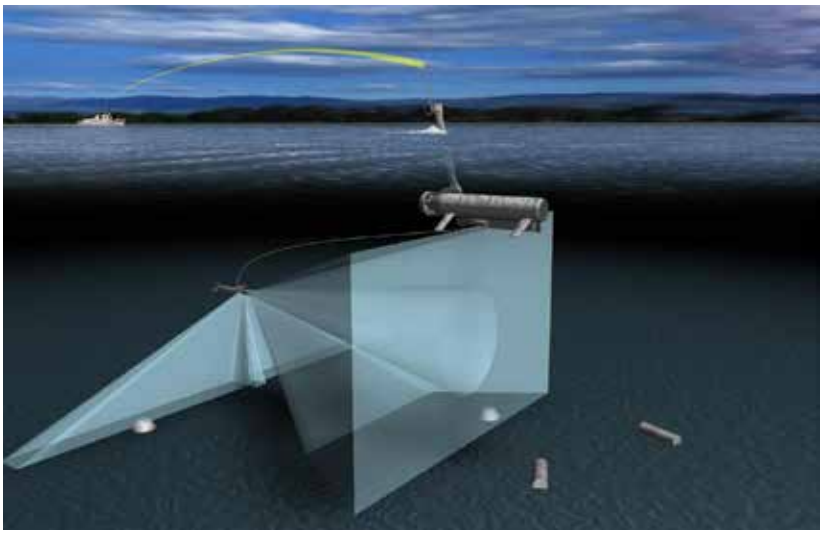
OVERSEAS ENVIRONMENTAL ASSESSMENT

Testing the AN/AQS-20A Mine Reconnaissance Sonar System in the NSWC PCD Testing Range, 2012-2014



Program Executive Office for Littoral Combat Ships

August 2012

Acronyms and Abbreviations

CCD	Charge-Coupled Device
CEQ	Council on Environmental Quality
CFCs	Chlorofluorocarbons
CFR	Code of Federal Regulations
CH_4	Methane
CO_2	Carbon Dioxide
CO_{2e}	Carbon Dioxide Equivalent
dB	Decibel
DLS	Data Link Subsystem
DoD	Department of Defense
DoN	Department of the Navy
EA	Environmental Assessment
EFH	Essential Fish Habitat
EO	Executive Order
EOID	Electro-Optic Identification Device
ESA	Endangered Species Act
FLS	Forward-Looking Sonar
FONSI	Finding of No Significant Impact
ft	foot (feet)
GFS	Gap-Filler Sonar
GHGs	Greenhouse gases
GOM	Gulf of Mexico
HFAS	High-frequency active sonar
IHA	Incidental Harassment Authorization
LCS	Littoral Combat Ship
LIDAR	Light Detection and Ranging
LOA	Letter of Authorization
LRM	Launch Recovery and Maintenance
MBTA	Migratory Bird Treaty Act
MCM	Mine Countermeasure
MFAS	Mid-frequency active sonar
MMPA	Marine Mammal Protection Act
mph	miles per hour
MSAT	Marine Species Awareness Training
NGO	non-governmental organizations
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NO_x	Nitrogen Oxides
NSWC PCD	Naval Surface Warfare Center Panama City Division
O_3	Ozone
OEA	Overseas Environmental Assessment
OPAREA	Operating Area
OPNAVINST	Chief of Naval Operations Instruction
PEO LCS	Program Executive Office for Littoral Combat Ships
Q-20	AN/AQS-20A Sonar System
RDT&E	Research, Development, Test, and Evaluation
RMFS	Remote Mine-hunting Functional Segment
RMMV	Remote Multi-Mission Vehicle
SLS	Side-Look Sonar
Sonar	Sound Navigation and Ranging
TACSIT	Tactical Situation
U.S.	United States
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VSS	Volume Search Sonar
yd	yard

OVERSEAS ENVIRONMENTAL ASSESSMENT

Lead Agency:	Department of the Navy
Action Proponent:	Program Executive Office for Littoral Combat Ships
Title of Proposed Action:	Testing the AN/AQS-20A Mine Reconnaissance Sonar System in the NSWC PCD Testing Range, 2012-2014
Designation:	Overseas Environmental Assessment

Abstract

The Program Executive Office for Littoral Combat Ships (PEO LCS) proposes to test the AN/AQS-20A Mine Reconnaissance Sonar System (referred to as the Q-20) while towed by the Remote Multi-Mission Vehicle (RMMV), or surrogate platforms, in 2012-2014 in the non-territorial waters of the Naval Surface Warfare Center Panama City Division (NSWC PCD) Testing Range. The RMMV is an autonomous, semi-submersible vehicle currently under development by the Navy. This testing is critical to support the timely deployment of the Q-20 to the operational Navy for mine countermeasure activities to be conducted aboard the Navy's new LCS. This OEA evaluates the potential effects on the physical and natural environment of the non-territorial waters of the NSWC PCD Testing Range. Based on this OEA, the Proposed Action would result in no significant harm to the environment of the U.S. Economic Exclusive Zone.

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EXECUTIVE SUMMARY

This Overseas Environmental Assessment (OEA) addresses potential impacts associated with the Program Executive Office for Littoral Combat Ships (PEO LCS) proposal to test the AN/AQS-20A Mine Reconnaissance Sonar System (referred to herein as the Q-20) from 2012 through 2014 in the non-territorial waters of the Panama City Testing Range. The system consists of the Q-20 sonar mounted on a towed body, which would typically be towed by the Remote Multi-Mission Vehicle (RMMV). Other towing platforms such as a surface vessel or, infrequently, a helicopter, may also be used in place of the RMMV. The Q-20 is equipped with high-frequency active sonar systems and a high-resolution electro-optical bottom imaging capability that would be used for mine detection and identification, navigational purposes, and minimization of the risk of collision with subsurface objects during maneuvers. The RMMV consists of a diesel-powered, remotely operated, 7-meter (23-foot) subsurface vehicle. Prior to testing, the Navy would deploy inert mine-like objects within the test area to simulate a minefield. Once a mine shape is detected, classified, and identified, the mine shape could then be "neutralized" with a simulated training neutralizer.

Q-20 testing would occur within a portion of the Naval Surface Warfare Center Panama City Division (NSWC PCD) Testing Range identified as the Tactical Situation (TACSIT) Channel and in adjacent waters. The northernmost portion of the TACSIT Channel is located approximately 32 nautical miles (nm; 37 mi) south of the city of Fort Walton Beach and continues for 37 nm (42 mi) in a generally southeastern direction. The test area is located in the littoral zone of the northern Gulf of Mexico (GOM) in depths of approximately 100 to 250 m (330 to 820 ft).

This OEA considers the potential impacts of Q-20 testing on air quality, geology and water quality, and biological resources. There are no reasonable alternatives to the proposed Q-20 testing in the NSWC PCD Testing Range. Analysis of the Proposed Action and the No Action Alternative concluded that there would be no significant harm to any of the resources as a result of the implementation of the Proposed Action.

PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to meet the developmental testing requirements of the Q-20 by verifying its performance in a realistic ocean and threat environment and supporting its integration with the RMMV and ultimately with the LCS. The need for the Proposed Action is to support the timely deployment of the Q-20 to the operational Navy for Mine Countermeasure (MCM) activities abroad, allowing the Navy to meet its statutory mission to deploy naval forces equipped and trained to meet existing and emergent threats worldwide and to enhance its ability to operate jointly with other components of the armed forces.

ALTERNATIVES

Two alternatives are considered in this OEA. Under Alternative 1, the Preferred Alternative, the Navy would test the Q-20 for up to 420 hours over 42 test days per year from 2012 through 2014 in the NSWC PCD Testing Range. This alternative meets the Navy's purpose and need. Reductions in testing hours, moving the test program into deeper or shallower waters, or deploying the Q-20 from a different platform would not meet the program requirements; hence there are no other reasonable action alternatives to the proposed Q-20 testing. Under Alternative 2, the No Action Alternative, the proposed testing of the Q-20 would not occur. The No Action Alternative would not meet the purpose of and need for the proposed action to meet developmental testing requirements prior to deploying the Q-20 to the operational Navy.

SUMMARY OF ENVIRONMENTAL COMPLIANCE

The Navy has complied with all applicable environmental laws and policies in the preparation of this OEA. Table ES-1 summarizes the applicable laws and policies and the status of compliance.

