



## **NOAA FISHERIES**

**PROPOSED ACTION:** Issuance of Regulations and a Letter of Authorization to the U.S. Marine Corps to Take Marine Mammals by Harassment, Incidental to Training Activities in Pamlico Sound, North Carolina.

**TYPE OF STATEMENT:** Environmental Assessment

**LEAD AGENCY:** U.S. Department of Commerce  
National Oceanic and Atmospheric Administration  
National Marine Fisheries Service

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**LOCATION:** Brant Island Bombing Target (BT-9) and Piney Island Bombing Range (BT-11) located within Marine Corps Air Station Cherry Point Range Complex in Pamlico Sound, North Carolina

**ABSTRACT:** This Environmental Assessment analyzes the environmental impacts of the National Marine Fisheries Service, Office of Protected Resources proposal to issue 5-year regulations and subsequent Letter of Authorization pursuant to section 101(a)(5)(A) of the Marine Mammal Protection Act for the unintentional taking of marine mammals incidental to military readiness training activities at BT-9 and BT-11, from March 2015 to March 2020.

**DATE:** February 2015

## CONTENTS

<b>LIST OF ABBREVIATIONS OR ACRONYMS .....</b>	<b>ii</b>
1.1 DESCRIPTION OF PROPOSED ACTION .....	1
1.1.1 BACKGROUND ON THE MARINE CORPS' MMPA APPLICATION .....	2
1.1.2 MARINE MAMMALS IN THE ACTION AREA .....	2
1.2 PURPOSE AND NEED .....	3
1.3 THE ENVIRONMENTAL REVIEW PROCESS .....	5
1.3.1 LAWS, REGULATIONS, OR OTHER NEPA ANALYSES INFLUENCING THE EA'S SCOPE .....	5
1.3.2 SCOPE OF ENVIRONMENTAL ANALYSIS .....	7
1.3.3 INTEGRATING NEPA REVIEW WITH OTHER ENVIRONMENTAL REVIEWS .....	7
1.3.4 RELEVANT COMMENTS ON OUR <i>FEDERAL REGISTER</i> NOTICE .....	8
1.4 OTHER PERMITS, LICENSES, OR CONSULTATION REQUIREMENTS REQUIRED BY NOAA .....	9
1.4.1 ENDANGERED SPECIES ACT .....	9
1.4.2 MARINE MAMMAL PROTECTION ACT .....	9
1.4.3 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT .....	9
<b>CHAPTER 2 – ALTERNATIVES .....</b>	<b>10</b>
2.1 INTRODUCTION .....	10
2.2 DESCRIPTION OF THE MARINE CORPS' PROPOSED ACTIVITIES .....	10
2.2.1 SPECIFIED TIME AND AREAS .....	11
2.2.2 SURFACE-TO-SURFACE EXERCISES .....	12
2.2.3 AIR-TO-SURFACE EXERCISES .....	13
2.2.4 ORDNANCE USAGE AND ESTIMATED ANNUAL EXPENDITURES .....	16
2.3 DESCRIPTION OF ALTERNATIVES .....	17
2.3.1 ALTERNATIVE 1 – ISSUANCE OF AN AUTHORIZATION WITH MITIGATION MEASURES .....	17
2.3.2 ALTERNATIVE 2 – NO ACTION ALTERNATIVE .....	21
2.3.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION .....	21
<b>CHAPTER 3 – AFFECTED ENVIRONMENT .....</b>	<b>22</b>
3.1 PHYSICAL ENVIRONMENT .....	22
3.1.1 MARINE MAMMAL HABITAT .....	22
3.2 BIOLOGICAL ENVIRONMENT .....	22
3.2.1 MARINE MAMMALS .....	22
<b>CHAPTER 4 – ENVIRONMENTAL CONSEQUENCES .....</b>	<b>26</b>
4.1 EFFECTS OF ALTERNATIVE 1 – ISSUANCE OF AN AUTHORIZATION WITH MITIGATION MEASURES .....	26
4.1.1 IMPACTS TO MARINE MAMMAL HABITAT .....	26
4.1.2 IMPACTS TO MARINE MAMMALS .....	27
4.2 EFFECTS OF ALTERNATIVE 2 – NO ACTION ALTERNATIVE .....	30
4.2.1 IMPACTS TO MARINE MAMMAL HABITAT .....	30
4.2.2 IMPACTS TO MARINE MAMMALS .....	30
4.3 COMPLIANCE WITH NECESSARY LAWS – NECESSARY FEDERAL PERMITS .....	31
4.4 UNAVOIDABLE ADVERSE IMPACTS .....	31
4.5 CUMULATIVE EFFECTS .....	31
4.5.1 UNUSUAL MORTALITY EVENT (UME) FOR BOTTLENOSE DOLPHINS .....	31
4.5.2 MILITARY ACTIVITIES .....	32
4.5.3 FUTURE OIL AND GAS EXPLORATION .....	32
4.5.4 RECREATIONAL FISHING ACTIVITIES .....	32
4.5.5 CLIMATE CHANGE .....	32
4.5.6 CONCLUSION .....	33
<b>REFERENCES .....</b>	<b>35</b>

## LIST OF ABBREVIATIONS OR ACRONYMS

BT	Bombing Target
BT-9	Brant Island Bombing Target
BT-11	Piney Island Bombing Target
cal	caliber
CFR	Code of Federal Regulations
Commission	Marine Mammal Commission
dB	decibel
DOD	Department of Defense
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act of 1973 (16 U.S.C. 1531 <i>et seq.</i> )
FONSI	Finding of No Significant Impact
FR	<i>Federal Register</i>
ft	feet
HE	High Explosives
Hz	hertz
IHA	Incidental Harassment Authorization
ITA	Incidental Take Authorization
km	kilometer
km <sup>2</sup>	square kilometer
LOA	Letter of Authorization
m	meter
mi <sup>2</sup>	square mile
mm	millimeter
MCAS	Marine Air Corps Station
MMPA	Marine Mammal Protection Act of 1972, as amended (16 U.S.C. 1361 <i>et seq.</i> )
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
μPa	micropascal
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act of 1969 (42 U.S.C. 4321 <i>et seq.</i> )
NEW	Net explosive weight
NNCE	Northern North Carolina Estuarine stock of bottlenose dolphins
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
OMB	Office of Management and Budget
Opinion	Biological Opinion
SNCE	Southern North Carolina Estuarine stock of bottlenose dolphins
SMC	Southern Migratory Coastal stock of bottlenose dolphins
UME	Unusual Mortality Event
USFWS	U.S. Fish and Wildlife Service
USMC	U.S. Marine Corps

## CHAPTER 1 – INTRODUCTION AND PURPOSE AND NEED

### 1.1 DESCRIPTION OF PROPOSED ACTION

The Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 *et seq.*) prohibits the incidental taking of marine mammals. However, there are exceptions to the MMPA's prohibition on take. The National Marine Fisheries Service (hereinafter, NMFS or the Service), Office of Protected Resources, Permits and Conservation Division may authorize the incidental taking of marine mammals upon the request of a U.S. citizen<sup>1</sup> provided that the Service follows certain statutory and regulatory procedures and make determinations (*Section 1.2 discusses this exception in more detail*).

The incidental take of a marine mammal falls under four categories: mortality, serious injury, injury, or harassment. The MMPA defines harassment as any act of pursuit, torment, or annoyance which: (1) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (2) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

The U.S. Marine Corps (Marine Corps) has requested regulations and a Letter of Authorization (LOA) to take marine mammals, specifically bottlenose dolphins (*Tursiops truncatus*), incidental to training operations within two bombing targets (Brant Island Bombing Target (BT-9) and Piney Island Bombing Target (BT-11)) in Pamlico Sound, North Carolina. These training operations qualify as military readiness activities.

In response to their request, NMFS proposes to promulgate 5-year regulations and subsequently issue one 5-year LOA per Section 101(a)(5)(A) the MMPA. These regulations and subsequent LOA would allow the Marine Corps to take marine mammals by Level A and Level B harassment only, incidental to the conduct of their activities, March 2015 through March, 2020. The proposed regulations and subsequent LOA would not authorize take by mortality or serious injury. NMFS does not have the authority to permit, authorize, or prohibit the Marine Corps' training activities under Section 101(a)(5)(A) of the MMPA, as that authority lies with the Department of Defense (DOD).

NMFS' proposed promulgation of regulations and subsequent issuance of an LOA to the Marine Corps is a major federal action under the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*), the Council on Environmental Quality (CEQ) regulations in 40 CFR §§ 1500-1508, and NOAA Administrative Order (NAO) 216-6. Thus, NMFS must analyze the effects of the Service's proposed action on the human environment.

This Environmental Assessment (EA) addresses the potential environmental impacts of the following choices available to us under section 101(a)(5)(A) of the MMPA, namely:

- Proposed issuance of 5-year regulations and a subsequent issuance of a 5-year LOA to the Marine Corps, taking into account the prescribed means of take, mitigation measures, and monitoring requirements;

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<sup>1</sup> Section 101(a)(5)(A) of the MMPA allows the authorization of take incidental to a specified activity (*other than commercial fishing*) only when a U.S. citizen conducts the activity. Section 3(10) of the MMPA defines the term "person", in part, as "any...department, or instrumentality of the Federal Government....", and NMFS has defined "U.S. citizens" at 50 CFR 216.103 as "individual U.S. citizens or any corporation or similar entity organized under the laws of the United States....", also stating that "U.S. Federal, state and local government agencies shall also constitute citizens of the United States...."

- No issuance of 5-year regulations and no subsequent issuance of a 5-year LOA, in which case, for the purposes of NEPA analysis only, NMFS assumes that the proposed activities would proceed and cause incidental take without the mitigation and monitoring measures prescribed in the proposed issuance of 5-year Regulations and a subsequent LOA; or

### **1.1.1 BACKGROUND ON THE MARINE CORPS' MMPA APPLICATION**

The Marine Corps plans to conduct weapons delivery training exercises (air-to-surface and surface-to-surface) at two water-based bombing targets (BT-9 and BT-11) located within the Cherry Point Range Complex in North Carolina. The Marine Corps must meet its statutory responsibility to organize, train, equip, and maintain combat-ready Marine Corps forces at the BT-9 and BT-11 bombing targets in Pamlico Sound, North Carolina. The bombing targets provide unique training environments and are of vital importance to the readiness of Marine Corps forces.

The types of ordnances proposed for use at the BT-9 and BT-11 bombing targets include gun ammunition (small and large arms), rockets, grenades, bombs, and pyrotechnics. Training for the military readiness activities would occur between March 2015 and March 2020, year-round, day or night, with no seasonal restrictions. Active sonar is not a component of the proposed training activities.

These operations, which constitute a military readiness activity, have the potential to cause Level A and Level B harassment to marine mammals in the vicinity of the two bombing targets. The following aspects of the proposed exercises are likely to result in take by Level B (behavioral) and Level A harassment of individuals of Atlantic bottlenose dolphins: exposure to sound and pressure from underwater detonations. We describe the Marine Corps' training activities in more detail in section 2.2.

The proposed regulations would establish a framework for authorizing incidental take in a future 5-year LOA. The LOA, if approved, would authorize the take of Atlantic bottlenose dolphins, by Level A and Level B (behavioral) harassment only.

### **1.1.2 MARINE MAMMALS IN THE ACTION AREA**

There is one species of marine mammal with possible or confirmed occurrence in the area of the specified activity: the Atlantic bottlenose dolphin, which routinely frequents Pamlico Sound (DoN, 2003; Lefebvre *et al.*, 2001). This is the only marine mammal species that would most likely experience harassment incidental to the Marine Corps' training activities.

Table 1 lists the four designated coastal and estuarine stocks for the Atlantic bottlenose dolphin that may occur within the proposed activity areas. Dolphins encountered at BT-9 and BT-11 would most likely belong to the Northern North Carolina Estuarine System and the Southern North Carolina Estuarine System stocks (Read *et al.*, 2003a, 2003b).

**Table 1** – Odontocetes with possible and/or confirmed occurrence in the proposed activity area.

Atlantic Bottlenose Dolphin Stocks within North Carolina Waters	
1	Western North Atlantic Northern Migratory Coastal
2	Western North Atlantic Southern Migratory
3	Northern North Carolina Estuarine System
4	Southern North Carolina Estuarine System

### 1.1.3 SPECIES NOT CONSIDERED DUE TO RARITY IN THE ACTION AREA

NMFS does not consider the following marine mammals species in this EA because their range does not overlap with the action area or they are rarely present in the proposed action area (Waring *et al.*, 2014). The region of influence for the Marine Corps’ proposed action includes nearshore estuarine waters and does not include offshore waters. Therefore, take is unlikely for these offshore and pelagic species listed in Table 2 (DoN, 2009; NMFS, 2012, 2014c).

**Table 2** – Species with rare or uncommon occurrence in the proposed activity area.

Species Not Considered Further in this EA		
1	West Indian manatee <sup>1</sup>	<i>Trichechus manatus</i>
2	North Atlantic right whale	<i>Eubalaena glacialis</i>
3	Blue whale	<i>Balaenoptera musculus</i>
4	Fin whale	<i>Balaenoptera physalus</i>
5	Humpback whale	<i>Megaptera novaeangliae</i>
6	Sei whale	<i>Balaenoptera borealis</i>
7	Sperm whale	<i>Physeter macrocephalus</i>
8	Atlantic spotted dolphin	<i>Stenella frontalis</i>
9	Common dolphin	<i>Delphinus delphis</i>

<sup>1</sup> This species is under the jurisdiction of the U.S. Fish and Wildlife Service.

