are intermittent in time. Surface vessels associated with the missions are present in limited duration and are intermittent as well.

Other sources that may affect marine mammal habitat were considered and potentially include the introduction of fuel, debris, ordnance, and chemical residues into the water column. The effects of each of these components were considered in the NEODS BA and were determined to not likely adversely affect protected marine species. Marine mammal habitat would not be affected.

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

Based on the discussions in Section 9, marine mammal habitat will not be lost or modified.

11. MEANS OF AFFECTING THE LEAST PRACTICABLE ADVERSE IMPACTS

The potential takes outlined in Section 6 represent the maximum expected number of animals that could be exposed to noise. None of the above impact estimates take into consideration measures that will be employed by the Proponent primarily to ensure the safety of test participants and non-participants alike, and secondly, to minimize impacts to protected species. The NEODS has employed a number of mitigation measures, which are discussed below, in an effort to substantially decrease the number of animals potentially affected. Eglin AFB is committed to assessing the mission activity for opportunities to provide operational mitigations while potentially sacrificing some mission flexibility.

Impact Minimization Measures and Proposed Management Practices

Prior to the mission, a trained observer aboard the largest surface support vessel will survey (visually monitor) the test area, a very effective method for detecting sea turtles and cetaceans. The area to be surveyed will be 230 meters (~ 0.15 NM) every direction from the target, which is approximately the size of the largest harassment ZOI. The trained observer will conduct ship-based monitoring for non-participating vessels as well as protected species. Surface observation would be effective out to several kilometers.

Weather that supports the ability to sight small marine life (e.g., sea turtles) is required in order to mitigate the test site effectively (DoN, 1998). Wind, visibility, and surface conditions of the Gulf of Mexico are the most critical factors affecting mitigation operations. Higher winds typically increase wave height and create "white cap" conditions, limiting an observer's ability to locate surfacing marine mammals and sea turtles. NEODS missions would be delayed if the sea state were greater than the Scale Number 3 described on Table 11-1 below. Such a delay would maximize detection of marine mammals and sea turtles.

Table 11-1. Sea State Scale for Marine Mammal and Sea Turtle Observation

Scale Number	Sea Conditions
0	Flat calm, no waves or ripples
1	Small wavelets, few if any whitecaps
2	Whitecaps on 0-33% of surface; 0.3 to 0.6 m (1 to 2 feet) waves
3	Whitecaps on 33-50% of surface; 0.6 to 0.9 m (2 to 3 feet) waves
4	Whitecaps on greater than 50% of surface; greater than 0.9 m (3 feet) waves

Shipboard Monitoring Team

Shipboard monitoring would be staged from the highest point possible on a support ship. The trained marine observer will be experienced in shipboard surveys and be familiar with the marine life of the area. The observer on the vessel must be equipped with optical equipment with sufficient magnification (e.g., binoculars, as these have been successfully used in monitoring activities from ships), which should allow the observer to sight surfacing mammals from a significant distance past the safety zone of 230 meters. The trained observer would be responsible for reporting sighting locations, which would be based on bearing and distance.

The trained observer will have proper lines of communication to avoid communication deficiencies to make Go/No-Go recommendations for the detonations. The observer recommends the Go/No-Go decision to the Officer in Tactical Command, who makes the final Go/No-Go decision.

Mitigation Procedures Plan

Stepwise mitigation procedures for NEODS missions are outlined below. All zones (TTS, injury, and safety zones) are monitored, plus a buffer area that is twice the size of the largest ZOI (460 meters or 0.25 nautical miles).

Pre-mission Monitoring: The purposes of pre-mission monitoring are to (1) evaluate the test site for environmental suitability of the mission (e.g., relatively low numbers of marine mammals and turtles, few or no patches of *Sargassum*, etc.) and (2) verify that the ZOI is free of visually detectable marine mammals, sea turtles, large schools of fish, large flocks of birds, large *Sargassum* mats, and large concentrations of jellyfish (both are possible indicators of turtle presence). On the morning of the test, the Officer in Tactical Command would confirm that the test sites can still support the mission and that the weather is adequate to support mitigation.

(a) Two Hours Prior to Mission

Approximately two hours prior to the mission, or at daybreak, the appropriate vessel(s) would be on-site near the location of the earliest planned detonation point. Observers onboard the vessels and the trained marine observer would assess the suitability of the test site, based on visual observation of marine mammals and sea turtles, the presence of large *Sargassum* mats, and overall environmental conditions (visibility, sea state, etc.). This information would be relayed to the Officer in Tactical Command.