Table ES-1. Environmental Compliance

Environmental Laws and Policies	Responsible Agency	Status of Compliance
Executive Order (EO) 12114: Environmental Effects Abroad of Major Federal Actions	DoN	In compliance. The Proposed Action would not result in significant harm to the overseas environment; therefore, preparation of an Overseas Environmental Impact Statement is not required.
Office of the Chief of Naval Operations Instruction (OPNAVINST) 5090.1C CH-1: Environmental Readiness Program Manual	DoN	In compliance.
Marine Mammal Protection Act (MMPA) (16 USC §1431 *et seq*.)	National Marine Fisheries Service (NMFS)	In compliance. The Proposed Action would result in sub-TTS behavioral Level B exposures for six marine mammal species, for which the Navy received an Incidental Harassment Authorization (IHA) from NMFS on 26 July 2012.
Endangered Species Act (ESA) (16 USC §1531 *et seq*.)	U.S. Fish and Wildlife Service (USFWS), NMFS	In compliance. The Proposed Action would have no effect on ESA-listed species, and no critical habitat for ESA-listed species would be impacted. Consultation under the ESA is not required.
Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (16 USC §§1801-1802)	NMFS	In compliance. No action is required because the Proposed Action would not have an adverse effect on Essential Fish Habitat (EFH).
Migratory Bird Treaty Act (MBTA) (16 USC §§703-712); Executive Order 13186	USFWS	In compliance. The Proposed Action would not adversely impact migratory birds or their habitats.
Act to Prevent Pollution from Ships (33 U.S.C. §§1905-1915)	DoN	In compliance. The Proposed Action does not involve the release of materials into the water, and all vessels would follow standard Navy pollution prevention measures.
Executive Order (EO) 13089, Coral Reefs Protection	National Oceanic and Atmospheric Administration	In compliance. The Proposed Action would not impact coral reefs.

Table ES-1. Environmental Compliance

Environmental Laws and Policies	Responsible Agency	Status of Compliance
Clean Air Act (CAA) (42 USC §§ 7401-7671q)	U.S. Environmental Protection Agency (USEPA)	In compliance. The Proposed Action would occur in non-territorial waters; therefore, *de minimis* thresholds and attainment status do not apply.

ENVIRONMENTAL CONSEQUENCES

The environmental consequences associated with implementation of the Preferred Alternative and the No Action Alternative are presented in Table ES-2. As shown in Table ES-2, implementation of either the Preferred Alternative or the No Action Alternative would not result in significant harm to any overseas resources. The No Action Alternative would, however, fail to meet the Navy's requirements to test the Q-20 prior to its deployment to the operational Navy.

Table ES-2. Environmental Consequences of Alternatives

Resource Area	Preferred Alternative	No Action Alternative
Air Quality	○	○
Geology and Water Quality	○	○
Biological Resources	○	○

Notes: ○ = No significant harm; ● = Potentially significant harm

Final

OVERSEAS ENVIRONMENTAL ASSESSMENT

TESTING THE AN/AQS-20A MINE RECONNAISSANCE SONAR SYSTEM IN THE NSWC PCD TESTING RANGE, 2012-2014

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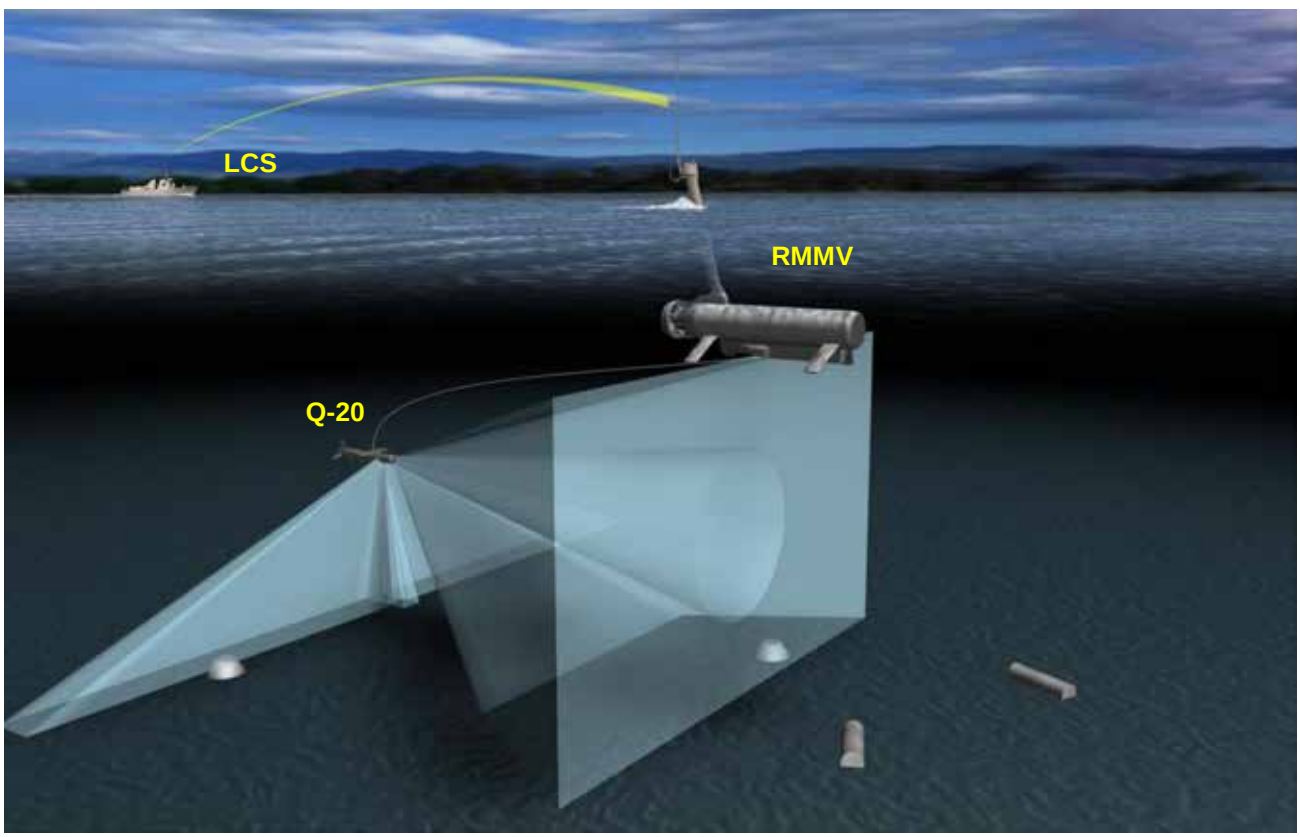
CHAPTER 1
PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

The Program Executive Office for Littoral Combat Ships (PEO LCS) proposes to test the AN/AQS-20A Mine Reconnaissance Sonar System (referred to herein as the Q-20) from 2012 through 2014 in the non-territorial waters of the Naval Surface Warfare Center, Panama City Division (NSWC PCD) Testing Range. The system consists of the Q-20 sonar mounted on a towed body, which would typically be towed by the Remote Multi-Mission Vehicle (RMMV), although other towing platforms may be used in place of the RMMV. The Q-20 is equipped with high-frequency active sonar systems and a high-resolution, electro-optical bottom imaging capability that would be used for mine detection and identification, navigational purposes, and minimization of the risk of collision with subsurface objects during maneuvers. The RMMV consists of a diesel-powered, remotely-operated, 7-meter (m; 23 foot [ft]) subsurface vehicle. The RMMV also possesses a built-in collision avoidance system in its mast to prevent impacts with surface objects. A surrogate towing platform to the RMMV would typically be a small surface vessel, a Littoral Combat Ship (LCS), or a helicopter. An artist's rendering of the Q-20's deployment from an LCS is shown in Figure 1-1.