## 1.2 PURPOSE AND NEED

The MMPA prohibits “takes” of marine mammals with only a few specific exceptions. The applicable exception in this case is an exemption for incidental take of marine mammals in section 101(a)(5)(A) of the MMPA.

Section 101(a)(5)(A) of the MMPA directs the Secretary of Commerce (Secretary) to authorize, upon request, the incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region, if we make certain findings and issue regulations.

The National Defense Authorization Act of 2004 (NDAA; Public Law 108–136) removed the ‘small numbers and specified geographical region limitations indicated earlier and amended the definition of harassment as it applies to a military readiness activity to read as follows: (i) Any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild [Level A Harassment]; or (ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered [Level B Harassment]. Entities seeking to obtain authorization for the incidental take of marine mammals under our jurisdiction must submit such a request (in the form of an application) to us.

We have issued regulations to implement the Incidental Take Authorization provisions of the MMPA (50 CFR § 216) and have produced Office of Management and Budget (OMB)-approved application instructions (OMB Number 0648-0151) that prescribe the procedures necessary to apply for incidental take authorizations. All applicants must comply with the regulations at 50 CFR § 216.104 and submit applications requesting incidental take according to the provisions of the MMPA.

**Purpose:** The primary purpose of NMFS' proposed action is to authorize—per the MMPA—the take of marine mammals, incidental to the Marine Corps' proposed activities. The proposed regulations and subsequent LOA would exempt the Marine Corps from the take prohibitions contained in the MMPA.

To authorize the take of marine mammals in accordance with Section 101(a)(5)(A) of the MMPA, NMFS must evaluate the best available information to determine whether the take, if authorized, would have a negligible impact on the affected marine mammal species or stock (*i.e.*, the population level) and have an unmitigable impact on the availability of the affected species or stock for certain subsistence uses (where relevant). NMFS cannot issue the proposed regulations and subsequent LOA if the action would result in more than a negligible impact on marine mammal species or stocks or if it would result in an unmitigable impact on subsistence uses.

In addition, NMFS must prescribe, where applicable, the permissible methods of taking and other means of effecting the least practicable adverse impact on the marine mammal species or stocks and their habitat (*i.e.*, mitigation), paying particular attention to rookeries, mating grounds, and other areas of similar significance. NMFS' duty under this least practicable adverse impact standard is to prescribe mitigation reasonably designed to minimize, to the extent practicable, any adverse population level impacts, as well as habitat impacts. While one can minimize population-level impacts only by reducing impacts on individual marine mammals, not all take translates to population-level impacts. Thus, NMFS' objective under the least practicable adverse impact standard is to design mitigation targeting those impacts on individual marine mammals that would most likely to lead to adverse population-level effects (78 FR at 78113 and 78135, 2013a). If appropriate, NMFS must also prescribe the means of effecting the least practicable impact on the availability of the species or stocks of marine mammals for subsistence uses. Incidental take authorizations must also include requirements or conditions pertaining to the monitoring and reporting of such taking—in large part to better understand the effects of such taking on the species or stock. Also, NMFS must publish a proposed rule in the *Federal Register* for public notice and comment.

The purpose of this action is therefore to determine whether the take resulting from the Marine Corps' activities would have a negligible impact on affected marine mammal species or stocks and develop mitigation and monitoring measures to reduce the potential impacts.

**Need:** As noted above this section, the MMPA establishes a general moratorium or prohibition on the take of marine mammals, including take by Level A and Level B harassment, serious injury, or mortality. The MMPA establishes a process where individuals engaged in specified activities within a specified geographic area may request a take authorization for the incidental take of small numbers of marine mammals.

On January 28, 2013, the Marine Corps submitted an application demonstrating both the need and potential eligibility for the proposed issuance regulations and a subsequent LOA in connection with the activities described in section 1.1.1. NMFS now has a corresponding duty to determine whether and how NMFS can authorize take of individuals of bottlenose dolphins, incidental to the activities described in their application. NMFS' responsibilities under section 101(a)(5)(A) of the MMPA and its implementing regulations establish and frame the need for this proposed action.

Any alternatives considered under NEPA must meet the Service's statutory and regulatory requirements. NMFS' described purpose and need guide the Service in developing reasonable alternatives for consideration, including alternative means of mitigating potential adverse effects.

### **1.3 THE ENVIRONMENTAL REVIEW PROCESS**

NEPA compliance is necessary for all "major" federal actions with the potential to significantly affect the quality of the human environment. Major federal actions include activities fully or partially funded, regulated, conducted, authorized, or approved by a federal agency. Because our proposed issuance of regulations and a subsequent LOA would allow for the taking of marine mammals consistent with provisions under the MMPA, we consider this as a major federal action subject to NEPA.

Under the requirements of NAO 216-6 section 6.03(f)(2)(b) for incidental harassment authorizations, NMFS prepared this EA to determine whether the direct, indirect, and cumulative impacts related to the proposed issuance of regulations and an associated LOA for incidental take of marine mammals during the conduct of Marine Corps' proposed activities at BT-9 and BT-11 could be significant. If NMFS deems the potential impacts to be not significant, this analysis, in combination with other analyses incorporated by reference—may support the issuance of a Finding of No Significant Impact (FONSI) for the proposed regulations and subsequent LOA.

#### **1.3.1 LAWS, REGULATIONS, OR OTHER NEPA ANALYSES INFLUENCING THE EA'S SCOPE**

NMFS has based the scope of the proposed action and nature of the alternatives considered in this EA on the relevant requirements in section 101(a)(5)(A) of the MMPA. Thus, NMFS' authority under the MMPA bounds the scope of our alternatives. NMFS concludes that this analysis—combined with the analyses in the following documents—fully describes the potential impacts associated with the Marine Corps' proposed activities, including any required mitigation and monitoring measures for marine mammals.

After conducting an independent review of the information and analyses for sufficiency and adequacy, NMFS incorporates by reference the relevant analyses on the Marine Corps' proposed action, as well as a discussion of the affected environment and environmental consequences within the following documents per 40 CFR 1502.21 and NAO 216-6 § 5.09(d):

- Notice of receipt of the Marine Corps' application in the *Federal Register* ([78 FR 19224, March 29, 2013](#)) (NMFS, 2013b);
- Notice of proposed rulemaking in the *Federal Register* ([79 FR 41374, July 15, 2014](#)), (NMFS, 2014c);
- Request by the U.S. Marine Corps for the issuance of regulations and associated LOA for the incidental take of common bottlenose dolphin (*Tursiops truncatus*) related to range

operations at the USMC Cherry Point Range Complex in Pamlico Sound, North Carolina (USMC, 2012b);

- Environmental Assessment: Marine Air Corps Station (MCAS) Cherry Point Range Operations (DoN, 2009); and
- Finding Of No Significant Impact (FONSI): MCAS Cherry Point Range Operations Craven, Carteret, And Pamlico Counties, North Carolina (USMC, 2009).

### **MMPA APPLICATION AND PROPOSED RULE**

The CEQ regulations (40 CFR § 1502.25) encourage federal agencies to integrate NEPA’s environmental review process with other environmental review laws. NMFS relies substantially on the public process for developing proposed regulations and proposed incidental take authorizations; evaluating relevant environmental information; and providing a meaningful opportunity for public participation as we develop corresponding EAs. NMFS fully considered public comments received in response to the publication of the proposed rule during the corresponding NEPA review process.

On March 29, 2013, per the regulations at 50 CFR 216.104(b)(1)(i), NMFS began the public review process by publishing a Notice of Receipt in the *Federal Register* ([78 FR 19224](#)). On July 15, 2014, NMFS published a proposed rule in the *Federal Register* ([79 FR 41374](#)) which included the following:

- A detailed description of the proposed action and an assessment of the potential impacts on marine mammals and their habitat;
- Plans for the Marine Corps’ mitigation and monitoring measures to avoid and minimize potential adverse impacts to marine mammals and their habitat and proposed reporting requirements;
- Information on NMFS’ proposal to issue regulations and a subsequent LOA to the Marine Corps to authorize take by Level B (behavioral) harassment, Level A harassment, serious injury, and injury of individuals of bottlenose dolphins; and
- NMFS’ consideration of environmental issues and impacts of relevance related to the proposed issuance of the regulations and subsequent LOA and our preliminary findings under the MMPA.

NMFS considered the Marine Corps’ proposed activities and associated mitigation and monitoring measures discussed in Section 2.3.1 of this document. In the proposed rule, ([79 FR 41374, July 15, 2014](#)), NMFS preliminarily determined— provided that the Marine Corps implement the required mitigation and monitoring measures — that the military readiness activities in BT-9 and BT-11 as well as the total level of take incidental to authorized training exercises over the 5-year effective period of the regulations would have a negligible impact on the marine mammal species and stocks present in the action areas. In addition, NMFS preliminarily determined that the proposed activity would not have an unmitigable adverse impact on the availability of marine mammals for subsistence uses. The notice of proposed rulemaking afforded the public a 30-day comment period on our proposed regulations and associated LOA.

### 1.3.2 SCOPE OF ENVIRONMENTAL ANALYSIS

Given the limited scope of the decision for which NMFS is responsible, this EA intends to provide more focused information on the primary issues and impacts of environmental concern related specifically to our proposed issuance of regulations and a subsequent LOA. This EA does not further evaluate effects to the elements of the human environment listed in Table 3 because environmental reviews for the Marine Corps’ activities, incorporated by reference (DoN, 2009; USMC, 2009), have evaluated the effects of their activities on other elements of the human environment.

The Marine Corps’ 2009 EA and 2009 FONSI (USMC, 2009) for their activities concluded that the impact of the action:

- Would have minor and transitory effects on the marine environment or marine resources;
- Would not significantly impact marine invertebrate populations, recreational and commercial fisheries, seabirds, and associated Essential Fish Habitat;
- Would not significantly impact archaeological and traditional cultural resources; and
- Would not significantly impact recreational dive sites and shipwrecks.

The Marine Corps’ analysis of the training area environment falls within the scope of the 2009 EA and FONSI. There are no substantial changes to those elements since the release of the Marine Corps’ 2009 EA and FONSI.

**Table 3** – Components of the human environment not affected by our proposed issuance of regulations and a subsequent LOA to the Marine Corps.

Biological	Physical	Socioeconomic / Cultural
Amphibians	Air Quality	Commercial Fishing
Humans	Essential Fish Habitat	Oil and Gas Activities
Non-Indigenous Species	Geography	Recreational Fishing
Seabirds	Land Use	Shipping and Boating
Sea Turtles	Oceanography	Recreational Diving
	State Marine Protected Areas	National Historic Preservation Sites
	Federal Marine Protected Areas	National Trails and Nationwide Inventory of Rivers
	National Estuarine Research Reserves	Low Income Populations
	National Marine Sanctuaries	Minority Populations
	Park Land	Indigenous Cultural Resources
	Prime Farmlands	Public Health and Safety
	Wetlands	Historic and Cultural Resources
	Wild and Scenic Rivers	
	Ecologically Critical Areas	

### 1.3.3 INTEGRATING NEPA REVIEW WITH OTHER ENVIRONMENTAL REVIEWS

NAO 216-6 established agency procedures for complying with NEPA and the implementing NEPA regulations issued by the CEQ. Consistent with the intent of NEPA and the clear direction in NAO 216-6 to involve the public in NEPA decision-making, we requested comments on the potential environmental impacts described in the Marine Corps’ application and in the *Federal Register* notice of the proposed rule ([79 FR 41374, July 15, 2014](https://www.federalregister.gov/documents/2014/07/15/79-fr-41374)). The CEQ regulations further encourage agencies to integrate the NEPA review process with review under the environmental

statutes. Consistent with the Service’s practice, NMFS integrated the NEPA review and preparation of this EA with the public process required by the MMPA for the issuance of proposed regulations and subsequent LOA.

The *Federal Register* notice of the proposed rule ([79 FR 41374, July 15, 2014](#)), combined with NMFS’ preliminary determinations, supporting analyses, and corresponding public comment period are instrumental in providing the public with information on relevant environmental issues and offering the public a meaningful opportunity to provide comments to the Service for consideration in both the MMPA and NEPA decision-making processes.

The *Federal Register* notice of the proposed rule summarized NMFS’ proposed action and any potential impacts to marine mammals and their habitat, and included a statement that the Service evaluated the Marine Corps’ EA (DoN, 2009) and determined the need for a supplemental EA to address: (1) the proposed increases in ordnance usage; and (2) the use of revised thresholds for estimating potential impacts on marine mammals from explosives. NMFS invited interested parties to submit written comments concerning the application and the Service’s preliminary analyses and findings including those relevant for consideration in the EA. The public comment period for the notice of the proposed rulemaking began on July 15, 2014 and ended on August 14, 2014.

NMFS posted the Marine Corps’ application on a [website](#) concurrently with the release of the *Federal Register* notice of the proposed rule ([79 FR 41374, July 15, 2014](#)). NMFS bases this EA on the information included in the *Federal Register* notice, the documents it references, and the public comments provided in response. At the conclusion of this process, NMFS will post the final EA, and, if appropriate, FONSI, on the same website.

**1.3.4 RELEVANT COMMENTS ON OUR *FEDERAL REGISTER* NOTICE**

During the 30-day public comment period on the *Federal Register* Notice of Receipt ([78 FR 19224, March 29, 2013](#)) and the 30-day public comment period on the *Federal Register* notice of the proposed rule ([79 FR 41374, July 15, 2014](#)), we received comment letters from the following individuals or groups (Table 4).