(b) One Hour Prior to Mission

One hour prior to the mission, monitoring would commence within the test site to evaluate the test site for environmental suitability. The observer would monitor the area around the detonation site, out to 0.25 NM from the site, and record in a database all marine mammals and sea turtle sightings, including the time of each sighting.

(c) Five Minutes Prior to Mission

Visual monitoring would continue to document any protected animals seen inside the ZOI and farther out to 0.25 NM. If a marine mammal is traveling toward the test area, the time and distance can be calculated to determine if it will enter the test area during detonation.

(d) Go/No-Go Decision Process

The observer would plot and record sightings and bearing for all marine animals detected. This would depict animal sightings relative to the mission area. The observer would have the authority to declare the range fouled and recommend a hold until monitoring indicates that the test area is and will remain clear of detectable marine mammals or sea turtles.

(e) Throughout the Mission

Pre-mission monitoring of the test area will continue until the last detonation is complete. If any change in the status of the test area is observed or a protected marine mammal is sighted, the mission will be postponed until the area can be certified clear of protected marine mammals.

The mission would be postponed if:

1. Any marine mammal or sea turtle is visually detected within the ZOI. The delay would continue until the marine mammal or sea turtle that caused the postponement is confirmed to be outside of the ZOI due to the animal swimming out of the range.
2. Any marine mammal or sea turtle is detected in the ZOI (230 meter radius) and subsequently cannot be reacquired. The mission would not continue until the last verified location is outside of the ZOI and the animal is moving away from the mission area.
3. Large *Sargassum* rafts or large concentrations of jellyfish are observed within the ZOI. The delay would continue until the *Sargassum* rafts or jellyfish that caused the postponement are confirmed to be outside of the ZOI either due to the current and/or wind moving them out of the mission area.
4. Large schools of fish are observed in the water within 230 meters of the mission area. The delay would continue until the large fish schools are confirmed to be outside the ZOI.

In the event of a postponement, pre-mission monitoring would continue as long as weather and daylight hours allow. If a charge failed to explode, operations would attempt to recognize and solve the problem while continuing with all mitigation measures in place. The probability of this occurring is very remote but the possibility still exits. Should a charge fail to explode, the Proponent would attempt to identify the problem and detonate the charge with all marine mammal and sea turtle mitigation measures in place as described.

Post-mission monitoring: Post-mission monitoring is designed to determine the effectiveness of pre-mission mitigation by reporting any sightings of dead or injured marine mammals or sea turtles. Post-detonation monitoring would commence immediately following each detonation. Monitoring would continue for at least two hours after the last detonation, concentrating on the area down current of the test site.

Marine mammals or sea turtles killed by an explosion would likely suffer lung rupture, which would cause them to float to the surface immediately due to air in the blood stream. Animals that were not killed instantly but were mortally wounded would likely resurface within a few days, though this would depend on the size and type of animal, fat stores, depth, and water temperature (DoN, 2001). The monitoring team would attempt to document any marine mammals or turtles that were killed or injured as a result of the test and, if practicable, recover and examine any dead animals. The species, number, location, and behavior of any animals observed by the observation teams would be documented and reported to the Officer in Tactical Command.

The NMFS maintains stranding networks along coasts to collect and circulate information about marine mammal and sea turtle standings. Local coordinators report stranding data to state and regional coordinators. Any observed dead or injured marine mammal or sea turtle would be reported to the appropriate coordinator.

Summary of Mitigation Plan

In the event either any human safety concerns arise or protected species are sighted within the ZOI, the test will be postponed. The area to be surveyed will be 0.15 NM in every direction from the target (approximately the size of the largest harassment ZOI.). Additionally, a buffer area (0.25 NM) will be surveyed for protected marine animals moving toward the ZOI. The total area to be monitored is 0.2 NM^2. The survey vessel will leave the safety footprint immediately prior to detonation; however, given the relatively small impact area, visual observation of the ZOI will be ongoing.

Avoidance of impacts to schools of cetaceans will most likely be realized through visual monitoring since groups of dolphins are relatively easy to spot with the survey distances and methods that will be employed. Typically, solitary marine mammals such as sea turtles, while more challenging to detect, will also be afforded substantial protection through pre-mission monitoring.