Notes: Q-20 = AN/AQS-20A sonar mounted on a towed body; RMMV = Remote Multi-Mission Vehicle; LCS = Littoral Combat Ship
Source: PEO LMW 2011

Figure 1-1. Artist's Rendering of Q-20 Deployment from LCS

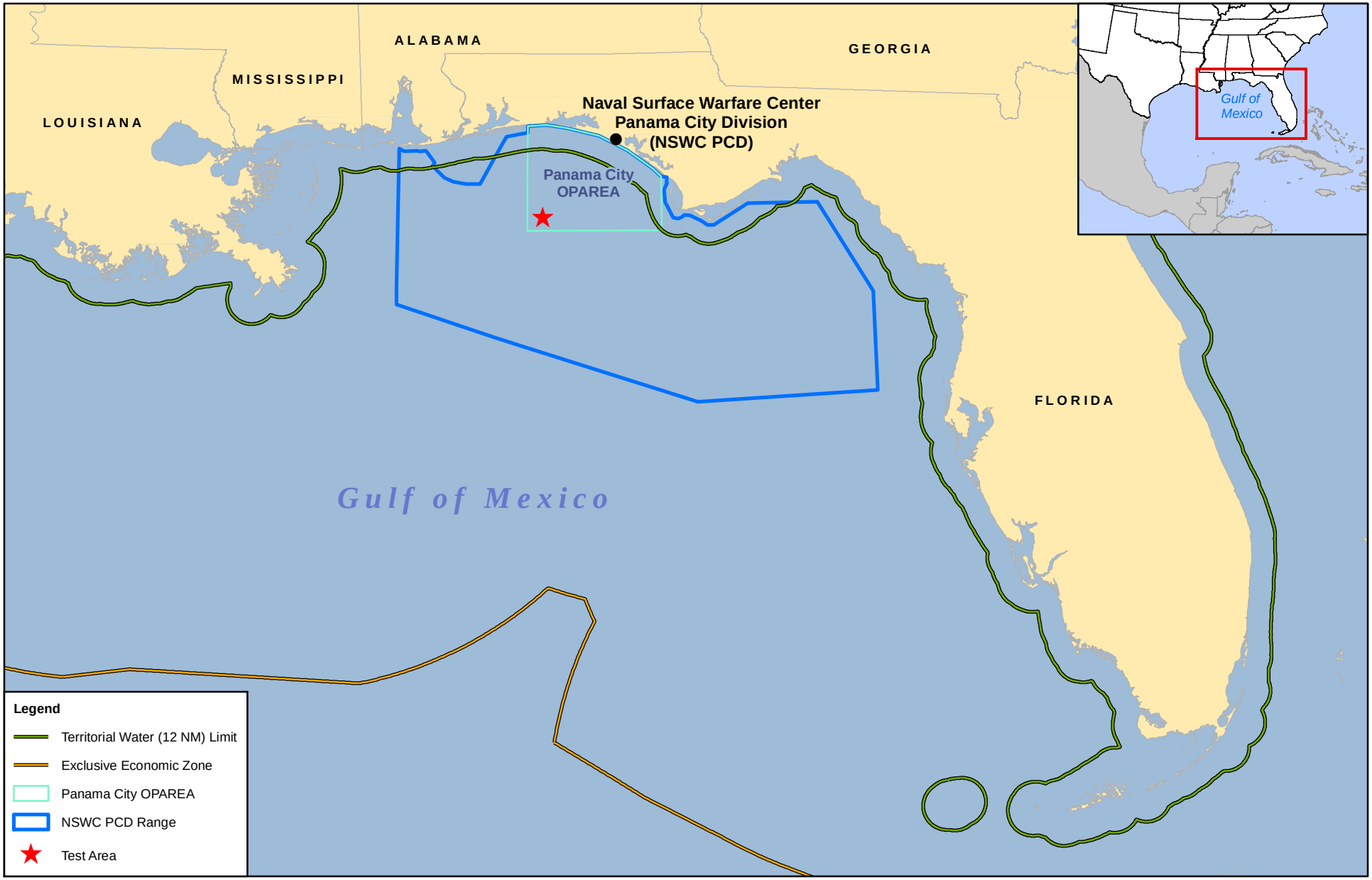
The Q-20 provides the Navy with a high-endurance, off-board mine reconnaissance package in a low-observable sub-surface system. During proposed testing, the system would be towed or transported to the test area by a range craft or other Navy vessel, which could include the Navy's new LCS. The system addresses a critical need in mine warfare, using unmanned, autonomous, and off-board systems to detect and assess littoral minefield risks without putting sailors or ships at risk in the minefield.

This Overseas Environmental Assessment (OEA) addresses the potential environmental impacts of the proposed Q-20 testing in the non-territorial waters of the NSWC PCD Testing Range (Figure 1-2). Testing as proposed would begin in July 2012 and continue through December 2014. This OEA has been prepared by the PEO LCS for the United States Department of the Navy (DoN) in accordance with Executive Order (EO) 12114, Department of Defense regulations implementing EO 12114, and the Chief of Naval Operations Instruction (OPNAVINST) 5090.1C CH-1 (Environmental Readiness Program Manual), Chapter 5 in particular.

1.2 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to meet the developmental testing requirements of the Q-20 by verifying its performance in a realistic ocean and threat environment and supporting its integration with the RMMV and ultimately with the LCS. Testing would include component, subsystem-level, and full-scale system testing in the operational environment.

The need for the Proposed Action is to support the timely deployment of the Q-20 to the operational Navy for Mine Countermeasure (MCM) activities abroad, allowing the Navy to meet its statutory mission to deploy naval forces equipped and trained to meet existing and emergent threats worldwide and to enhance its ability to operate jointly with other components of the armed forces.



0 25 50 Nautical Miles
0 50 100 Kilometers

Note: NM = Nautical Mile

Figure 1-2
Regional Location: Test Area in the Panama City OPAREA

N

1.3 LEGAL REQUIREMENTS

Since the environmental effects of the Proposed Action would occur only in the non-territorial waters of the U.S., EO 12114 directs the environmental planning process. Department of Defense (DoD) regulations implementing EO 12114 are published at 32 CFR Part 187.

The Department of the Navy (DoN) environmental planning process is directed by OPNAVINST 5090.1C CH-1, *Environmental Readiness Program Manual*, and in particular, Chapter 5, *Environmental Planning Under the National Environmental Policy Act and Executive Order 12114*. In determining the appropriate level of environmental documentation for an overseas action, Chapter 5 directs the action proponent to prepare an OEA (as opposed to an Overseas EIS) if the activity or action will not result in harmful effects or if its effects are unknown. Based on the raw quantitative analysis (Chapter 3 of this OEA) and protective measures that would be implemented (Chapter 2 of this OEA), the Q-20 testing would not result in harmful effects and therefore, an OEA is the appropriate environmental planning document.

The MMPA (16 USC §§ 1361 *et seq*. 1972) prohibits "takes" of marine mammals without authorization from the National Marine Fisheries Service (NMFS). Takes are defined as Level A (permanent hearing loss or other injury or mortality) or Level B (temporary hearing loss or non-injury behavioral effects). MMPA authorization can be in the form of an Incidental Harassment Authorization (IHA), which only authorizes Level B takes, or a Letter of Authorization (LOA) when there is a reasonable likelihood of Level A takes, i.e., injury to or mortality of a marine mammal.

Table 1-1 summarizes the applicability of the various environmental statutes and other regulations.

Table 1-1. Applicability of Environmental Statutes and Regulations

Environmental Laws and Policies	*Applicable?*	*Status of Compliance*
Executive Order (EO) 12114, Environmental Effects Abroad	Yes	In compliance. The Proposed Action would not result in significant harm to the overseas environment; therefore, preparation of an Overseas Environmental Impact Statement is not required.
Office of the Chief of Naval Operations Instruction (OPNAVINST) 5090.1C CH-1: Environmental Readiness Program Manual	Yes	In compliance.
Marine Mammal Protection Act (MMPA) (16 USC §1431 et seq.)	Yes	In compliance. The Proposed Action would result in sub-TTS behavioral Level B exposures for six marine mammal species, for which the Navy received an Incidental Harassment Authorization (IHA) from NMFS.
Endangered Species Act (ESA) (16 USC §1531 et seq.)	Yes	In compliance. The Proposed Action would have no effect on ESA-listed species, and no critical habitat for ESA-listed species would be impacted. Consultation under the ESA is not required.
Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (16 USC §§1801-1802)	Yes	In compliance. No action is required because the Proposed Action would not have an adverse effect on Essential Fish Habitat (EFH).
Migratory Bird Treaty Act (MBTA) (16 USC §§703-712); Executive Order 13186	Yes	In compliance. The Proposed Action would not adversely impact migratory birds or their habitats.