**Table 4** – Organizations and individuals who submitted comments on our proposed action.

Organizations and Private Citizens	
Anonymous commenter	Tom Wright
Don Giles	Marine Mammal Commission
Robert Gephart	Center for Biological Diversity

The substantive public comments related to the potential environmental impacts associated with the Service’s proposed action of issuing regulations and a subsequent LOA for the Marine Corps; action include:

- Re-evaluating our preliminary determinations for negligible impact related to the Northern North Carolina Estuarine and Southern North Carolina Estuarine stocks of bottlenose dolphins.
- Consideration of additional mitigation measures to reduce serious injury and mortality.

The Marine Mammal Commission (Commission) provides comments on all proposed incidental take authorizations as part of their established role under the MMPA (§ 202 (a)(2)). The Commission submitted the following comments:

- A recommendation that the Marine Corps work with the Navy and NMFS to include its training activities at BT-9 and BT-11 in future U.S. Navy Environmental Impact Statements and rulemakings that authorize the taking of marine mammals for activities conducted within the Cherry Point Range Complex.
- A recommendation that NMFS require the Marine Corps to determine the effectiveness of all sensor-based monitoring, including the camera systems and infrared capabilities of those systems.
- A recommendation that the Marine Corps use either direct strike or dynamic Monte Carlo models to determine the probability of ordnance strike.

NMFS fully considered all of the public comments, including any pertinent and substantive information, as part of our MMPA and NEPA decision-making process and crafted our proposed final rule and this EA accordingly. NMFS has also provided responses to the public comments in the *Federal Register* notice announcing the Service's final decision.

#### **1.4 OTHER PERMITS, LICENSES, OR CONSULTATION REQUIREMENTS REQUIRED BY NOAA**

This section summarizes federal, state, and local permits, licenses, approvals, and consultation requirements necessary to implement the proposed action. NMFS incorporates those descriptions by reference in this EA and briefly summarizes them in this section.

##### **1.4.1 ENDANGERED SPECIES ACT**

Section 7 of the ESA and implementing regulations at 50 CFR § 402 require consultation with the appropriate federal agency (either NMFS or the U.S. Fish and Wildlife Service) for federal actions that “may affect” a listed species or critical habitat. Our proposed issuance of regulations and a subsequent LOA would not affect any ESA-listed species or designated critical habitat under our jurisdiction (NMFS, 2012). Therefore, there is no requirement for NMFS to consult under Section 7 of the ESA on the proposed issuance of regulations and an associated LOA under section 101(a)(5)(A) of the MMPA. Accordingly, NMFS' proposed action is not likely to jeopardize the continued existence of any threatened or endangered species or result in destruction or adverse modification of critical habitat for such species.

##### **1.4.2 MARINE MAMMAL PROTECTION ACT**

NMFS discuss the MMPA and its provisions that pertain to the proposed action described within section 1.2.

##### **1.4.3 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT**

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA; 16 U.S.C. 1801 *et seq.*), Federal agencies are required to consult with the Secretary of Commerce with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency which may adversely affect essential fish habitat (EFH) identified under the MSFCMA. Table 3.3-5 (page 3-79) of the Marine Corps' EA (DoN, 2009) identifies marine species with EFH within MCAS Cherry Point.

EFH and Habitat Areas of Particular Concern for a number of invertebrate and fish species managed under Fishery Management Plans occur within the project area. The Marine Corps determined in its 2009 EA that their activities would not reduce EFH quality and/or quantity. Explosions would not occur on the seafloor and, therefore, ordnance expenditures would not result in impacts to the substrate. Underwater detonations would not result in substantial sediment displacement to the seafloor. If minor displacement occurs, water currents would redistribute sediments so that habitat alteration would be short term. Items and materials expended into the waters in BT-9 and BT-11 would not result in any adverse impacts to the chemical or biological environments that would reduce the quality and/or quantity of EFH. The proposed activities would occasionally introduce small quantities of chemical compounds into the waters around BT-9 and BT-11, which would rapidly disperse. These additions would be too small to adversely impact any of the EFH within Pamlico Sound. The main effect of the Marine Corp's activities would be short-term disturbance that might lead to temporary and localized relocation of the EFH species or their food. Thus, no substantial or adverse impacts to EFH are anticipated as a result of implementing the proposed action.

Separately, NMFS determined that mitigation and monitoring measures required by the proposed regulations and subsequent LOA for the take of marine mammals, incidental to the conduct of the Marine Corps' training activities would not result in adverse effects to EFH. Thus, the proposed issuance of regulations and a subsequent LOA for the taking of marine mammals, incidental to the Marine Corps' activities would not impact EFH and would not require an EFH consultation.

## **CHAPTER 2 – ALTERNATIVES**

### **2.1 INTRODUCTION**

The NEPA and the implementing CEQ regulations (40 CFR §§ 1500-1508) require consideration of alternatives to proposed major federal actions and NAO 216-6 provides agency policy and guidance on the consideration of alternatives to our proposed action. An EA must consider all reasonable alternatives, including the No Action Alternative. This provides a baseline analysis against which we can compare the other alternatives.

To warrant detailed evaluation as a reasonable alternative, an alternative must meet the Service's purpose and need. In this case, and as NMFS previously explained, an alternative meets the purpose and need if it satisfies the requirements under section 101(a)(5)(A) of the MMPA. NMFS evaluated each potential alternative against these criteria; identified one action alternative along with the No Action Alternative; and carried these forward for evaluation in this EA.

Alternative 1 includes a suite of mitigation measures intended to minimize any potential adverse effects to marine mammals. This chapter describes both alternatives and compares them in terms of their environmental impacts and their achievement of objectives.

### **2.2 DESCRIPTION OF THE MARINE CORPS' PROPOSED ACTIVITIES**

NMFS presented a general overview of the Marine Corps' proposed activities in the *Federal Register* notice of the proposed rule ([79 FR 41374, July 15, 2014](#)). Also, the Marine Corps' EA (DoN, 2009), describes the activities that will occur in BT-9 and BT-11. NMFS incorporates those descriptions by reference in this EA and briefly summarize them here.

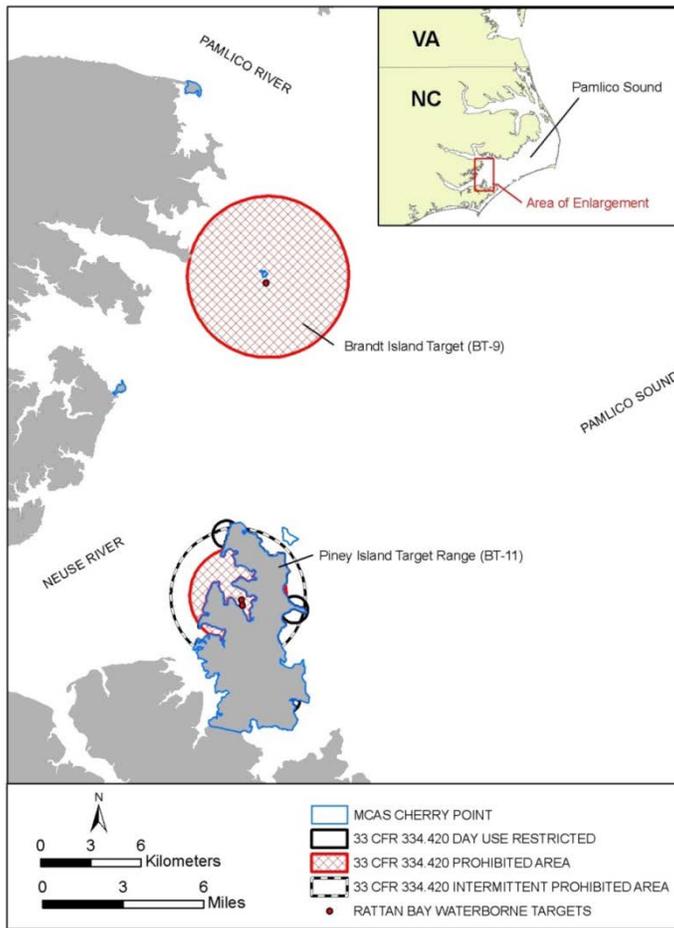
### 2.2.1 SPECIFIED TIME AND AREAS

The Marine Corps' air-to-surface and surface-to-surface training exercises would occur during a five-year period, day, or night with no seasonal restrictions. Approximately 15 percent of the activities would occur at night.

**Brant Island Target (BT-9):** The BT-9 area (Figure 1) is a water-based bombing target and mining exercise area located approximately 52 kilometers (km) (32.3 miles (mi)) northeast of MCAS Cherry Point. The U.S. Army Corps of Engineers, Wilmington District has defined a danger zone (prohibited area) by a 6-mi diameter boundary around BT-9 (33 CFR 334.420). This restriction prohibits non-military vessels within the designated area. The BT-9 target area ranges in depth from 1.2 to 6.1 meters (m) (3.9 to 20 feet (ft)), with the shallow areas concentrated along the Brandt Island Shoal. The target itself consists of three ship hulls grounded on Brant Island Shoals, located approximately 4.8 km (3.0 mi) southeast of Goose Creek Island.

**Piney Island Bombing Range (BT-11):** The BT-11 area (Figure 1) encompasses a total of 50.6 square kilometers (km<sup>2</sup>) (19.5 square miles (mi<sup>2</sup>)) on Piney Island located in Carteret County, NC. The target prohibited area, at a radius of 1.8 miles, is roughly centered on Rattan Bay and includes approximately 9.3 km<sup>2</sup> (3.6 mi<sup>2</sup>) of water and water depths range from 0.3 m (1.0 ft) along the shoreline to 3.1 m (10.1 ft) in the center of Rattan Bay. Water depths in the center of Rattan Bay range from approximately 2.4 to 3 m (8 to 10 ft) with bottom depths ranging from 0.3 to 1.5 m (1 to 5 ft) adjacent to the shoreline of Piney Island. The in-water stationary targets of BT-11 consist of a barge and patrol boat located in roughly the center of Rattan Bay. The Marine Corps also use on an intermittent basis for strafing at water- and land-based targets, a second danger zone, with an inner radius of 1.8 miles and outer radius of 2.5 miles and also roughly centered on Rattan Bay.

**Figure 1** – Proposed locations of the Marine Corps’ activities in Pamlico Sound, NC. Brant Island Bombing Target (BT-9) and Piney Island Bombing Range (BT-11) (33 CFR 334.420).



## 2.2.2 SURFACE-TO-SURFACE EXERCISES

**Gunnery Exercises:** Gunnery exercises are the only category of surface-to-surface activity currently conducted within BT-9 or BT-11. Surface-to-surface gunnery firing exercises typically involve Special Boat Team personnel firing munitions from a machine gun and 40 millimeter (mm) grenade launchers at a water-based target or throwing concussion grenades into the water (*e.g.*, not at a specific target) from a small boat. The number and type of boats used depend on the unit using the boat and the particular training mission. These include: small unit river craft, combat rubber raiding craft, rigid hull inflatable boats, and patrol craft. These boats may use inboard or outboard, diesel or gasoline engines with either propeller or water jet propulsion systems.

The Marine Corps propose to use a maximum of six boats ranging in size from 7.3 to 26 m (24 to 85 ft) to conduct the surface-to-surface firing activities. Each boat would travel between 0 to 20 knots (kts) (0 to 23 miles per hour (mph)) with an average of two vessels to approach and engage the intended targets. The boats typically travel in linear paths and do not operate erratically.

Boat sorties occur in all seasons and the number of sorties conducted at each range may vary from year to year based on training needs and worldwide operational tempo. The majority of boat sorties at BT-9 originate from MCAS Cherry Point's Navy boat docks, but they may also

originate from the State Port in Morehead City, NC, Marine Corps Base Camp Lejeune, and U.S. Coast Guard Station Hobucken in Pamlico Sound. The majority of boat sorties at BT-11 originate from launch sites within the range complex.

There is no specific schedule associated with the use of BT-9 or BT-11 by the small boat teams. However, the Marine Corps schedules the exercises for 5-day blocks with exercises at various times throughout the year. Variables such as deployment status, range availability, and completion of crew specific training requirements influence the exercise schedules. Table 5 in this document outlines the number of surface-to-surface exercises that occurred between 2011 and 2013 by bombing target area.

**Table 5** - Counts of surface-to-surface sorties conducted in BT-9 and BT-11 (2011-2013).

Year	BT-9	BT-11
2011	223	105
2012	322	106
2013	87	62

**BT-9 Gunnery Exercises:** The proposed direct-fire gunnery exercises (*i.e.*, all targets are within the line of sight of the military personnel) are usually live-fire exercises and would include the use of 7.62 millimeter (mm) or .50 caliber (cal) machine guns; 40-mm grenade machine guns; or G911 concussion hand grenades. At times, personnel would use inert ordnance (*i.e.*, blanks) so that the boat crews could practice ship-handling skills during training without being concerned with the safety requirements involved with live weapons.

The Marine Corps estimates that it could conduct up to approximately 354 vessel-based sorties annually at BT-9. This estimate includes the highest number of sorties conducted over the past three years (322) plus an additional 10 percent increase (32) in sorties to account for interannual variation based on future training needs and worldwide operational tempo.

**BT-11 Gunnery Exercises:** The proposed direct-fire gunnery exercises would include the use of small arms, large arms, bombs, rockets, and pyrotechnics. All munitions fired within the BT-11 range are non-explosive with the exception of the small explosives in the single charges. No live firing occurs at BT-11.

The Marine Corps estimates that it could conduct up to approximately 117 vessel-based sorties annually at BT-11. This estimate includes the highest number of sorties conducted over the past three years (106) plus an additional 10 percent increase (11) in sorties to account for interannual variation based on future training needs and worldwide operational tempo.