Post-mission monitoring would be conducted for two hours after each mission and would attempt to document any marine mammals or turtles that were killed or injured as a result of the test and, if practicable, recover and examine any dead animals. Post-mission monitoring activities may include coordination with marine animal stranding networks if any dead or injured marine mammal or sea turtles are observed.

Hardbottom habitats and artificial reefs would be avoided to alleviate any potential impacts to protected habitat. NEODS testing would be delayed if large *Sargassum* mats or large schools of fish or jellyfish were found in the ZOI. Testing would resume only when the mats or schools move outside of the largest ZOI. The NEODS personnel will recover all debris from the targets and charges following test activities.

Conservative Estimates of Marine Mammal Densities

By using conservative mathematic calculations, conservative density estimates can serve as a respectable mitigation technique for take estimates. Marine mammal densities used to calculate takes were based on the most current and comprehensive Gulf of Mexico surveys available (GulfCet II). The densities are adjusted for the time the animals are submerged, and further adjusted by applying standard deviations to provide an approximately 99 percent confidence level. As an example, the density estimates for bottlenose dolphins range from 0.06 to 0.15 animals/km^2 in GulfCet II aerial surveys of the shelf and slope. However, the final adjusted density used in take calculations is 0.81 animals/km^2.

12. MINIMIZATION OF ADVERSE EFFECTS ON SUBSISTENCE USE

Based on the discussions in Section 8, there are no impacts on the availability of species or stocks for subsistence use.

13. MONITORING AND REPORTING MEASURES

Mitigations may include any supplemental activities that are designed, proposed, and exercised to help reduce or eliminate the potential impacts to the marine resources. The Air Force recognizes the importance of such "in-place" mitigations and is aware that NMFS recommends an approved mitigation plan that outlines the scope and effectiveness of the Proposed Action's mitigations.

The risk of harassment (Levels A & B) to marine mammals has been determined to be relatively small (Section 6). Eglin AFB has determined that with the implementation and commitment to utilizing the "visual monitoring" mitigations (Section 11), potential takes are greatly reduced.

For NEODS testing, areas to be used in missions are visually monitored for marine mammal presence from a surface vessel prior to detonation of mine neutralization charges. Monitoring would be conducted before missions to clear marine mammals and sea turtles within the ZOI. If protected animals are inside the ZOI, firing would be postponed until they left the area. The following procedures may be feasible during the mission activities using the operational aircraft.

- Conduct survey clearance procedures using best operational methods possible.
- Clear ZOI and avoid all protected species and *Sargassum* rafts to the maximum extent possible.
- Reconduct clearance procedures if dolphins, turtles, or *Sargassum* rafts are encountered.
- Conduct post-mission observation and report operations data as required by Eglin's Natural Resources Branch, AAC/EMSN.
- Submit an annual summary (coordinated through AAC/EMSN) of mission observations to:

National Marine Fisheries Service
Southeast Regional Office (SERO)
Protected Resources Division
9721 Executive Center Drive North
St. Petersburg, FL 33702

14. RESEARCH

Although Eglin AFB does not currently conduct independent Air Force monitoring efforts, Eglin's Natural Resources Branch does participate in marine animal tagging and monitoring

programs lead by other agencies. Additionally, the Natural Resources Branch also supports participation in annual surveys of marine mammals in the Gulf of Mexico with NOAA Fisheries. From 1999 to 2002, Eglin's Natural Resources Branch has, through a contract representative, participated in summer cetacean monitoring and research opportunities. The contractor participated in visual surveys in 1999 for cetaceans in Gulf of Mexico, photographic identification of sperm whales in the northeastern Gulf in 2001, and as a visual observer during the 2000 Sperm Whale Pilot Study and the 2002 sperm whale Satellite-tag (S-tag) cruise. Support for these research efforts is anticipated to continue.

Eglin AFB conducts other research efforts that utilize marine mammal stranding information as a means of ascertaining the effectiveness of mitigation techniques. Stranding data is collected and maintained for the Florida panhandle and Gulf-wide areas. This is undertaken through the establishment and maintenance of contacts with local, state, and regional stranding networks. Eglin AFB assists with stranding data collection by maintaining its own team of stranding personnel. In addition to simply collecting stranding data, various analyses are performed. Stranding events are tracked by year, season, and NMFS statistical zone, both Gulf-wide and on the coastline in proximity to Eglin AFB. Stranding data is combined with records of EGTTR mission activity in each water range and analyzed for any possible correlation. In addition to being used as a measure of the effectiveness of mission mitigations, stranding data can yield insight into the species composition of cetaceans in the region.

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