Table 1-1. Applicability of Environmental Statutes and Regulations

Environmental Laws and Policies	*Applicable?*	*Status of Compliance*
Act to Prevent Pollution from Ships (33 U.S.C. §§1905-1915)	Yes	In compliance. The Proposed Action would not involve the release of materials into the water, and all vessels would follow standard Navy pollution prevention measures.
Marine Protection, Research and Sanctuaries Act (Ocean Dumping Act) (33 USC §1401 et seq.)	No	The Proposed Action does not involve the disposal of materials into the water, and is not within any designated sanctuary.
Executive Order (EO) 13089, Coral Reefs Protection	Yes	In compliance. The Proposed Action would not impact coral reefs.
Clean Air Act (CAA) (42 USC §§ 7401-7671q)	No	The Proposed Action would occur in non-territorial waters; therefore, the CAA does not apply. However, potential impacts on air quality are considered per EO 12114.
Clean Water Act (CWA) (33 USC §1344)	No	The Proposed Action would occur in non-territorial waters; therefore, the CWA does not apply. However, potential impacts on water quality are considered per EO 12114.
Rivers and Harbors Act (RHA) (33 USC §403)	No	The Proposed Action would occur in non-territorial waters; therefore, the RHA does not apply.
National Historic Preservation Act (NHPA) (16 USC 470 et seq.)	No	The Proposed Action would occur in non-territorial waters; therefore, the NHPA does not apply.
Archaeological Resources Protection Act (ARPA) of 1979 (16 USC §§470aa-mm)	No	The Proposed Action would occur in non-territorial waters; therefore, the ARPA does not apply.
Bald and Golden Eagle Protection Act (BGEPA) (16 USC §§ 668-668c)	No	The Proposed Action would occur in non-territorial waters; therefore, the BGEPA does not apply.
Sikes Act and Sikes Act Improvement Act (16 USC §§ 670a to 670o), Conservation Programs on Government Lands	No	The Proposed Action would occur in non-territorial waters; therefore, the Sikes Act and Sikes Act Improvement Act do not apply.
EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations	No	The Proposed Action would occur in non-territorial waters; therefore, EO 12898 does not apply. Furthermore, the Proposed Action would have no impact on minority or low-income populations.
EO 13045, Protection of Children from Environmental Health Risks and Safety Risks	No	The Proposed Action would occur in non-territorial waters, more than 12 nautical miles from shore, and would not expose children to health or safety risks.

1.4 SCOPE OF THE OEA

This document meets the requirements of EO 12114, which applies to actions and effects occurring in the overseas environment more than 12 nm from shore. EO 12114 defines "environment" as "the natural and physical environment" and specifically excludes "social, economic, and other environments." DoN policy for implementing EO 12114 specifies that an OEA should only address those resource and issue areas that are subject to impacts and that the level of analysis should be commensurate with the anticipated level of environmental impact. Accordingly, this OEA addresses the direct and indirect effects of the action on the following resources:

- Air Quality
- Geology and Water Quality
- Marine Biological Resources

1.5 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

This action is being coordinated with the National Marine Fisheries Service (NMFS) in conjunction with MMPA compliance. Public participation is not required for an OEA per OPNAVINST 5090.1C, CH-1; however, the IHA application was made available to the public through coordination with NMFS regarding the IHA process. NMFS issued the Navy an IHA for the proposed action on 26 July 2012.

CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

2.1 PROJECT OVERVIEW

The Proposed Action is to test the Q-20 in non-territorial waters of the NSWC PCD Testing Range. The Q-20 uses high-frequency sonar and an Electro-Optic Identification Device (EOID) to locate and identify mines in littoral waters (Figure 2-1). The Q-20 would typically be towed by the RMMV, although it could occasionally be towed by surrogate platforms such as small range craft or contractor boats, the LCS, or, on occasion, a Navy helicopter. Testing would occur from March 2012 through December 2014, with annual testing requirements amounting to approximately 42 mission tests.

2.2 PROJECT LOCATION

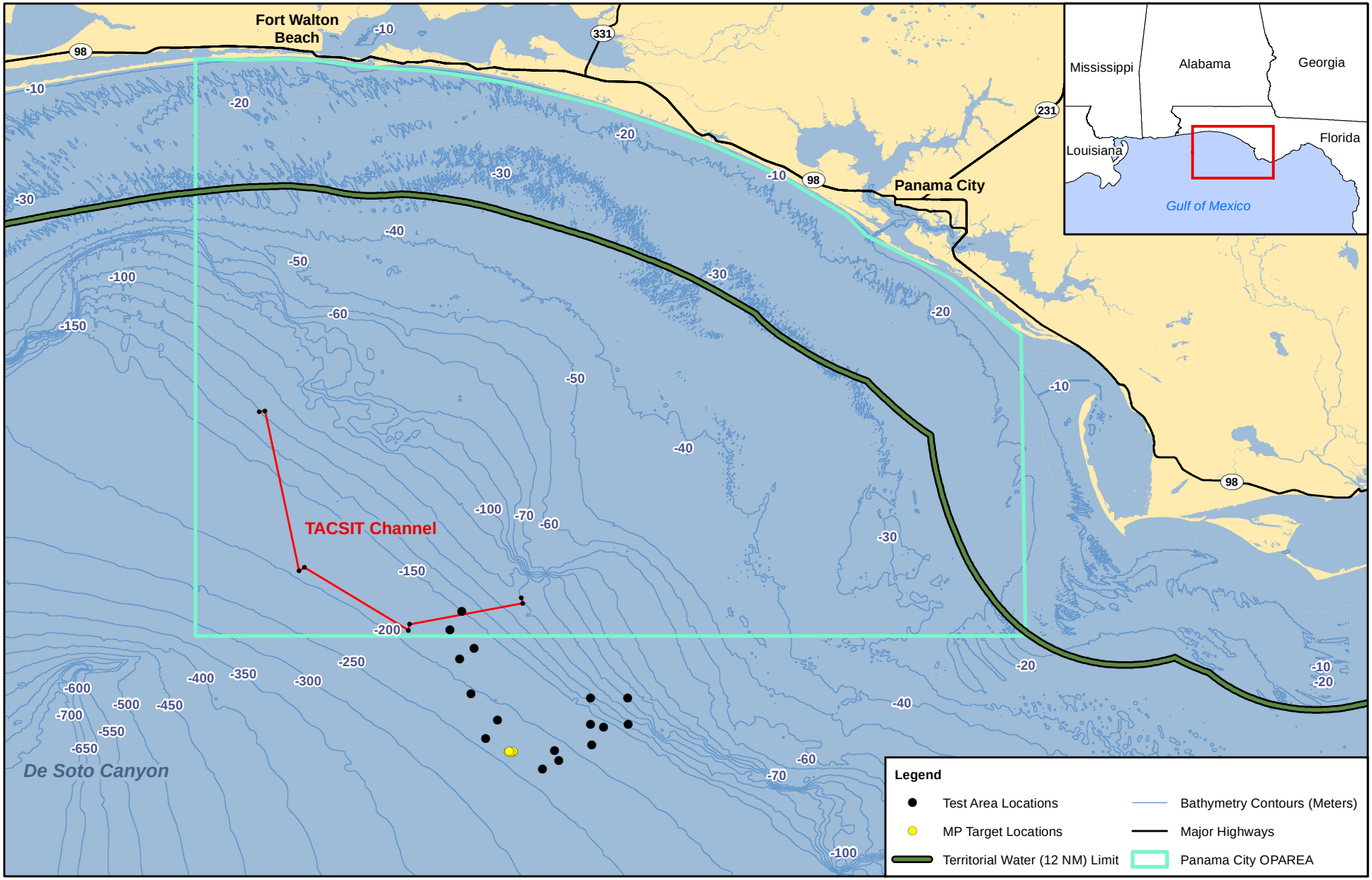
The Proposed Action would be located within a portion of the NSWC PCD Testing Range, identified in Figure 2-2 as the TACSIT Channel, and in adjacent waters that include Target and Operational Test Fields located in Military Warning Area 151 (W-151). The northernmost portion of the TACSIT Channel is located approximately 32 nautical miles (NM; 37 mi) south of the city of Fort Walton Beach and continues for 37 nm (42 mi) in a generally southeastern direction. The test area is located in the northern Gulf of Mexico (GOM) between depths of 100 m and 250 m (330 ft to 820 ft). The Navy would deploy inert mine-like objects within this area to simulate a minefield. Mine shapes already in place for other test activities could also be used. Once an inert mine shape is detected, classified, and identified, the inert mine shape could then be neutralized with a simulated training neutralizer.