### 2.2.3 AIR-TO-SURFACE EXERCISES

Air-to-surface training exercises involve fixed-, rotary-, or tilt-wing aircraft firing munitions at targets on the water's surface or on land (as in the case of BT-11). Table 6 in this document outlines the number of air-to-surface exercises that occurred in 2011, 2012, and 2013 by bombing target area.

**Table 6** - Counts of air-to-surface exercises conducted in BT-9 and BT-11 (2011-2013).

Year	BT-9	BT-11
2011	1,554	4,251
2012	842	11,706
2013	407	1,177

The Marine Corps estimates that it could conduct up to approximately 1,709 air-based based sorties annually at BT-9. This estimate includes the highest number of sorties conducted over the past three years (1,554) plus an additional 10 percent increase (155) in sorties to account for interannual variation based on future training needs and worldwide operational tempo.

For the BT-11 area, the Marine Corps estimates that it could conduct up to approximately 12,877 air-based based sorties annually. This estimate includes the highest number of sorties conducted over the past three years (11,706) plus an additional 10 percent increase (1,171) in sorties to account for interannual variation based on future training needs and worldwide operational tempo.

There are four types of air-to-surface activities conducted within BT-9 and BT-11. They include: mine laying, bombing, gunnery, or rocket exercises. The Marine Corps' 2009 EA (DoN, 2009) describes the exercises that will occur in BT-9 and BT-11. We incorporate those descriptions by reference in this EA and briefly summarize them here.

**BT-9 Mine Laying Exercises** (*aircraft and inert mine shapes*): Mine laying exercises are simulations only, meaning that mine detonations would not occur during training. These exercises, regularly conducted at the BT-9 bombing target, involve the use of fixed-wing aircraft (F/A-18F Hornet Strike Fighter, P-3 Orion, or P-8 Poseidon) flying undetected to the target area using either a low- or high-altitude tactical flight pattern. When the aircraft reaches the target area, the pilot would deploy a series of inert mine shapes in an offensive or defensive pattern into the water. The aircraft would make multiple passes along a pre-determined flight azimuth dropping one or more of the inert shapes each time. The mine-laying exercises at BT-9 would include the use of MK-62, MK-63, MK-76, BDU-45, and BDU-48 inert training shapes. Each inert shape weighs 500, 1000, 25, 500, and 10 pounds (lbs), respectively.

**Bombing Exercises** (*fixed-wing aircraft and inert bombs*): Pilots train to destroy or disable enemy ships or boats during bombing exercises. These exercises, conducted at BT-9 or BT-11, normally involve the use of two to four fixed-wing aircraft (i.e., an F/A-18F Hornet Strike Fighter or AV-8 Harrier II) approaching the target area from an altitude of approximately 152 m (500 ft) up to 4,572 m (15,000 ft). When the aircraft reach the target area, they establish a predetermined racetrack pattern relative to the target and deliver the bombs. Participating aircraft follow the same flight path during subsequent target ingress, ordnance delivery, target egress, and downwind pattern. The Marine Corps uses this type of pattern to ensure that only one aircraft releases ordnance at any given time.

The pilots deliver the bombs against targets at BT-9 or BT-11, day or night; the average time to complete this type of exercise is approximately one hour. There is no set level or pattern of amount of sorties conducted and there are no cluster munitions authorized for use during bombing exercises.

The bombing exercises would typically use unguided MK-76, BDU-45, MK-82, and MK-83 inert training bombs (25, 500, 500, and 1,000 lbs, respectively); precision-guided munitions consisting of laser-guided bombs (inert); and laser-guided training rounds (inert, but contains a small impact-initiated spotting charge).

For unguided munitions, the typical release altitudes are 914 m (3,000 ft) or above 4,572 m (15,000 ft). The typical release altitude for precision-guided munitions is 1.8 km (1.1 mi) or greater in altitude. For laser-guided munitions, onboard laser designators, laser designators from

support aircraft, or ground support personnel use lasers to illuminate the certified targets. For either weapons delivery system, the lowest minimum altitude for ordnance delivery (inert bombs) would be 152 m (500 ft).

**Gunnery Exercises** (*aircraft, cannons, and inert munitions*): During air-to-surface gunnery exercises with cannons, pilots train to destroy or disable enemy ships, boats, or floating /near-surface mines from aircraft with mounted cannons equal to or larger than 20 mm. The Marine Corps proposes to use either fixed-wing (F/A-18F Hornet Strike Fighter or an AV-8 Harrier II) or rotary-wing (AH-1 Super Cobra), tilt-rotor (V-22), and other aircraft to conduct gunnery exercises at BT-9 or BT-11. During the exercise (*i.e.*, strafing run), two aircraft would approach the target area from an altitude of approximately 914 m (3,000 ft) and within a distance of 1,219 m (4,000 ft) from the target, begin to fire a burst of approximately 30 rounds of munitions before reaching an altitude of 305 m (1,000 ft) to break off the attack. Each aircraft would reposition for another strafing run until each aircraft expends its exercise ordnance of approximately 250 rounds (approximately 8-12 passes per aircraft per exercise).

This type of gunnery exercise would typically use a Vulcan M61A1/A2, 20 mm cannon or a GAU-12, 25 mm cannon. The Marine Corps proposes to use inert munitions for these exercises. The aircraft deliver the ordnance against targets at BT-9 or BT-11, day or night. The average time to complete this type of exercise is approximately 1 hour.

**Gunnery Exercises** (*aircraft and machine guns*): During air-to-surface gunnery exercises with machine guns, pilots train to destroy or disable enemy ships, boats, or floating /near-surface mines with aircraft using mounted machine guns. The Marine Corps proposes to use rotary-wing (CH-52 Super Stallion, UH-1 Iroquois Huey, CH-46 Sea Knight, MV-22 Osprey, or H-60 Hawk series, and other types) aircraft to conduct gunnery exercises at BT-9 or BT-11. During the exercise an aircraft would fly around the target area at an altitude between 15 and 30 m (50 and 100 ft) in a 91 m (300 ft) racetrack pattern around the water-based target. Each gunner would expend approximately 400 rounds of 7.62 mm ammunition and 200 rounds of .50 cal ammunition in each exercise. The aircraft deliver the ordnance against the bombing targets at BT-9 or BT-11, day or night. The average time to complete this type of exercise is approximately one hour.

**Rocket Exercises:** The Marine Corps proposes to carry out rocket exercises similar to the bombing exercises. Fixed- and rotary-wing aircraft crews launch rockets at surface maritime targets, day and night, to train for destroying or disabling enemy ships or boats. These operations employ 2.75-inch and 5-inch rockets (4.8 and 15.0 lbs net explosive weight, respectively). Generally, personnel would deliver an average of approximately 14 rockets per sortie. As with the bombing exercises, there is no set level or pattern of amount of sorties conducted.

**Pyrotechnics:** Pyrotechnics are non-explosive devices that use chemical reactions to produce heat, light, gas, smoke, and/or sound to simulate threat conditions during exercises (DoN, 2009). The Marine Corps proposes to use chaff, LUU-2, LUU-19, MI27 A1-parachute flare, self-protection flares, signal illuminations, simulated booby traps, Smokey Sams, artillery simulators, and ground bursts.

## 2.2.4 ORDNANCE USAGE AND ESTIMATED ANNUAL EXPENDITURES

The Marine Corps proposes to use five types of explosive sources at BT-9: 2.75-inch Rocket High Explosives (HE), 5-inch Rocket HE, 30 mm HE, 40 mm HE, and G911 grenades. They will also use inert sources including rockets, bombs, and pyrotechnics.

Their 2009 EA (DoN, 2009) describes the ordnance types and usage levels based on training missions planned for use in BT-9 at that time. However, since the release of the 2009 EA, the Marine Corps have adjusted their usage projections for BT-9 based on a growth in deployment cycles; evolving national security mission needs; and global operational training tempo. To account for changes to the proposed action (*i.e.*, increased ammunitions levels in BT-9) not addressed in the 2009 document, NMFS provides information on the types of ordnance and expenditure levels proposed for use at BT-9 in Table 7.

**Table 7** - Type of ordnance, net explosive weight, and proposed levels of annual expenditures at BT-9.

Proposed Ordnance	Net Explosive Weight in Pounds (lbs)	Number of Rounds Proposed for Use in the 2009 EA	Number of Rounds Proposed for Use under the Rule and LOA
Small arms excluding .50 cal (7.62 mm)	N/A, inert	525,610	525,610
.50 cal	N/A, inert	257,067	568,515
Large arms – live (30 mm)	0.1019	12,592 (3,120)	3,432
Large arms – live (40 mm)	0.1199	(9,472)	10,420
Large arms – inert (20, 25, 30, and 40 mm)	N/A	93,024	120,405
Rockets – live (2.75- inch)	4.8	241 (184)	220
Rockets – live (5-inch)	15.0	(57)	68
Rockets – inert (2.75-inch rocket, 2.75-inch illumination, 2.75-inch white phosphorus, 2.75-inch red phosphorus; 5-inch rocket, 5-inch illumination, 5-inch white phosphorus, 5-inch red phosphorus )	N/A	703	844
Grenades – live (G911)	0.5	144	144
Bombs – inert (BDU-45 practice bomb, MK-76 practice bomb, MK-82 practice bomb, MK-83 practice bomb)	0.0838 - 0.1676 signal cartridge only	4,055	4,460
Pyrotechnics – inert (chaff, LUU-2, self-protection flares)	N/A	4,496	4,496

For BT-11, all munitions proposed for use are inert (not live). The Marine Corps proposes to use six types of these sources: 2.75-inch rocket, 5-inch rocket, 30 mm inert, 40 mm inert, bombs, and pyrotechnics. To account for changes to the proposed action (*i.e.*, increased ammunitions levels in BT-11) not addressed in the 2009 document, NMFS provides information on the types of ordnance and expenditure levels proposed for use at BT-11 in Table 8. NMFS also provided this information to the public in the *Federal Register* notice of the proposed rule ([79 FR 41374, July 15, 2014](https://www.federalregister.gov/documents/2014/07/15/79-FR-41374)).

**Table 8** - Type of ordnance, net explosive weight, and proposed levels of annual expenditures at BT-11.

Proposed Ordnance	Net Explosive Weight in Pounds (lbs)	Number of Rounds Proposed for Use in the 2009 EA	Number of Rounds Proposed for Use under the Rule and LOA
Small arms excluding .50 cal (7.62 mm)	N/A, inert	507,812	610,957
.50 cal	N/A, inert	216,234	366,775
Large arms – inert (20, 25, 30, and 40 mm)	N/A	240,334	240,334
Rockets – inert (2.75-inch rocket, 2.75-inch illumination, 2.75-inch white phosphorus, 2.75-inch red phosphorus; 5-inch rocket, 5-inch illumination, 5-inch white phosphorus, 5-inch red phosphorus )	N/A	4,549	5,592
Bombs – inert (BDU-45 practice bomb, MK-76 practice bomb, MK-82 practice bomb, MK-83 practice bomb)	0.0838 - 0.1676 signal cartridge only	22,114	22,114
Pyrotechnics – inert (chaff, LUU-2, self-protection flares, SMD SAMS)	N/A	8,912	8,912

The Marine Corps estimates that the 5-year level of expended ordnance at BT-9 and BT-11 (both surface-to-surface and air-to-surface) would be approximately 6,193,070 and 6,273,420 rounds, respectively. The approximate annual quantities of ordnance listed in Tables 7 and 8 represent conservative figures, meaning that the volume of each type of inert and explosive ordnance proposed for is the largest number that personnel could expend annually. The Marine Corps realizes that its evolving training programs, linked to real world event necessitate flexibility regarding the amounts of ordnance used in air-to-surface and surface-to-surface exercises. Thus, the proposed regulations and subsequent LOA would account for inter-annual variability in ordnance expenditures over the course of the five years.

## 2.3 DESCRIPTION OF ALTERNATIVES

### 2.3.1 ALTERNATIVE 1 – ISSUANCE OF AN AUTHORIZATION WITH MITIGATION MEASURES

The Proposed Action constitutes Alternative 1 and is the Preferred Alternative. Under this alternative, NMFS would propose to issue regulations and an associated LOA (valid for five years) to the Marine Corps allowing the incidental take of 323 bottlenose dolphins from Level B harassment (behavioral and TTS) and 33 bottlenose dolphins from Level A harassment annually, subject to the mandatory mitigation and monitoring measures and reporting requirements set forth in the final rule and subsequent LOA, if issued, in the following sections.

Under this alternative, NMFS would not authorize take by mortality or serious injury. The Marine Corps applied for take by serious injury and mortality, and NMFS proposed to authorize take by serious and injury and mortality in the proposed rule ([79 FR 41374, July 15, 2014](#)). However, based on public comments received on the *Federal Register* notice of the proposed rule ([79 FR 41374, July 15, 2014](#)), NMFS reassessed the take estimates presented in the Marine Corps’ 2014 application addendum and Tables 10 and 11 of the proposed rulemaking ([79 FR 41374, July 15, 2014](#), page 41397), and determined that the estimates overestimated the number of marine mammals that could potentially be taken by mortality and serious injury. Additionally, NMFS inadvertently included estimated take by slight lung injury (which NMFS classifies as Level A Harassment under the MMPA, not as serious injury) within the annual estimated take by serious injury category in Table 10 of the proposed rulemaking ([79 FR 41374, July 15, 2014](#), page 41397). Thus, this error of commission led NMFS to inaccurately state the number of takes by serious injury that could occur in the absence of mitigation. Moreover, as stated in the proposed rule, in consideration of the effectiveness of the mitigation measures, NMFS does not expect take by serious injury or mortality to occur. NMFS believes it has sufficient information

about the Marine Corps' activities and the effectiveness of the mitigation measures to reasonably conclude that the activities are not likely to result in any serious injury or mortality. NMFS notes that over the course of the previous incidental harassment authorizations issued to the Marine Corps for the same activities, there were no reported incidents of serious injury to or mortality of any marine mammal. NMFS believes that the mitigation measures that will be implemented by the Marine Corps (e.g., conservative exclusion zones for marine mammals; pre- and post-exercise monitoring, range sweeps, cold passes, delay of exercises, visual monitoring with high-resolution cameras with night vision capabilities, and passive acoustic monitoring) would reduce the amount and severity of the potential impacts from the activity, making it unlikely that any take by serious injury or mortality would occur.

## **MITIGATION AND MONITORING MEASURES**

As described in Section 1.2, NMFS must prescribe the means of effecting the least practicable adverse impact on the species or stocks of marine mammals and their habitat. In order to do so, we must consider the Marine Corps' proposed mitigation and monitoring measures and assess how these measures could benefit the affected species or stocks and their habitat.

The Service's evaluation of potential measures includes consideration of the following factors in relation to one another: (1) the manner in which, and the degree to which, we expect the successful implementation of the measure to minimize adverse impacts to marine mammals; (2) the proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and (3) the practicability of the measure for applicant implementation.

The NDAA of 2004 amended the MMPA as it relates to military-readiness activities and the incidental take authorization process such that least practicable adverse impact shall include consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity. NMFS and the Marine Corps have worked to identify potential practicable and effective mitigation measures, which include a careful balancing of the likely benefit of any particular measure to the marine mammals with the likely effect of that measure on personnel safety, practicality of implementation, and impact on the military-readiness activity.

To reduce the potential for disturbance from acoustic stimuli associated with the proposed activities, the Marine Corps would implement the following mitigation measures for marine mammals. These include:

- **Visual Monitoring:** Range operators would conduct or direct visual surveys to monitor BT-9 or BT-11 for marine mammals before and after each exercise. Range operation and control personnel would monitor the target area through two tower mounted safety and surveillance cameras with infrared (IR) night vision capabilities. Visual monitoring would occur throughout the duration of each exercise day and night.
- **Range Sweeps:** The Marine Corps would use helicopters to conduct pre- and post-exercise range sweeps to ensure that BT-9 and BT-11 are free of marine mammals. The sweeps would occur at 100 to 300 m (328 to 984 ft) above the water surface, at airspeeds between 60 to 100 kts (69 to 115 mph). The path of the sweep runs down the western side of BT-11, circles around BT-9 and then continues down the eastern side of BT-9 before leaving. The sweep typically takes 20 to 30 minutes to complete. The helicopter crew would communicate directly with range personnel and would provide immediate notification of a fouled target area due to the presence of marine mammals. The aircraft

would remain in the area of a marine mammal sighting until the animal clears the area, if possible, or as mission requirements dictate.

- **Aircraft Cold Pass:** Standard operating procedures for waterborne targets require the pilot to perform a visual check prior to ordnance delivery to ensure the target area is clear of unauthorized civilian boats, personnel, and marine mammals. This is referred to as a *cold* or clearing pass. Pilots requesting entry onto the BT-9 and BT-11 airspace must perform a low-altitude, cold first pass (*i.e.*, a pass without any release of ordnance) immediately prior to ordnance delivery at the bombing targets both day and night. Pilots would conduct the cold pass with the aircraft (helicopter or fixed-winged) flying straight and level at altitudes of 61 to 914 m (200 to 3,000 ft) over the target area. If marine mammals are present in the target area, the Range Controller may deny ordnance delivery to the target as conditions warrant.
- **Delay of Exercises:** The Marine Corps would consider an active range as fouled and not available for use if a marine mammal is present within 914 m (3,000 ft) of the target area at BT-9 or anywhere within Rattan Bay (BT-11). Therefore, if Marine Corps personnel observe a marine mammal within 914 m (3,000 ft) of the target at BT-9 or anywhere within Rattan Bay at BT-11 during the cold pass or from range camera detection, they would delay training until the marine mammal moves beyond and on a path away from 914 m (3,000 ft) from the BT-9 target or moved out of Rattan Bay at BT-11. This mitigation applies to air-to-surface and surface-to-surface exercises day or night.

To implement the mitigation measures that require real-time monitoring and to satisfy the monitoring requirements of the proposed regulations and an associated LOA, the Marine Corps proposes to implement the following monitoring measures for marine mammals. These include:

- **Sighting Data Collection:** The Marine Corps would collect sighting data for marine mammals present in BT-9 and BT-11 during range sweeps. They would immediately provide the information to range personnel who would take appropriate management action and would enter the data into the sighting database, web-interface, or report generator.

Sighting data includes the following (collected to the best of the observer's ability): (1) species identification; (2) group size; (3) the behavior of marine mammals (*e.g.*, milling, travel, social, foraging); (4) location and relative distance from the bombing target; (5) date, time and visual conditions (*e.g.*, Beaufort sea state, weather) associated with each observation; (6) direction of travel relative to the bombing target; and (7) duration of the observation.

- **Protected Species Observer Training:** The Marine Corps would require that operators of small boats, and other personnel monitoring for marine mammals from watercraft would take the Marine Species Awareness Training (Version 2), maintained and promoted by Department of the Navy.
- **Long-term Monitoring:** The Marine Corps would sponsor the Duke University Marine Lab (Duke) to conduct long-term monitoring of the bombing target ranges. Duke would obtain information on abundance, group dynamics (*e.g.*, group size, age census), behavior, habitat use, and acoustic data on the bottlenose dolphins which inhabit Pamlico Sound, specifically those around BT-9 and BT-11.

- **Passive acoustic monitoring (PAM):** The Marine Corps would use a PAM system to provide insight into how dolphins use the two ranges, by monitoring for their vocalizations year-round, regardless of weather conditions or darkness.

This Alternative includes mandatory requirements for the Marine Corps to achieve the MMPA requirement of effecting the least practicable adverse impact on each species or stock of marine mammal and their habitat, paying particular attention to rookeries, mating grounds, and other similar areas of significance.

## REPORTING MEASURES

- **Coordination with Stranding Networks:** The Marine Corps would monitor the principal marine mammal stranding networks and other media to correlate analysis of any dolphin strandings that could potentially be associated with BT-9 or BT-11 training operations. Marine Corps personnel would notify NMFS immediately or as soon as clearance procedures allow if they find an injured, stranded, or dead marine mammal during or shortly after, and in the vicinity of, any training operations. The Marine Corps would provide NMFS with species or description of the animal(s), the condition of the animal(s), location, time of first discovery, observed behaviors (if alive), and photo or video (if available).
- **Annual Report:** The Marine Corps will submit an annual report to NMFS by June 1<sup>st</sup> of each year starting in 2016. The first report will cover the time period from issuance of the March 2015 Letter of Authorization through March 12, 2016. Each annual report after that time will cover the time period from March 13 through March 12<sup>th</sup> annually. The reports would summarize the type and amount of training exercises conducted, all marine mammal observations made during monitoring, and if personnel implemented any mitigation measures. The report would also address the effectiveness of the monitoring plan in detecting marine mammals.
- **Comprehensive Report:** The Marine Corps will submit a draft final comprehensive report to NMFS no later than 180 days prior to expiration of these regulations. This report must summarize the findings made in all previous reports and assess both the impacts at each of the bombing targets and the cumulative impact on bottlenose dolphin from the specified activities.

The draft final comprehensive report will summarize the type and amount of training exercises conducted, all marine mammal observations made during monitoring, and if mitigation measures were implemented. The draft final comprehensive report will also address the effectiveness of the monitoring plan in detecting marine mammals. The draft comprehensive report will be subject to review and comment by NMFS. Prior to acceptance by NMFS, the Marine Corps must address any recommendations made by NMFS, within 60 days of its receipt, in the final comprehensive report.

NMFS preliminarily determined that the measures included in the proposed rule were sufficient to reduce the effects of the Marine Corps' activity on marine mammals to the level of least practicable adverse impact. In addition, the Service preliminarily determined that the level of taking of marine mammals in the proposed rule, incidental to the Marine Corps' action would constitute no more than a negligible impact on the relevant species or stocks. NMFS has not altered the mitigation, monitoring and reporting requirements to be included within the proposed regulations or subsequent LOA, nor has the agency received any information that would cause us

to change our preliminary determinations for mitigation, monitoring, or reporting under the MMPA. NMFS, has however, reassessed the estimates of bottlenose dolphins that the Marine Corps could potentially take during the course of the training activities and will not authorize take of bottlenose dolphins by mortality or serious injury in these regulations.

Accordingly, this Preferred Alternative would satisfy the purpose and need of our proposed action under the MMPA—the proposed issuance of final rule and associated an Authorization, along with required mitigation measures and monitoring. This would enable the Marine Corps to comply with the statutory and regulatory requirements of the MMPA.

### **2.3.2 ALTERNATIVE 2 – NO ACTION ALTERNATIVE**

Under the No Action Alternative, the Marine Corps could choose not to proceed with their proposed activities. For purposes of this EA, we characterize the No Action Alternative as the Marine Corps not receiving an LOA under the proposed regulations and conducting the military readiness activities without the protective measures and reporting requirements required by an Authorization under the MMPA. We take this approach to meaningfully evaluate the primary environmental issues—the impact on marine mammals from these activities in the absence of protective mitigation and monitoring measures.

### **2.3.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION**

NMFS considered whether other alternatives could meet the purpose and need and support the Marine Corps’ activities. They include:

- An alternative that would allow for the promulgation of regulations and subsequent Authorization with no required mitigation or monitoring.
- An alternative that would allow for the promulgation of regulations and subsequent Authorization that would authorize incidental take by mortality and serious injury.

NMFS eliminated the first alternative from further consideration, as it would not be in compliance with the MMPA and therefore would not meet the Service’s purpose and need.

NMFS eliminated the second of these alternatives from further consideration because we have sufficient information about the Marine Corp’s activities and the effectiveness of the mitigation measures to reasonably conclude that the activities are not likely to result in any serious injury or mortality. NMFS notes that over the course of the previous incidental harassment authorizations issued to the Marine Corps for the same activities, there were no reported incidents of serious injury to or mortality of any marine mammal. For these reasons, NMFS does not analyze either of these alternatives further in this document.

## CHAPTER 3 – AFFECTED ENVIRONMENT

This chapter describes existing conditions in BT-9 and BT-11 in Pamlico Sound, NC. Descriptions of the physical and biological environment of the action area are contained in the documents incorporated by reference (see section 1.3.1) and summarized here.

### 3.1 PHYSICAL ENVIRONMENT

As discussed in Chapter 1, NMFS' proposed action and alternatives relate only to the proposed issuance of regulations and a subsequent LOA and not to the physical environment. Certain aspects of the physical environment are not relevant to NMFS' proposed action (see section 1.3.2 - Scope of Environmental Analysis). Because of the requirements of NAO 216.6, however, this section includes a brief summary of the physical environment.

The waters surrounding the BT-11 range consist of the Pamlico Sound, Cedar Bay, Long Bay, Jacks Bay, Rattan Bay, South Bay, Stump Bay, and Turnagain Bay (DoN, 2009).

The large Pamlico Sound that meets with the Neuse and Pamlico Rivers encompasses several of the major components of the project area (BT-9 and BT-11 ranges), and is the largest coastal lagoon estuary in the United States (DoN, 2009). Underwater sediments in Pamlico Sound are mostly fine to very fine sands with incursions of silt near the mouths of the Pamlico and Neuse Rivers and at the center of the sound The Neuse River is located in the central area of the MCAS Cherry Point operating region and is one of the large contributors of freshwater to the Pamlico Sound area. The maximum depth of the river is 6 m (20 ft), and salinities are typical of estuarine waters, ranging from 0.5 to 25 parts per thousand (Paerl *et al.*, 2001).

#### 3.1.1 MARINE MAMMAL HABITAT

NMFS presented information on marine mammal habitat and the potential impacts to marine mammal habitat in the *Federal Register* notice of the proposed rule ([79 FR 41374, July 15, 2014](#)). Also, the Marine Corps presented more detailed information on the physical and oceanographic aspects of the North Carolina environment in the Environmental Assessment: Marine Air Corps Station (MCAS) Cherry Point Range Operations (DoN, 2009).

In Pamlico Sound, bottlenose dolphins concentrate in shallow-water habitats along shorelines, and few, if any, individuals are present in the central portions of the sounds (Gannon, 2003). The dolphins utilize shallow habitats, such as tributary creeks and the edges of the Neuse River, where the bottom depth is less than 3.5 m (11.5 ft) (Gannon, 2003). Fine-scale distribution of dolphins seems to relate to the presence of topography or vertical structure, such as the steeply-sloping bottom near the shore and oyster reefs. Bottlenose dolphins may use these features to facilitate prey capture (Gannon, 2003).

### 3.2 BIOLOGICAL ENVIRONMENT

#### 3.2.1 MARINE MAMMALS

Section 1.1.2 of this EA provides information on marine mammal species with possible or confirmed occurrence in the proposed action area (Table 1). The Atlantic bottlenose dolphin is the only marine mammal species that would most likely experience harassment incidental to the Marine Corps' training activities (Read, *et al.*, 2003a, 2003b).

The *Federal Register* notice of the proposed rule ([79 FR 41374, July 15, 2014](#)) provided information on the stock, regulatory status, abundance, occurrence, seasonality, distribution, life history, population size, and hearing ability of the marine mammals in the action area. NMFS incorporates those descriptions by reference and briefly summarizes the information in Table 9.