2.3 PROJECT COMPONENTS

2.3.1 AN/AQS-20A Mine Reconnaissance Sonar System (Q-20)

The Q-20 has an actively controlled tow body that provides a stable platform for four sonar, and one optical mine reconnaissance, sensors that are used for the detection, classification, localization, and identification of bottom, moored, and volume mines. Active sonars emit acoustic energy specifically to obtain information concerning objects that reflect sound energy. The Q-20's sensors are summarized below; additional information can be found at http://www.raytheon.com/businesses/rtnwcm/groups/public/documents/datasheet/an_aqs_20_minehunting.pdf.

Figure 2-1. The AN/AQS-20A (Q-20)



0 10 20 Nautical Miles

0 10 20 Kilometers

Figure 2-2
Q-20 Testing in the Panama City OPAREA

Notes:
-NM = Nautical Mile

2.3.1.1 Q-20 Sonar Systems

The Q-20 is equipped with four high frequency (>10 kilohertz [kHz]) sonar systems that are used for mine detection in the water column and along the ocean bottom, high-resolution bottom imaging for navigational purposes, and to minimize risk of collision with sub-surface objects. These sonars are the only active underwater acoustic sources that would be tested during the Proposed Action. The four Q-20 sonar sensors are: (1) Volume Search Sonar (VSS); (2) Side-Look Sonar (SLS); (3) Forward-Looking Sonar (FLS); and (4) Gap-Filler Sonar (GFS). The VSS and the FLS sonars are the only acoustic sonars that require consideration under the MMPA; the SLS and GFS sonars operate at very high frequencies (greater than 200 kHz), well above the hearing sensitivities of marine mammals, sea turtles, and seabirds. Specifications for the four sonar arrays are provided in Table 2-1. Sound source levels are in decibels referenced to 1 micro Pascal (dB re 1 μPa) at 1 m.

Table 2-1. Q-20 Sonar Specifications

Sonar Array	*Frequency (kHz)*	*Source Strength (dB [re: 1 μPa at 1 m])*	*Directional Exposure*
Volume Search Sonar (VSS)	35	212	Crosstrack beam width: 243º Squint Angle: 0º or 30º
Forward Looking Sonar (FLS)	85	207	Azimuth: 60º Depression/Elevation: 60º
Side Looking Sonar (SLS)	>200	216	Azimuth: 5.6º Depression/Elevation: 14.9º
Gap Filler Sonar (GFS)	>200	190	Azimuth: +/- 23º Depression/Elevation: 24.6º down

Notes: Source Strength is normalized to a duration of 1 second. Sources above 200 kHz are not required to be modeled for impacts to biological resources. Crosstrack beam width describes the area of the search; squint angle is the angle that the beam may be steered away from the track; azimuth and depression/elevation are parameters describing the angle of the search field and the width of the beam at a given distance from the source (see Figure 1-1).

2.3.1.2 Optical Sensor

Optical testing of the EOID would be conducted during test events. The EOID module would be used on the Q-20 tow body to scan and create an image of a mine-like object. The EOID uses a Class 4 frequency, doubled-pulsed laser source for illumination of objects on or above the seabed. Testing would assess the mechanical performance of the EOID, and its functional capability to identify mine-like objects or targets of opportunity in the test area.

The EOID is an application of optical remote sensing technology known as Light Detection and Ranging (LIDAR). The EOID produces an infrared laser beam that is internally converted to blue-green light before being emitted, though some residual infrared light exists; this laser propagation method is employed by most blue-green lasers. Reflections from the observed objects are received by two onboard charge-coupled device (CCD) cameras. Typical usage of the laser is not continuous: although it is ready to emit in a standby mode, operations usually require the laser to emit in 10-second bursts. The EOID is used to identify bottom targets during specific types of maneuvers. These maneuvers do not exceed three laser emissions of 10 seconds each per target. The EOID laser can present hazards to the eye from inter-beam viewing and specular reflections. NSWC PCD's Laser Safety Plan will be followed to assure personnel safety while handling the EOID (NSWC PCD 2010).

2.3.2 Remote Multi-Mission Vehicle (RMMV)

The RMMV is a diesel-powered, remotely-operated, 7 m sub-surface vehicle that tows the Q-20 (Figure 2-4). The RMMV would be visible at the surface by its snorkel/mast that extends vertically 5 m from the

RMMV and 1.8 m above the surface, providing air intake and exhaust for the diesel engine, a platform for the radio frequency antennae, and an operator initiated real-time obstacle avoidance system.

Line-of-sight and over-the-horizon radio frequency telemetry systems (i.e., a Data Link Subsystem [DLS]) would provide command and control of the RMMV and transmit mine reconnaissance sensor data to and from command and control technicians. A team of four people would operate the RMMV and the Q-20 from either the LCS or a range craft: a supervisor would maintain overall responsibility for the test; a Remote Vehicle Operator would operate and monitor the RMMV; a Remote Sensor Operator would operate and monitor the Q-20; and a Mission Logger would capture all commands, results, and metrics for the test. The system could be pre-programmed to perform autonomously, or test operators could manually control and monitor the RMMV and Q-20 via real-time encrypted data communications modes, with response times of 5 – 15 seconds to effect changes in course and speed.

The RMMV would operate at speeds up to 12 knots (13.8 miles per hour [mph]) during testing. Collision avoidance maneuvers would be assessed during test events. Test observers on support vessels would possess the capability to immediately shutdown the RMMV with a kill switch transponder should the need arise to ensure public safety, avoid marine animals or object collisions, prevent entanglements, or prevent loss of the RMMV or the Q-20. The decision to halt operations using the kill switch for safety reasons would be by the authority of the Offshore Lead, the Safety Officer, or other designee, who would be present during the test mission. The RMMV and the Q-20 would be recovered at the conclusion of each mission run.

Additional details about the RMMV can be found at http://www.lockheedmartin.com/products/RemoteMinehuntingSystem/index.html.

Source: PEO LMW 2011

Figure 2-3. The Remote Multi-Mission Vehicle (RMMV)

2.3.3 Surface Vessels

Although the RMMV would be the primary vessel used to tow the Q-20 during test events, other range craft, contractor vessels, or a helicopter could potentially be used to tow the Q-20 if the RMMV were unavailable. Other surface vessels would provide field observation and safety support during test events.

2.4 Q-20 Test Activities

This section covers the general test strategy. Tests would include component, subsystem level, and full-scale testing in the operational environment. When the RMMV is used, the RMMV and the Q-20 would be operated by remote command and control systems, and field observation and safety would be provided by support vessels.

Q-20 test events would begin in July of 2012 and would continue through December of 2014, allowing for unexpected delays. A test event consists of all activities needed to complete the test's objectives, which may or may not involve active Q-20 sonar use. In some instances, a test event may span several

days. During such extended events, to conserve fuel and other resources, supporting vessels may remain at sea until the test event is concluded. Regardless of test event objectives, active Q-20 sonar use would not exceed 10 hours in one 24-hour day, and the total number of test days with active sonar use would not exceed 42 days in one year. As such, total active Q-20 sonar use would not exceed 420 hours per year. LIDAR use during a Q-20 mission test event is expected to be approximately 4 minutes.

Each test event would begin by towing or transporting the Q-20, as well as personnel and other equipment (such as the RMMV) as appropriate, to the TACSIT Channel testing site with a range support vessel. Once in place, the system would operate under its own propulsion (e.g., the RMMV's diesel engine) and begin the mission run. The test event would end with a return to the shore facility. Test events would be approximately equally divided between summer and winter months. If a helicopter were to be used to tow the Q-20 during the test, the helicopter would also transport the Q-20 to the test area. Tests at the TACSIT Channel would involve searching the channel for mine-like objects.

Each test event would have the following outline:

1. Transit to track.
    a. RMMV inertial navigation unit alignment (Q-20 not powered on)
    b. Q-20 in-water examination (may involve divers or onboard observers)
    c. Q-20 alignment maneuvering and self-tests (Q-20 powered on; sonar not in use)
2. Track execution (sonar in use)
    a. System follows track of waypoints specific to test mission, with changing parameters such as:
        i. RMMV speed and heading
        ii. Q-20 depth/altitude
        iii. Q-20 sonar mode
        iv. Deploy/retrieve Q-20
    b. Perform reacquisition maneuvers on contacts (mine shapes), if contained in test mission plan
3. Transit from track
    a. Q-20 powered off
    b. Prepare for collection

2.5 ACTION ALTERNATIVES

OPNAVINST 5090.1C CH-1, *Environmental Readiness Program Manual*, requires the exploration of a reasonable range of action alternatives and the analysis of at least one action alternative to the Proposed Action, unless there are no practicable action alternatives that would meet the purpose and need.