**Table 9** – General information on the species/stocks that could potentially occur in the proposed action areas.

<b>Bottlenose Dolphin Stocks</b>	<b>Regulatory Status</b>	<b>Stock/Species Abundance</b>	<b>Occurrence and Range</b>	<b>Season</b>
Western North Atlantic Northern Migratory Coastal (NMC)	MMPA – D ESA - NL	11,548 (CV=0.36)	Occasional Coastal	Winter
Western North Atlantic Southern Migratory (SMC)	MMPA – D ESA - NL	9,173 (CV=0.46)	Occasional Coastal	Winter
Northern North Carolina Estuarine System (NNCES)	MMPA – S ESA - NL	950 (CV = 0.23)	Common Estuarine	Summer - Fall
Southern North Carolina Estuarine System (SNCES)	MMPA – S ESA - NL	118 (CV=0.19)	Common Estuarine	Late Summer

<sup>1</sup> MMPA: D = Depleted, Strategic Stock; S = Strategic Stock only; NC = Not Classified.

<sup>2</sup> ESA: NL = Not listed.

The bottlenose dolphin is one of the most well-known species of marine mammals. They have a robust body and a short, thick beak. Their coloration ranges from light gray to black with lighter coloration on the belly. Inshore and offshore individuals vary in color and size. Inshore animals are smaller and lighter in color, while offshore animals are larger, darker in coloration and have smaller flippers (DoN, 2009; Waring, *et al.*, 2014). Bottlenose dolphins are generalists and feed on a variety of prey items “endemic” to their habitat, foraging individually and cooperatively. Like other dolphins, bottlenose dolphins use high frequency echolocation to locate and capture prey. Coastal animals prey on benthic invertebrates and fish, and offshore animals feed on pelagic squid and fish (DoN, 2009; Waring, *et al.*, 2014).

**Western North Atlantic Northern Migratory Coastal (NMC) Stock:** This stock is not listed as threatened or endangered under the ESA; however, it is categorized as depleted (and thus strategic) under the MMPA. The best available abundance estimate for the NMC stock is 11,548 animals (Waring, *et al.*, 2014). However, there is insufficient data to determine the population trends for this stock.

Based on aerial survey data, tag-telemetry studies, photo-identification data, and genetic studies, the NMC stock of bottlenose dolphins occurs along the North Carolina coast and as far north as Long Island, New York (CETAP, 1982; Garrison *et al.*, 2002; Kenney, 1990; Waring, *et al.*, 2014). During summer months (July–September), this stock occupies coastal waters from the shoreline to approximately the 25-m (82-ft) isobath between the Chesapeake Bay mouth and Long Island, New York. During the winter months (January–March), the stock moves south to waters off North Carolina and occupies coastal waters from Cape Lookout, North Carolina to the Virginia–North Carolina border (Barco & Swingle, 1996; Waring, *et al.*, 2014).

**Western North Atlantic Southern Migratory Coastal (SMC) Stock:** This stock is not listed as threatened or endangered under the ESA; however, it is categorized as depleted (and thus strategic) under the MMPA. The best available abundance estimate for the SMC stock is 9,173 animals (Waring, *et al.*, 2014). However, there is insufficient data to determine the population trends for this stock.

Based on tag-telemetry studies, the SMC stock of bottlenose dolphins occurs in coastal waters between southern North Carolina and Georgia, but the stock’s migratory movements and spatial

distribution are the most poorly understood of the coastal stocks (Waring, *et al.*, 2014). During the fall (October–December), this stock occupies waters of southern North Carolina (South of Cape Lookout) where it overlaps spatially with the Southern North Carolina Estuarine System stock in coastal waters. In winter months (January–March), the SMC stock moves as far south as northern Florida where it overlaps spatially with the South Carolina/Georgia and Northern Florida Coastal stocks. In spring (April–June), the stock moves north to waters of North Carolina where it overlaps with the Southern North Carolina Estuarine System stock and the Northern North Carolina Estuarine System stock. In summer months (July–September), the stock most likely occupies coastal waters north of Cape Lookout, North Carolina, to the eastern shore of Virginia (Waring, *et al.*, 2014).

**Northern North Carolina Estuarine System (NNCES) Stock:** This stock is not listed as threatened or endangered under the ESA; however, it is categorized as strategic only (not depleted) under the MMPA. The best available abundance estimate for the NNCES stock is 950 animals (Waring, *et al.*, 2014). However, there is insufficient data to determine the population trends for this stock.

Based on photo-identification studies, the NNCES stock of bottlenose dolphins occurs in the estuarine waters of Pamlico Sound (Waring, *et al.*, 2014). The ranging patterns of bottlenose dolphins in those studies support the presence of a group of dolphins within these waters that are distinct from both dolphins occupying estuarine and coastal waters in southern North Carolina and animals in the NMC and SMC stocks that occupy coastal waters of North Carolina at certain times of the year (NMFS, 2001; Read *et al.*, 2003c).

During summer and fall months (July–October), the NNCES stock occupies waters of Pamlico Sound and nearshore coastal (less than 1 km (3,280 ft) from shore) and estuarine waters of central and northern North Carolina to Virginia Beach and the lower Chesapeake Bay (Waring, *et al.*, 2014). It likely overlaps with animals from the SMC stock in coastal waters during these months. During late fall and winter (November–March), the NNCES stock moves out of estuarine waters and occupies nearshore coastal waters between the New River and Cape Hatteras (Waring, *et al.*, 2014). It overlaps with the NMC stock during this period, particularly between Cape Lookout and Cape Hatteras. It appears that the region near Cape Lookout including Bogue Sound and Core Sound is an area of overlap with the Southern North Carolina Estuarine System stock during late summer (Waring, *et al.*, 2014).

**Southern North Carolina Estuarine System (SNCES) Stock:** This stock is not listed as threatened or endangered under the ESA; however, it is categorized as strategic only (not depleted) under the MMPA. The best available abundance estimate for the SNCES stock is 118 animals (Waring, *et al.*, 2014). However, there is insufficient data to determine the population trends for this stock.

Based on photo-identification studies, the SNCES stock of common bottlenose dolphins occupies estuarine and nearshore coastal waters (less than 3 km from shore) between the Little River Inlet Estuary, including the estuary and the New River (Waring, *et al.*, 2014). During summer and fall months (July–October), the SNCES stock occupies estuarine and nearshore coastal waters (less than 3 km (1.7 mi) from shore) between the North Carolina–South Carolina border and Core Sound. It likely overlaps with the NNCES stock in the northern portion of its range (*i.e.*, southern Pamlico Sound) during late summer (Waring, *et al.*, 2014). During late fall through spring, the

SNCES stock moves south to waters near Cape Fear. In coastal waters, it overlaps with the SMC stock during this period (Waring, *et al.*, 2014).

**Bottlenose Dolphin Distribution within BT-9 and BT-11:** In 2000, Duke University Marine Lab (Duke) conducted a boat-based mark-recapture survey throughout the estuaries, bays and sounds of North Carolina (Read, *et al.*, 2003c). The 2000 boat-based survey produced an estimate of 919 dolphins for the northern inshore waters divided by an estimated 5,015 km<sup>2</sup> (1,936 mi<sup>2</sup>) survey area.

In a follow-on aerial study (July, 2002 to June, 2003) specifically in and around BT-9 and BT-11, Duke reported one sighting in the restricted area surrounding BT-9, two sightings in proximity to BT-11, and seven sightings in waters adjacent to the bombing targets (Maher, 2003). In total, the study observed 276 bottlenose dolphins ranging in group size from two to 70 animals.

Results of a passive acoustic monitoring effort conducted from 2006-2007 by Duke University researchers detected that dolphin vocalizations in the BT-11 vicinity were higher in August and September than vocalization detection at BT-9 (Read, 2007). Additionally, detected vocalizations of dolphins were more frequent at night for the BT-9 area and during early morning hours at BT-11 (Read, 2007).

## **CHAPTER 4 – ENVIRONMENTAL CONSEQUENCES**

This chapter of the EA analyzes the impacts of the alternatives and addresses the potential direct, indirect, and cumulative impacts of NMFS' proposed issuance of regulations and an associated five-year Authorization.

The Marine Corp's application, our notice of a proposed rule, and other related environmental analyses identified previously, facilitate an analysis of the direct, indirect, and cumulative effects of our proposed issuance of regulations and an associated five-year LOA.

Under the MMPA, NMFS has evaluated the potential impacts of the proposed activities in order to determine whether to authorize incidental take of marine mammals. Under NEPA, NMFS has determined that an EA is appropriate to evaluate the potential significance of environmental impacts resulting from the proposed issuance of regulations and an associated five-year Authorization.

### **4.1 EFFECTS OF ALTERNATIVE 1 – ISSUANCE OF AN AUTHORIZATION WITH MITIGATION MEASURES**

Alternative 1 is the Preferred Alternative. Under Alternative 1, we would issue regulations and an associated five-year Letter of Authorization to the Marine Corps allowing the incidental take, by Level A and Level B harassment only, of one species of marine mammals, subject to mandatory mitigation and monitoring measures and reporting requirements. NMFS would incorporate the mitigation and monitoring measures and reporting described earlier in this EA into a final rule and subsequent LOA.

#### **4.1.1 IMPACTS TO MARINE MAMMAL HABITAT**

NMFS' proposed action would have no additive or incremental effect on the physical environment beyond those resulting from the proposed activities. The BT-9 and BT-11 bombing targets are not located within a marine sanctuary, a wildlife refuge, a National Park, or other conservation areas. The regulations and associated LOA, if issued, would not impact physical habitat features, such as substrates and/or water quality.

The primary impact to marine mammal habitat would be noise resulting from air-to-surface and surface-to-surface training activities. However, the noise does not constitute a long-term physical alteration of the water column or bottom topography. NMFS does not expect the proposed activities to affect prey availability, due to the limited duration and intermittent nature of the training exercises. Surface vessels associated with the missions are present within BT-9 and BT-11 in limited and intermittent periods of time. Therefore, NMFS does not anticipate that the Marine Corps' activities would permanently affect marine mammal utilization of the waters in BT-9 or BT-11.

NMFS does not expect that the proposed activities would have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or on the food sources that they utilize. Marine mammal habitat includes rookeries, mating grounds, feeding areas, and areas of similar significance. NMFS does not anticipate that the Marine Corp's proposed activities operations would result in any temporary or permanent effects on the habitats used by the marine mammals in the area, including the food sources they use (*i.e.* fish and invertebrates). While NMFS anticipates that the specified activity may result in marine mammals avoiding certain areas due to temporary ensonification, this impact to marine mammal habitat is temporary and reversible.

#### 4.1.2 IMPACTS TO MARINE MAMMALS

The following specific aspects of the proposed training exercises are likely to result in the incidental take of marine mammals: exposure to sound and pressure from underwater detonations. Thus, NMFS anticipates that take, by Level B (behavioral) and Level A harassment only, of individuals of Atlantic bottlenose dolphin (*Tursiops truncatus*) would result from the training exercises.

Acoustic stimuli generated by the training activities may affect marine mammals in one or more of the following ways: behavioral disturbance, tolerance, masking of natural sounds, and temporary or permanent hearing impairment, or non-auditory physical effects (Richardson *et al.*, 1995). NMFS' *Federal Register* notice of the proposed rule ([79 FR 41374, July 15, 2014](#)) and the Marine Corps' application (USMC, 2012b), 2009 EA (DoN, 2009), and 2009 FONSI (USMC, 2009) on this action provide detailed descriptions of these potential effects of the Marine Corps' and NMFS' proposed actions on marine mammals. NMFS incorporates those discussions by reference.

In the Potential Effects of the Specified Activity on Marine Mammals section of the proposed rule ([79 FR 41374, July 15, 2014](#)), NMFS included a qualitative discussion of the different ways that the Marine Corps' activities may potentially affect marine mammals without consideration of mitigation and monitoring measures (see ([79 FR 41374, July 15, 2014](#)); pages 41383-41391). Marine mammals may experience direct physiological effects (*e.g.*, threshold shift and non-acoustic injury, acoustic masking, impaired communication, stress responses, behavioral disturbance, stranding, behavioral responses from vessel movement, and injury or death from vessel collisions).

In summary, the effects of noise on marine mammals are highly variable, ranging from minor and negligible to potentially significant, depending on the intensity of the source, the distances between the animal and the source, and the overlap of the source frequency with the animals' audible frequency. However, it is important to consider the context in predicting and observing the level and type of behavioral response to anthropogenic signals (Ellison *et al.*, 2012). Several studies have observed the following:

- Marine mammals repeatedly exposed to a sound source may partially habituate to the sound (Richardson & Wursig, 1997).
- Marine mammals are able to compensate for masking by adjusting their acoustic behavior such as shifting call frequencies and increasing call volume and vocalization rates (Di Iorio & Clark, 2010; Miller *et al.*, 2000; Risch *et al.*, 2012);
- Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Finneran *et al.*, 2005; Finneran & Schlundt, 2013; Finneran *et al.*, 2000; Kastak & Schusterman, 1998; Kastak *et al.*, 1999; Schlundt *et al.*, 2013; Schlundt *et al.*, 2000).

The Marine Corps proposed a number of monitoring and mitigation measures for marine mammals as part of the Service's evaluation for the Preferred Alternative. In analyzing the effects of the Preferred Alternative, NMFS concludes that the following monitoring and mitigation measures would minimize and/or avoid impacts to marine mammals:

- Visual and acoustic monitoring (*pre- and post-exercise*) of the training areas to detect the presence of marine mammals during training exercises.
- Suspensions/delays of training activities if a marine mammal enters within any of the designated mitigation zones.
- Range sweeps by aircraft the morning of each exercise day prior to the commencement of range operations and post-exercise range sweeps by aircraft.
- Low-altitude, cold first pass (*a pass without any release of ordnance*) immediately prior to ordnance delivery at the bombing targets, day and night.
- Required reporting of stranded or injured marine mammals in the vicinity of the BT-9 and BT-11 bombing targets to the NMFS Marine Mammal Stranding Network.
- Required research on a real-time acoustic monitoring system to automate detection of bottlenose dolphins in the training areas.

**Injury:** Based on the results of NMFS analyses described in section 2.3.1 of this EA, the Marine Corps' previous monitoring reports, and anecdotal observations for the same activities (USMC, 2012a, 2014), NMFS does not expect take by serious injury or mortality to occur, and would not authorize take by mortality or serious injury for the planned activities. The required mitigation and monitoring measures would minimize any potential risk for marine mammals.

**Unusual Mortality Event:** NOAA has declared an Unusual Mortality Event (UME) for bottlenose dolphins along the Atlantic coast from early July 2013 through the present. Elevated strandings of bottlenose dolphins have occurred in New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia and Florida (through Brevard County). All age classes of bottlenose dolphins are involved and strandings range from a few live animals to mostly dead animals with many very decomposed. Many dolphins have presented with lesions on their skin, mouth, joints, or lungs (NMFS, 2014a). At this time, all age classes of bottlenose dolphins are involved.

Based upon preliminary diagnostic testing and discussion with disease experts the tentative cause of this UME could be cetacean morbillivirus (NMFS, 2014b). However, the investigation is still ongoing and additional contributory factors to the UME are under investigation, including other pathogens, biotoxins, range expansion, etc. (NMFS, 2014b). To NMFS' knowledge, there are no available studies that would inform NMFS' analysis of whether the Marine Corps' proposed training activities would have any additional impacts on marine mammal species subject to a UME.

**Vessel Strikes:** Interactions with vessels are not a new experience for bottlenose dolphins in Pamlico Sound. Pamlico Sound is heavily used by recreational, commercial (*e.g.*, fishing, daily ferry service, tugs, etc.), and military (including the Navy, Air Force, and Coast Guard) vessels year-round. The Marine Corps would abide by marine mammal viewing guidelines and would not engage in high speed exercises if personnel detect a marine mammal within the immediate area of the bombing targets prior to training commencement. Based on the description of the action, the other activities regularly occurring in the area, the species that may be exposed to the activity and their observed behaviors in the presence of vessel traffic, and the implementation of measures to avoid vessel strikes, NMFS has determined that it is unlikely that the small boat maneuvers during surface-to-surface maneuvers would result in the take of any marine mammals, in the form of either behavioral harassment, injury, serious injury, or mortality.

**Estimated Take of Marine Mammals by Level A and Level B Harassment:** Under the Preferred Alternative, NMFS would authorize incidental take, by Level A and Level B harassment only, of one species of marine mammals. Tables 10 and 11 in this EA, present the annual estimated take of bottlenose dolphins from exposure to explosive ordnance based on current thresholds or by direct strike.

**Table 10** – Annual and 5-year estimated take of bottlenose dolphins from exposure to explosive ordnance based on indicated thresholds and the absence of mitigation measures.

Proposed Ordnance	Mortality	Serious Injury	Level A Harassment (PTS/Slight Lung Injury)	Level B Harassment (TTS and Behavior)	
		104 psi	187 dB SEL/Positive Impulse	172 dB SEL	167 dB SEL
30 mm HE	0 (0.0)	0 (0.46)	3.64	17.18	10.41
40 mm HE	0 (0.0)	2 (1.56)	23.78	153.84	95.37
2.75-inch Rocket	0 (0.06)	0 (0.34)	3.37	15.35	9.82
5-inch Rocket	0 (0.032)	0 (0.19)	1.59	7.21	4.77
G911 Grenade	0 (0.004)	0 (0.06)	0 (0.06)	4.60	2.91
Annual Totals*	0	2	33	199	124
5-Year Totals		10	165	1,615	

Estimates in parentheses less than or equal to 0.5 rounded to zero.

**Table 11** – Annual estimated take of bottlenose dolphins from direct strike by ordnance in the absence of mitigation measures.

Bombing Target	Estimated Annual Ordnance Levels	Strike Probability	Estimated Number of Strikes	Annual Estimate	5-Year Estimate
BT-9	1,225,815	$2.61 \times 10^{-7}$	0 (0.32)	0	0
BT-11	451,686.24 <sup>1</sup>	$9.4 \times 10^{-8}$	0 (0.042)	0	0

<sup>1</sup> BT-11 based on 36 percent of the total estimated ordnance levels (1,254,684) with a deployment footprint over water. In reanalyzing the data based on public comments, NMFS considered the modeled numbers less than or equal to 0.5 to be discountable for estimating take. Estimates in parentheses less than or equal to 0.5 rounded to zero.

NMFS proposes to authorize the incidental take of 323 bottlenose dolphins from Level B harassment (behavioral and TTS) and 33 bottlenose dolphins from Level A harassment annually. NMFS would not authorize take by serious injury or mortality within the proposed regulations or associated LOA.

NMFS has evaluated the potential effects of the Marine Corps’ proposed action on bottlenose dolphins, and has concluded that the proposed activities would, at most, result in a temporary modification in behavior, temporary changes in animal distribution, and/or low-level physiological effects. The required monitoring and mitigation measures for the Marine Corps’ proposed activities would effectively reduce any significant adverse effects of the acoustic stimuli on marine mammals present in the action area. NMFS bases these conclusions on the results of previous monitoring reports and anecdotal observations for the same activities conducted previously by the Marine Corps in BT-9 and BT-11 (USMC, 2012a, 2014).

Based on NMFS’ best professional judgment and evaluation of all of the available data, the Service does not expect long-term or substantial adverse effects for marine mammals, their habitats, or their role in the environment. Under the preferred alternative, NMFS does not expect the proposed activities to impact rates of recruitment or survival for any affected species or stock. Further, the proposed activities would not adversely affect marine mammal habitat and would not have an unmitigable adverse impact to subsistence uses. In sum, NMFS interprets these effects on bottlenose dolphins as falling within the MMPA definitions of Level B

(behavioral) harassment and Level A harassment. NMFS expects these impacts to be minor because of no anticipation of measurable changes to the population or impacts to rookeries, mating grounds, and other areas of similar significance.

#### **4.2 EFFECTS OF ALTERNATIVE 2— NO ACTION ALTERNATIVE**

Under the No Action Alternative, we would not issue regulations and an associated LOA to the Marine Corps. As a result, the Marine Corps would not receive an exemption from the MMPA prohibitions against the take of marine mammals and would, if it were to proceed with its activities, be in violation of the MMPA if take of marine mammals occurs.

The impacts to elements of the human environment resulting from the No Action alternative—conducting activities in the absence of required protective measures for marine mammals under the MMPA—would be greater than those impacts resulting from Alternative 1, the Preferred Alternative.

##### **4.2.1 IMPACTS TO MARINE MAMMAL HABITAT**

Under the No Action Alternative, the action would have no additive or incremental effect on the physical environment beyond those resulting from the Marine Corps' activities, which NMFS evaluated in the referenced documents. This Alternative would result in similar effects on the physical environment as Alternative 1. The only potential difference in impacts to marine mammal habitat under the no action alternative would be the lack of required monitoring measures to assess the presence of marine mammals.

##### **4.2.2 IMPACTS TO MARINE MAMMALS**

Under the No Action Alternative, the Marine Corps' activities would likely result in increased amounts of Level A and Level B harassment to marine mammals and possibly, although unlikely, a small level of takes by serious injury—specifically related to visual and acoustic stimuli—due to the absence of mitigation and monitoring measures required under the Authorization.

If the proposed activities proceeded without the protective measures and reporting requirements required by regulations and associated LOA under the MMPA, the direct, indirect, or cumulative effects on the human or natural environment could include the following:

- Dolphins within the action areas could potentially experience serious injury or mortality
- Dolphins within the action areas could potentially experience increases in the number of behavioral responses and frequency of changes in animal distribution because of the lack of mitigation measures required in the proposed regulations and associated LOA.
- NMFS would not be able to obtain the monitoring and reporting data needed to assess the anticipated impact of the activities upon the species or stock; and increased knowledge of the species as required under the MMPA.

While it is difficult to provide an exact number of takes that might occur under the No Action Alternative, NMFS would expect the numbers to be larger than those presented in Tables 10 and 11 in this document because of the lack of restrictions imposed on the Marine Corps' training activities. Thus, the Marine Corps could take significantly more marine mammals by Level A

and Level B harassment, and could potentially take marine mammals by serious injury or mortality, due to the lack of required mitigation measures.

Under Alternative 2, the action has no unmitigable adverse impact to subsistence uses, as there are no permitted subsistence uses of marine mammals in the region.

#### **4.3 COMPLIANCE WITH NECESSARY LAWS – NECESSARY FEDERAL PERMITS**

NMFS has determined that the issuance of regulations and an associated LOA would be consistent with the applicable requirements of the MMPA, ESA, and CZMA, and our implementing regulations. Please refer to section 1.4 of this EA for more information.

#### **4.4 UNAVOIDABLE ADVERSE IMPACTS**

The Marine Corps' application, NMFS' notice of a proposed rule, and other environmental analyses identified previously summarize unavoidable adverse impacts to marine mammals or the populations to which they belong or on their habitats occurring in the action areas. This document incorporates those documents by reference.

We acknowledge that the incidental take authorized would potentially result in unavoidable adverse impacts. However, we do not expect the Marine Corps' activities to have adverse consequences on the viability of marine mammals in BT-9 or BT-11, and the Service does not expect the marine mammal populations in that area to experience reductions in reproduction, numbers, or distribution that might appreciably reduce their likelihood of surviving and recovering in the wild. NMFS expects that the take resulting from the military readiness activities would have a negligible impact on the affected species or stocks of marine mammals.

The MMPA requirement of ensuring the proposed action has no unmitigable adverse impact to subsistence uses does not apply here because there are no permitted subsistence uses of marine mammals in the region.

#### **4.5 CUMULATIVE EFFECTS**

NEPA defines cumulative effects as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR §1508.7). Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time.

The proposed military readiness activities would add another, albeit temporary activity to the marine environment in BT-9 and BT-11. Further, the proposed activities would be limited to a relatively small area for a comparatively short period of time.

The Marine Corps' EA (DoN, 2009; NSF, 2014) summarizes the potential cumulative effects to marine mammals or the populations to which they belong or on their habitats occurring in the action area. This section incorporates the Marine Corp's 2009 EA by reference and provides a brief summary of the human-related activities affecting the marine mammal species in the action area.

##### **4.5.1 UNUSUAL MORTALITY EVENT (UME) FOR BOTTLENOSE DOLPHINS**

NOAA has declared an UME for bottlenose dolphins along the Atlantic coast from early July 2013 through the present. Elevated strandings of bottlenose dolphins have occurred in North

Carolina. All age classes of bottlenose dolphins are involved and strandings range from a few live animals to mostly dead animals with many very decomposed (NMFS, 2014a). Based upon preliminary diagnostic testing and discussion with disease experts, the tentative cause of this UME could be cetacean morbillivirus (NMFS, 2014b). However the investigation is still ongoing and additional contributory factors to the UME are under investigation including other pathogens, biotoxins, range expansion, etc. (NMFS, 2014b).

#### **4.5.2 MILITARY ACTIVITIES**

The proposed activities are located within the U.S. Navy's Cherry Point Operating Area (CHPT OPAREA) within the Southeast OPAREA. The CHPT OPAREA is located in the coastal and offshore waters off North Carolina from just north of Cape Hatteras south to its southeast corner southeast of Cape Fear at 32.1° N. The types of activities that could occur in the OPAREAs include aircraft carrier, ship and submarine operations; anti-air and surface gunnery, missile firing, anti-submarine warfare, mine warfare, and amphibious operations; all weather flight training, air warfare, refueling, UAV flights, rocket and missile firing, and bombing exercises; and fleet training and independent unit training. Per standard military practice, the Marine Corps coordinate with the U.S. Navy to minimize operational conflicts that could occur during training exercises.

#### **4.5.3 FUTURE OIL AND GAS EXPLORATION**

BT-9 and BT-11 are outside of the Bureau of Ocean and Energy's (BOEM) Outer Continental Shelf (OCS) Mid-Atlantic and South Atlantic Planning Areas for proposed geological and geophysical (G&G) activities (BOEM, 2014). BOEM's intention is to authorize oil and gas activities in support of all three BOEM program areas: oil and gas exploration and development, renewable energy, and marine minerals in the future. NMFS is unaware of any synergistic impacts to marine resources associated with reasonably foreseeable future actions that may be planned or occur outside of BT-9 and BT-11.

#### **4.5.4 RECREATIONAL FISHING ACTIVITIES**

The Marine Corps prohibits or restricts recreational fishing from selected areas of Pamlico Sound due to ongoing operations at BT-9 and BT-11. Increased military activities may discourage unauthorized fishing that occurs within the prohibited areas on more days of the year than would occur under the No Action Alternative. NMFS is unaware of any synergistic impacts to marine mammals associated with restricting access to recreational fishing within BT-9 and BT-11. However, these activities could result in by-catch of marine mammals, entanglement in fishing gear, and reduce prey availability for marine mammals.

#### **4.5.5 CLIMATE CHANGE**

The 2007 Intergovernmental Panel on Climate Change concluded that there is very strong evidence for global warming and associated weather changes and that humans have "very likely" contributed to the problem through burning fossil fuels and adding other "greenhouse gases" to the atmosphere (IPCC, 2007a, 2007b). This study involved numerous models to predict changes in temperature, sea level, ice pack dynamics, and other parameters under a variety of future conditions, including different scenarios for how human populations respond to the implications of the study.