In this case, there are no practicable alternatives to the proposed Q-20 testing in the NSWC PCD Testing Range for the following reasons:

- The test requirements are specific to the Q-20 and its final integration with the RMMV; no other systems or modified operating parameters will meet these requirements.
- An established Navy RDT&E range with range access, specialized procedures, and vessels and personnel on hand to support the necessary mine reconnaissance tests is required to perform the proposed testing.

- Testing requires ready access to an extensive area with moderate water depths (100-250 m) and relatively calm seas for extended periods of time to allow up to 420 hours of Q-20 operational testing per year.

Alternatives as to where the Proposed Action would be conducted were considered based upon how well the proposed test location satisfied the following critical operational and environmental requirements of Q-20 testing:

- Ocean environment that provides extended periods of relatively calm seas (seas less than 3 ft (0.91 m) 80 percent of the time in summer and 50 percent of the time in winter);
- High water clarity;
- A-1 bottom type (predominantly sandy, not hard, with low relief, as defined by Naval Warfare Publication 3-15);
- A wide coastal shelf with a depth of up to 600 ft (183 m);
- Proximity to Navy shore support facilities.

Relatively calm sea states are needed to test the RMMV while towing the Q-20 and to support the safe handling of the Q-20 during its deployment and recovery. The high water clarity and A-1 bottom type provide an ideal environment for testing the Q-20 and limits additional variables such as turbidity and high-relief rocky substrate that could confound the use of LIDAR and the ability of the Q-20 to discriminate mine-like objects. The wide expanse of relatively shallow water provides the capability of deploying different configurations of target fields in the test area. This capability would reduce the amount of time necessary to conduct the proposed testing. Otherwise, the target fields would have to be recovered and redeployed each time a new configuration was required. The wide expanse of relatively shallow water also provides the ability to plan and evaluate range of movement using test tracks in various directions i.e., North to South and East to West. The close proximity of Navy shore support facilities is needed to provide the infrastructure and assets to accomplish the required Q-20 testing while minimizing long sea transits to and from the test area and related costs to the program and shore support.

As shown in Table 2-2, the Navy considered seven potential test areas for conducting the Proposed Action. Some of the test areas partially fulfilled operational and environmental requirements. However, the NSWC PCD Testing Range is the only test area that fully provides all of the operational and environmental requirements, and specifically provides for the most critical two: a wide expanse of relatively shallow water close to shore and great abundance of A-1 bottom type. Therefore, no other test location alternatives are analyzed in this OEA.

As a result, two alternatives are considered in this OEA:

- Under Alternative 1, the Preferred Alternative, up to 420 hours of the proposed Q-20 active sonar testing would be conducted over 42 test days per year, from 2012 through 2014. This alternative meets the Navy's purpose and need.
- Under Alternative 2, the No Action Alternative, the proposed Q-20 active sonar testing would not occur. This alternative does not meet the Navy's purpose and need, but is carried forward for consideration as required by Navy policy.

Table 2-2. Alternative Site Scoring for Q-20 RMMV Testing

Test Criteria	*Site*						
	Panama City Testing Range, FL	*South FL Test Facility*	*Mayport/ Jacksonville FL Range Complex*	*Little Creek/Norfolk VA Range*	*Southern California Range Complex*	*Keyport Range Complex*	*Atlantic Undersea Test & Evaluation Center*
Extensive 100-250 m Depth	2	1	1	1	1	1	1
A-1 Bottom Type	2	2	2	2	1	1	1
Suitable for year-round testing	2	2	2	1	1	1	2
Shore Support	2	1	1	1	1	2	1
Total Score	**8**	**6**	**6**	**5**	**4**	**5**	**5**

Notes: Scoring as follows: 0 = does not meet criterion; 1 = partially meets criterion with some limitations; 2 = meets criterion without limitations

Table 2-3 summarizes the details of the alternatives.

Table 2-3. Q-20 Use: Proposed Action and Action Alternatives

Alternative	*Q-20 Active Sonar Use by Year in Non-Territorial Waters of the Gulf of Mexico (Hours)*			*Total Q-20 Active Sonar Use (Hours)*
	2012	*2013*	*2014*	
Alternative 1: Preferred Alternative (RMMV)	420	420	420	1,260
Alternative 2: No Action Alternative	0	0	0	0

2.6 PROTECTIVE MEASURES

The proposed Q-20 testing is not expected to cause significant harm to GOM resources; however, to further ensure that any potential effects to marine mammals and federally-listed marine species are minimized during tests, and ensure general navigational and operational safety, the following range operating procedures and protective measures would be integrated into and implemented during testing. These measures include standard practice by NSWC PCD under existing permits and those finalized in conjunction with the Navy's receipt of an Incidental Harassment Authorization (IHA) from NMFS on 26 July 2012.

(a) Personnel Training

(i) The Marine Species Awareness Training (MSAT) shall be provided to all applicable participants, where appropriate. Marine mammal observer training will be provided before active sonar testing begins.

(ii) Marine Observers shall be aware of the specific actions to be taken based on the Navy's Research, Development, Test and Evaluation (RDT&E) platform if a marine mammal or sea turtle is observed. Specifically, the following requirements for personnel training would apply:

(A) All Marine Observers onboard platforms involved in the Q-20 sonar test activities shall review the NMFS-approved MSAT material prior to use of active sonar.

(B) Marine Observers shall be trained in marine mammal recognition. Marine Observer training shall include completion of the Marine Species Awareness Training, instruction on governing laws and policies, and overview of the specific Gulf of Mexico species present, and observer roles and responsibilities.

(C) Marine observers shall be trained in the most effective means to ensure quick and effective communication within the command structure in order to facilitate implementation of mitigation measures if marine species are spotted.

(b) Range Operating Procedures: The following procedures shall be implemented to maximize the ability of Navy personnel to recognize instances when marine mammals or sea turtles are in the vicinity. Visual surveys will be conducted for all test operations to reduce the potential for vessel collisions with a protected species. If necessary the ship's course and speed will be adjusted.

(i) Marine Observer Responsibilities

(A) Marine Observers shall have at least one set of binoculars available for each person to aid in the detection of marine mammals.

(B) Marine Observers shall conduct monitoring for approximately 15 minutes prior to the initiation of and for approximately 15 minutes after the cessation of Q-20 testing activities.

(C) Marine Observers shall scan the water from the ship to the horizon and be responsible for all observations in their sector. In searching the assigned sector, the lookout shall always start at the forward part of the sector and search aft (toward the back). To search and scan, the lookout shall hold the binoculars steady so the horizon is in the top third of the field of vision and direct the eyes just below the horizon. The lookout shall scan for approximately five seconds in as many small steps as possible across the field seen through the binoculars. They shall search the entire sector in approximately five-degree steps, pausing between steps for approximately five seconds to scan the field of view. At the end of the sector search, the glasses shall be lowered to allow the eyes to rest for a few seconds, and then the lookout shall search back across the sector with the naked eye.

(D) Marine Observers shall be responsible for informing the Test Director of any marine mammal or sea turtle that may need to be avoided, as warranted.

(E) These procedures shall apply as much as possible during Remote Multi-Mission Vehicle (RMMV) operations. An observer shall be located on the support vessel or platform to observe the area when the system is undergoing a small track close to the support platform.

(ii) Operating Procedures

(A) Test Directors shall, as appropriate to the event, make use of marine species detection cues and information to limit interaction with marine species to the maximum extent possible, consistent with the safety of the ship.

(B) During Q-20 sonar activities, personnel shall utilize all available sensor and optical system (such as Night Vision Goggles) to aid in the detection of marine mammals.

(C) Navy aircraft participating shall conduct and maintain, when operationally feasible, required, and safe, surveillance for marine species of concern as long as it does not violate safety constraints or interfere with the accomplishment of primary operational duties.

(D) Marine mammal detections by aircraft shall be immediately reported to the Test Director. This action shall occur when it is reasonable to conclude that the course of the ship will likely close the distance between the ship and the detected marine mammal.

(E) Special conditions applicable for dolphins only: If, after conducting an initial maneuver to avoid close quarters with dolphins, the Test Director or the Test Director's designee concludes that dolphins are deliberately closing to ride the vessel's bow wave, no further mitigation actions are necessary while the dolphins or porpoises continue to exhibit bow wave riding behavior.

(F) Sonar levels (generally)—Navy shall operate sonar at the lowest practicable level, except as required to meet testing objectives.

(c) Clearance Procedures

(i) An initial evaluation of environmental suitability shall be made when the test platform (surface vessel or aircraft) arrives at the test site. This evaluation shall include an assessment of sea state and verification that the area is clear of visually detectable marine mammals, sea turtles, and indicators of their presence. Large sargassum rafts and large concentrations of jellyfish are considered indicators of potential sea turtle presence.

(ii) The area for visual surveying shall be visually surveyed for the presence of protected species and protected species indicators. Visual surveys shall be conducted from the test platform before test activities begin. When the platform is a surface vessel, no additional aerial surveys will be required. For surveys requiring only surface vessels, aerial surveys may be opportunistically conducted by aircraft participating in the test.

(iii) Shipboard monitoring shall be staged from the highest point possible on the vessel. The observer(s) shall be experienced in shipboard surveys, familiar with the marine life of the area, and equipped with binoculars of sufficient magnification. Each observer shall be provided with a two-way radio that will be dedicated to the survey, and shall have direct radio contact with the Test Director. Observers shall report to the Test Director any sightings of marine mammals, sea turtles, or indicators of these species, as described previously.

Distance and bearing will be provided when available. Observers may recommend a "Go" / "No Go" decision, but the final decision will be the responsibility of the Test Director.

(iv) Post-mission surveys shall be conducted from the surface vessel(s) and aircraft used for pre-test surveys. Any affected marine species shall be documented and reported to NMFS. The report shall include the date, time, location, test activities, species (to the lowest taxonomic level possible), behavior, and number of animals.

2.7 MONITORING AND REPORTING

(a) Monitoring

(i) Systematic monitoring of the affected area for marine mammals shall be conducted prior to, during, and after test events using aerial and/or ship-based visual surveys.

(ii) Observers shall record information during the test activity. Data recorded shall include but not limited to:

(A) location of sighting;

(B) species (or to the lowest taxa possible);

(C) number of individuals;

(D) number of calves present, if any;

(E) duration of sighting;

(F) behavior of marine animals sighted;

(G) direction of travel;

(H) environmental information associated with sighting event including Beaufort sea state, wave height, swell direction, wind direction, wind speed, glare, percentage of glare, percentage of cloud cover; and

(I) when in relation to Navy testing activities did the sighting occur (before, during or after Q-20 testing).

(iii) Any digital photographs that are taken of marine mammals during visual surveys shall be provided to local researchers for their regional research.

(b) Reporting

(i) General Notification of Injured or Dead Marine Mammals - Navy personnel shall ensure that NMFS (regional stranding coordinator) is notified immediately (or as soon as clearance procedures allow) if an injured or dead marine mammal is found during or shortly after, and in the vicinity of, any of Navy's Q-20 testing activities. The Navy shall provide NMFS with species or description of the animal(s), the condition of the animal(s) (including carcass condition if the animal is dead), location, time of first discovery, observed behaviors (if alive), and photo or video (if available).

(ii) If there is clear evidence that a marine mammal is injured or killed as a result of the Navy's Q-20 testing activity (e.g., instances in which it is clear that ship strike caused the injury or death) the Naval activities shall be immediately suspended and the situation immediately reported by personnel involved in the activity to the Test Director or the Test Director's designee, who will follow Navy procedures for reporting the incident to NMFS through the Navy's chain-of-command.

(iii) Annual Activity Report – The Navy shall submit a report annually on October 1 describing the Q-20 testing activities conducted and implementation and results of the monitoring measures. The report can be incorporated into the Annual NSWC PCD Report Monitoring Plan.

2.8 ONGOING MONITORING

The Navy has an existing Monitoring Plan that provides for site-specific monitoring for Marine Mammal Protection Act and Endangered Species Act listed species, primarily marine mammals within the Gulf of Mexico including marine water areas of the Q-20 Study Area (DoN, 2009; NMFS, 2010a). This monitoring plan was initially developed in support of the NSWC PCD Mission Activities Final Environmental Impact Statement/Overseas Environmental Impact Statement and subsequent Letter of Authorizations by the National Marine Fisheries Service (DoN, 2009; NMFS, 2010a). The primary goals of monitoring are to evaluate trends in marine species distribution and abundance in order to assess potential population effects from Navy training and testing events and determine the effectiveness of the Navy's mitigation measures. The monitoring plan, adjusted annually in consultation with NMFS includes aerial and ship based visual observations, acoustic monitoring, and other efforts such as oceanographic observations. The Navy is not currently committing to increased visual surveys at this time, but will research opportunities for leveraged work that could be added under an Adaptive Management provision of the IHA application for future Q-20 Study Area monitoring.

CHAPTER 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This chapter describes for each relevant resource area, the affected environment (background information and baseline conditions) and the environmental consequences of the Proposed Action. The 2009 NSWC PCD Mission Activities EIS/OEIS is a relevant document and its analysis is relied upon, by reference, where appropriate in this document. Consistent with EO 12114 and the Navy's implementing regulations (OPNAVINST 5090.1C CH-1, Chapter 5), this chapter focuses on the physical and natural environment. The effects of the No Action Alternative on all resources are discussed in the concluding section of this chapter.

3.2 AIR QUALITY

3.2.1 Affected Environment

Estimated emissions from a proposed federal action are typically compared with the relevant national and state standards to assess the potential for increases in pollutant concentrations. Impacts would occur if the action alternatives would directly or indirectly produce emissions that would be the primary cause of, or would significantly contribute to, a violation of state or federal ambient air quality standards. Emission thresholds associated with Clean Air Act (CAA) conformity requirements are another means of assessing the significance of air quality impacts. A formal conformity determination would be required for federal actions occurring in nonattainment or maintenance areas when the total direct and indirect stationary and mobile source emissions of nonattainment pollutants or their precursors exceed *de minimis* thresholds. Areas that violate ambient air quality standards are designated as nonattainment areas. Areas that comply with federal air quality standards are designated as attainment areas. This action would involve testing operations within non-territorial waters of the NSWC PCD Testing Range; therefore, *de minimis* thresholds and attainment status do not apply. Although the CAA does not apply, the standards provide a point of reference for estimating impacts.

Greenhouse gases (GHGs) are pollutants of concern for air quality and climate change. GHGs include water vapor, carbon dioxide (CO_2), methane (CH_4), oxides of nitrogen (NO_x), ozone (O_3), and several chlorofluorocarbons (CFCs). The largest source of manmade CO_2 emissions globally is the combustion of fossil fuels such as coal, oil, and gas in power plants, automobiles, industrial facilities, and other sources. Total GHG emissions from a source are often expresses as a CO_2 equivalent (CO_{2e}).

GHG emissions for an action can be inventoried based on methods prescribed by state and federal agencies. However, the specific contributions of a particular project to global or regional climate change generally cannot be identified based on existing scientific knowledge because individual projects typically have a negligible effect. Also, climate processes are understood at only a general level. Estimates of annual GHG emissions under Alternative 1 are provided in this section.

3.2.2 Environmental Consequences

Criteria pollutant emissions resulting from proposed Q-20 testing in non-territorial waters of the NSWC PCD Testing Range have been evaluated for the Proposed Action. Since the non-territorial waters of the NSWC PCD Testing Range are considered in attainment/unclassified for the National Ambient Air

Quality Standards, the provisions of the General Conformity Rule do not apply. However, emissions estimates for the Proposed Action have been estimated for planning purposes.

Air quality impacts from the proposed Q-20 testing program would occur from the use of support vessels and helicopters, and the RMMV, all of which are mobile emission sources. For the purpose of this analysis, it was assumed that a small support vessel (100 hp gasoline powered engine) and a large support vessel (600 hp diesel engine) would be used to assist the RMMV (370 hp diesel engine) during test activities operations. Helicopter use would be occasional and would replace use of the 600 hp diesel. Helicopter operations are assumed to involve use of the Seahawk SH-60, up to 100 hours per year. Each of the other mobile emission sources is assumed to operate in support of testing within the non-territorial waters for 12 hours per test event or 504 hours per year (total of 1,512 hours for all three vessels combined) per year from 2012 through 2014. Emissions associated with the incidental transit of support vessels to and from the mainland would be negligible and are not quantified here.

Annual emissions resulting from project activities have been estimated using data presented in Chapter 2, general air quality assumptions, and emission factors published in USEPA AP-42 for gasoline and diesel powered engines.