Increased ocean temperatures will reduce oxygen, and atmospheric CO<sub>2</sub> will reduce ocean pH and threaten the health of the marine ecosystem. Ocean circulation patterns will change, with less mixing of cold and warm water in tropical and subtropical areas, affecting the ability of near-

surface species to reach nutrients at lower depths (NJCAA, 2014). At more northern latitudes mixing could actually increase with melting of sea ice, but general ocean warming will alter migration and breeding patterns and push species further northward (NJCAA, 2014).

With the large degree of uncertainty on the impact of climate change to marine mammals in the Atlantic Ocean, NMFS recognizes that warming of this region could affect the prey base and habitat quality for marine mammals. Nonetheless, NMFS expect that the proposed conduct of the training exercises and issuance of regulations and associated LOA to the Marine Corps would not result in any noticeable contributions to climate change.

#### **4.5.6 CONCLUSION**

The military, commercial, and recreational activities, described previously, would not occur within BT-9 and BT-11 during the proposed activities due to safety concerns. Furthermore, given the small scale and infrequent occurrence of the proposed activity, NMFS anticipates minimal environmental effects, because the proposed military readiness activities would not contribute significantly or measurably to the overall environmental effects of other human activities within Pamlico Sound. While certain activities could occur that may result in behavioral disturbance of bottlenose dolphins in the vicinity and general time frame during which the activities would occur at BT-9 and BT-11, NMFS does not expect that the animals would experience more than short-term disturbance or displacement as a result of any of the activities. NMFS does not anticipate that the other military, commercial, and recreational activities in the vicinity would have an additive effect on the condition of the marine mammal species. Additionally, NMFS does not anticipate that the activities would result in injury or mortality of marine mammals. Therefore, NMFS has determined that the proposed activities would not produce any significant cumulative impacts to the human environment.

## **CHAPTER 5 – LIST OF PREPARERS AND AGENCIES CONSULTED**

### **Agencies Consulted:**

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## REFERENCES

- Barco, S. G., & Swingle, W. M. (1996). *Sighting Patterns of Coastal Migratory Bottlenose Dolphins (Tursiops Truncatus) in the Near Shore Waters of Virginia and North Carolina: Final Report*. Virginia Marine Science Museum.
- BOEM. (2014). Final Programmatic Environmental Impact Statement (EIS) Atlantic Outer Continental Shelf Proposed Geological and Geophysical Activities Mid-Atlantic and South Atlantic Planning Areas. Stuart, Florida. Department of the Interior. Bureau of Ocean Energy Management, Gulf of Mexico OCS Region.
- CETAP. (1982). A characterization of marine mammals and turtles in the mid- and North Atlantic areas of the U.S. outer continental shelf. Final Report. Contract No. AA551-CT8-48. Washington, DC. 586 pp.
- Di Iorio, L., & Clark, C. W. (2010). Exposure to seismic survey alters blue whale acoustic communication. *Biology Letters*, 6(1), 51-54.
- DoN. (2003). Marine Resource Assessment for the Cherry Point and Southern Virginia Capes (VACAPES) Inshore and Estuarine Areas. Final Report. Naval Facilities and Engineering Command, Norfolk, Virginia. Contract #N62470-95-D-1160, CTO 0030: Prepared by Geo-Marine, Inc. Plano, Texas. 285 pp.
- DoN. (2009). Environmental Assessment: MCAS Cherry Point Range Operations Norfolk, VA. Department of the Navy. NAVFAC Atlantic 436 pp.
- Ellison, W., Southall, B., Clark, C., & Frankel, A. (2012). A New Context-Based Approach to Assess Marine Mammal Behavioral Responses to Anthropogenic Sounds. *Conservation Biology*, 26(1), 21-28.
- Finneran, J. J., Carder, D. A., Schlundt, C. E., & Ridgway, S. H. (2005). Temporary threshold shift in bottlenose dolphins (*Tursiops truncatus*) exposed to mid-frequency tones. *The Journal of the Acoustical Society of America*, 118, 2696.
- Finneran, J. J., & Schlundt, C. E. (2013). Effects of fatiguing tone frequency on temporary threshold shift in bottlenose dolphins (*Tursiops truncatus*). *The Journal of the Acoustical Society of America*, 133(3), 1819-1826.
- Finneran, J. J., Schlundt, C. E., Carder, D. A., Clark, J. A., Young, J. A., Gaspin, J. B., & Ridgway, S. H. (2000). Auditory and Behavioral Responses of Bottlenose Dolphins (*Tursiops truncatus*) and a Beluga Whale (*Delphinapterus leucas*) to Impulsive Sounds Resembling Distant Signatures of Underwater Explosions. [e-paper]. *Journal of the Acoustical Society of America*, 108(1), 417-431.
- Gannon, D. P. (2003). *Behavioral Ecology of an Acoustically Mediated Predator-prey System: Bottlenose Dolphins and Sciaenid Fishes*. Ph.D. Dissertation, Duke University, Durham, NC.
- Garrison, L., Rosel, P., Hohn, A., Baird, R., & Hoggard, W. (2002). Abundance of the coastal morphotype of bottlenose dolphin *Tursiops truncatus*. Miami, Florida: National Marine Fisheries Service, Southeast Fisheries Science Center.
- IPCC. (2007a). Climate Change 2007: Synthesis Report. Valencia, Spain. Intergovernmental Panel on Climate Change.
- IPCC. (2007b). IPCC, 2007: Climate change 2007: The physical science basis. Contribution of Working Group I to the fourth assessment report of the Intergovernmental Panel on Climate Change.

- Kastak, D., & Schusterman, R. J. (1998). Low-frequency amphibious hearing in pinnipeds: Methods, measurements, noise, and ecology. *The Journal of the Acoustical Society of America*, 103(4), 13.
- Kastak, D., Schusterman, R. J., Southall, B. L., & Reichmuth, C. J. (1999). Underwater temporary threshold shift induced by octave-band noise in three species of pinniped. *The Journal of the Acoustical Society of America*, 106(2), 1142-1148.
- Kenney, R. D. (1990). Bottlenose dolphins off the northeastern United States. *The bottlenose dolphin*, Academic Press, San Diego, 369-386.
- Lefebvre, L. W., Marmontel, M., Reid, J. P., Rathbun, G. B., & Domning, D. P. (2001). *Biogeography of the West Indies: patterns and perspectives*. Boca Raton, FL: CRC Press. 425 pp.
- Maher, J. (2003). *Characterization of bottlenose dolphin (Tursiops truncatus) use of restricted areas in the Pamlico Sound, NC*. Masters, Duke University, Durham, NC.
- Miller, P. J. O., Biassoni, N., Samuels, A., & Tyack, P. L. (2000). Whale songs lengthen in response to sonar. [10.1038/35016148]. *Nature*, 405(6789), 903-903.
- NJCAA. (2014). New Jersey Climate Adaptation Alliance. A Summary of Climate Change Impacts and Preparedness Opportunities Affecting Natural Resources in New Jersey, March 2014. Rutgers The State University of New Jersey. 17 pp.
- NMFS. (2001). Stock structure of coastal bottlenose dolphins along the Atlantic coast of the U.S. NMFS/SEFSC Report prepared for the Bottlenose Dolphin Take Reduction Team. Miami, FL: Southeast Fisheries Science Center, 75 Virginia Beach Dr.
- NMFS. (2012). National Marine Fisheries Service Endangered Species Act Section 7 Biological Opinion for Ongoing Ordnance Delivery at Bombing Target 9 (BT-9) and Bombing Target 11 (BT-II) at Marine Corps Air Station, Cherry Point, North Carolina. Silver Spring, MD. Department of Commerce. National Marine Fisheries Service. 226 pp.
- NMFS. (2013a). "Takes of Marine Mammals Incidental to Specified Activities; U.S. Navy Training and Testing Activities in the Hawaii-Southern California Training and Testing Study Area; Final Rule Final Rule," 78 *Federal Register* 247 (December 24, 2013), pp. 78106 - 78158.
- NMFS. (2013b). "Taking of Marine Mammals Incidental to Specified Activities; U.S. Marine Corps Training Exercises at Air Station Cherry Point; Notice; Proposed Incidental Harassment Authorization; Receipt Of Application For Letter Of Authorization; Request For Comments.," 78 *Federal Register* 61 (March 29, 2013), pp. 19224 -19243
- NMFS. (2014a, May 20, 2014). 2013-2014 Bottlenose Dolphin Unusual Mortality Event in the Mid-Atlantic Retrieved 6/3/2014, 2014, from <http://www.nmfs.noaa.gov/pr/health/mmume/midatl dolphins2013.html>
- NMFS. (2014b). FAQs on the 2013-2014 Bottlenose Dolphin UME in the Mid-Atlantic Retrieved 6/3/2014, 2014, from <http://www.nmfs.noaa.gov/pr/health/mmume/mid-atlantic2013.html>
- NMFS. (2014c). "Taking and Importing Marine Mammals; Taking Marine Mammals Incidental to U.S. Marine Corps Training Exercises at Brant Island Bombing Target and Piney Island Bombing Range, USMC Cherry Point Range Complex, North Carolina; Proposed Rule; Request for Comments," 79 *Federal Register* 135 (July 15, 2014), pp. 41374-41403.

- NSF. (2014). Draft Environmental Assessment of a Marine Geophysical Survey by the R/V Marcus G. Langseth in the Atlantic Ocean off Cape Hatteras, September-October 2014, LGL Report TA8350-1. King City, Ontario. Prepared by LGL Ltd., environmental research associates for the Division of Ocean Sciences. National Science Foundation. 98 pp.
- Paerl, H. W., Bales, J. D., Ausley, L. W., Buzzelli, C. P., Crowder, L. B., Eby, L. A., . . . Richardson, T. L. (2001). Ecosystem impacts of three sequential hurricanes (Dennis, Floyd, and Irene) on the United States' largest lagoonal estuary, Pamlico Sound, NC. *Proceedings of the National Academy of Sciences*, 98(10), 5655-5660.
- Read, A. J. (2007). Real-Time Acoustic Monitoring of Bottlenose Dolphins in and around the Brant Island Shoal Bombing Target (BT-9) and the Piney Island Bombing Range (BT-11). Pre-Proposal to Environmental Affairs Division, Cherry Point MCAS. Durham, NC: Duke University Marine Laboratory. 3 pp.
- Read, A. J., Urian, K. W., & Waples, D. M. (2003a). *Monitoring bottlenose dolphin use of the Brant Island Shoal Bombing Target (BT-9) and the Piney Island Bombing Range (BT-11) and adjacent waters; January-March 2003*: Progress report prepared for MCAS Cherry Point by Duke University Marine Laboratory
- Read, A. J., Urian, K. W., & Waples, D. M. (2003b). *Monitoring bottlenose dolphin use of the Brant Island Shoal Bombing Target (BT-9) and the Piney Island Bombing Range (BT-11) and adjacent waters; October- December 2002*: Progress report prepared for MCAS Cherry Point by Duke University Marine Laboratory.
- Read, A. J., Urian, K. W., Wilson, B., & Waples, D. M. (2003c). Abundance of bottlenose dolphins in the bays, sounds, and estuaries of North Carolina. *Marine Mammal Science*, 19(1), 59-073.
- Richardson, W. J., Greene, C. R., Malme, C. I., & Thomson, D. H. (1995). *Marine Mammals and Noise*. San Diego, California: Academic Press. 576 pp.
- Richardson, W. J., & Wursig, B. (1997). Influences of man-made noise and other human actions on cetacean behaviour. *Marine And Freshwater Behaviour And Physiology*, 29(1-4), 183-209.
- Risch, D., Corkeron, P. J., Ellison, W. T., & Van Parijs, S. M. (2012). Changes in humpback whale song occurrence in response to an acoustic source 200 km away. *PloS one*, 7(1), e29741.
- Schlundt, C. E., J. J. Finneran, B. K. Branstetter, J. S. Trickey, & Jenkins, K. (2013). *Auditory effects of multiple impulses from a seismic air gun on bottlenose dolphins (Tursiops truncatus)*. Paper presented at the Twentieth Biennial Conference on the Biology of Marine Mammals Dunedin, New Zealand.
- Schlundt, C. R., Finneran, J. J., Carder, D. A., & Ridgway, S. H. (2000). Temporary shift in masked hearing thresholds of bottlenose dolphins, *Tursiops truncatus*, and white whale, *Delphinapterus leucas*, after exposure to intense tones. *Journal of the Acoustical Society of America*, 107(6), 3496-3508.
- USMC. (2009). Finding of No Significant Impact: MCAS Cherry Point Range Operations Craven, Carteret, And Pamlico Counties, North Carolina Cherry Point, NC. Department of Defense. U.S. Marine Corps. 7 pp.
- USMC. (2012a). Monitoring Report: Incidental Harassment Authorization Compliance Report for Training Activities at MCAS Cherry Point, North Carolina Cherry Point, NC. 7 pp.
- USMC. (2012b). Request by the U.S. Marine Corps for the issuance of a Letter of Authorization (LOA) for the incidental take of common bottlenose dolphin (*Tursiops truncatus*) related to range operations at

the USMC Cherry Point Range Complex in Pamlico Sound, North Carolina Marine Corps Air Station, Cherry Point, NC. 2 pp.

USMC. (2014). Monitoring Report: Incidental Harassment Authorization Compliance Report for Training Activities at MCAS Cherry Point, North Carolina Cherry Point, NC. 7 pp.

Waring, G. T., Josephson, E., Fairfield-Walsh, C. P., Maze-Foley, K., & Rosel, P. E. (2014). U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2013 Volume 1. National Marine Fisheries Service. 484 pp.