Emission estimates for all project activities are provided in Tables 3.2-1 and 3.2-2, and emissions calculations can be found in Appendix A.

Table 3.2-1 Total Annual Emissions – Alternative 1

Emission Source	Emissions (tons/year)							
	NOx	CO	VOC	SO_X	PM	CO_2	CH_4	N_2O
Small Support Vessel	0.28	0.18	0.37	0.01	0.02	27.20	0.00	0.26
Large Support Vessel	4.68	1.01	0.37	0.31	0.37	173.83	0.00	4.45
RMMV	1.41	1.75	0.20	0.19	0.23	107.20	0.00	1.34
SH-60 Helicopter	0.38	0.38	0.03	0.02	0.25	186	0.01	0.01
Total	**6.75**	**3.32**	**0.97**	**0.53**	**0.87**	**494.23**	**0.01**	**6.06**

Table 3.2-2 GHG Emissions Summary– Alternative 1

Emission Source	Emissions (metric tons/year)			
	CO_2	CH_4	N_2O	CO_{2e}
Total Operations	449.30	0.01	5.51	2158

Total annual emissions associated with Alternative 1 would be minor and less than significant because they would disperse quickly within the project area and have no effect on air quality. In addition, potential effects of GHG emissions are by nature global and cumulative impacts, as individual sources of GHG emissions are not large enough to have an appreciable effect on climate. GHG emissions associated with Alternative 1 would be minor and would not significantly alter global atmospheric conditions. Therefore, Alternative 1 would not significantly harm air quality.

3.3 GEOLOGY AND WATER QUALITY

3.3.1 Affected Environment

Sea floor depth in the non-territorial portion of the NSWC PCD Testing Range ranges from about 30 m to about 300 m. Depth in the immediate project area ranges from about 120 m to 190 m. Bathymetry is characterized by a steepening continental shelf that deepens beyond the boundary of the NSWC PCD Testing Range. Soft bottom areas are the most extensive type of bottom in the NSWC PCD Testing

Range. Sand is the predominant substrate throughout the NSWC PCD Testing Range with silt at depths greater than about 100 m. Hard bottom areas are hard or rocky outcroppings or formations that support the growth of algae, sponges, and a few stony coral species. Within the non-territorial waters of the NSWC PCD Testing Range, known hard bottom areas are scattered coral reefs found between 60 m and 90 m that cover 77 km^2, less than 1% of the total area (Figure 3.2 in NSWC PCD 2009). Hard bottom areas provide habitat for other animals such as crabs, lobsters, sea anemones, grouper, and snapper. Hard bottom areas are sensitive and can be negatively affected by direct contact or continuous silting from bottom disturbances. One hard bottom area is known to exist at the eastern end of the proposed test area.

No water quality criteria exist for the non-territorial waters, where all activities under the Proposed Action would take place (NSWC PCD 2009). Turbidity in the GOM generally decreases from nearshore to offshore, and bottom turbidities tend to be higher than turbidity levels at the surface. On average, the turbidity levels within the GOM range from 0.05-0.15 nephelometric turbidity units (NTUs) (NSWC PCD 2009). This would equate to a diver having an approximate 23 m (75 ft) of visibility. No water quality data are available for the amount of suspended or dissolved solids (turbidity) caused by current subsurface operations (NSWC PCD 2009).

3.3.2 Environmental Consequences

All shipboard activities would be conducted in accordance with the Environmental Readiness Program Manual (OPNAVINST 5090.1C CH-1, Chapters 22-23) to avoid and minimize the discharge of pollutants to the marine environment, and to contain and clean up any inadvertent discharge.

Since the RMMV is propeller driven, and since neither it nor the Q-20 would move along the ocean floor, there are is no potential to impact to geology or sediments from RMMV or Q-20 operation. Surface operations would also have no effect on marine sediments, and standard Navy procedures for shipboard pollution prevention would be followed at all times to avoid and minimize effects on water quality associated with vessel operations. Similarly, sonar and LIDAR use would not affect marine sediments or water quality.

Inert test mine deployment and retrieval in the test area would be conducted in the same manner described in the EIS/OEIS (NSWC PCD 2009). Inert mine shapes are not placed in hard-bottom areas. As described in that document, sediments displaced during these activities would be expected to settle quickly after minor disruption during placement or retrieval of the mines or mooring blocks. Inert test mines are constructed of inert materials and are resistant to corrosion; therefore, leaching is not anticipated to affect water quality. This activity will likely result in only minor disturbances to the sea floor, and effects will be temporary; therefore, in accordance with EO 12114 and as concluded in the NSWC PCD EIS/OEIS (2009), there would be no significant harm to marine geology or water quality.

3.4 BIOLOGICAL RESOURCES

The potentially affected biological resources include the habitats and organisms that occur in the surface waters, water column, and seabed of the NSWC PCD Testing Range where testing would take place. Consistent with the NSWC PCD EIS, the resources of concern addressed in subsections below include marine habitats, invertebrates, fish, essential fish habitat (EFH), birds, marine mammals, and sea turtles.

3.4.1 Marine Habitats

3.4.1.1 Affected Environment

The term marine habitats, as used in this document, refers to unique regions of the marine environment that provide conditions suitable for supporting some portion of the life cycle of a species or suite of

species. Habitats may be composed of abiotic (nonliving) structure or living organisms. The habitats evaluated are limited to those that are potentially susceptible to damage or degradation during the proposed activities. This includes areas of the water column and seabed within the test area. The seabed in the test area consists of unconsolidated sand, silt, and clay (DoN 2007). An area of hard bottom exists in depths of about 110 m near the east end of the test area (NSWC PCD 2009, Figure 3-4; compare to Figure 2-2).

Special Biological Resource Areas are also included in the category of marine habitats. These are offshore habitats that contain both unique flora and fauna. These may be areas that are important as feeding grounds, critical habitats, or principal places of productivity in the GOM. They are all unique ecosystems and support a large variety of species, many still unidentified. One designated Special Biological Resource Area, the DeSoto Canyon Closed Area (NSWC PCD 2009 [Figure 3.5]), extends into the test area. The DeSoto Canyon Closed Area, established in November 2000 under the Magnuson-Stevens Fisheries Conservation and Management Act, consisting of two rectangular areas covering nearly 85,000 km^2, was created as a federal fisheries management zone for the purpose of reducing the number of undersized swordfish, billfish, and other species incidentally caught with pelagic longline gear. As such, longlining is prohibited year-round within the closed area. The managed area consists of the water column up to the surface, but does not include bottom features.

3.4.1.2 Environmental Consequences

Surface and subsurface activities that are part of the Proposed Action include vessel movements and engine noise, the placement and retrieval of non-explosive/inert mines and mine shapes, and the use of sonar and LIDAR in mine reconnaissance testing. Standard procedures would be followed to avoid discharges of pollutants or waste into the marine environment (OPNAVINST 5090.1C, Chapters 22-23). Proposed subsurface operations would avoid hard bottom and coral through protective measures detailed in Chapter 2. Effects of the Proposed Action would constitute very small-scale, temporary disturbances at the surface, in the water column, and on the seabed, which would not cause lasting physical damage or degradation of these habitats' capacity to support populations of marine organisms or affect their productivity. As a result, the Proposed Action would not cause significant harm to marine habitats.

3.4.2 Marine Invertebrates

3.4.2.1 Affected Environment

Only general descriptions of marine invertebrate communities are provided in NSWC PCD (2009) and DoN (2007). Biological surveys on the Gulf continental shelf, including some samples near the test area, were conducted for the Bureau of Land Management (BLM) in the 1970s (BLM 1979) and documented generally sandy bottom conditions, with infaunal (living within the sediments) communities characterized by a diverse assemblage of crustaceans, molluscs, and polychaetes. The most abundant epifaunal (living on and immediately above the seabed) macroinvertebrates included swimming crabs, squid, brittle stars, feather stars, and sand dollars (see www.itis.gov for scientific names).

3.4.2.2 Environmental Consequences

As discussed previously, vessel movements and mine placement/retrieval associated with the Proposed Action would have localized, temporary effects on the habitats that support marine invertebrates, with no effects expected on productivity or populations as a whole. Invertebrates may detect sonar, but reactions to high-frequency sound as produced by the Q-20 are unknown, and in any case would be brief due to the mobile, intermittent nature and short duration of sonar pulses (NSWC PCD 2009).

Most of the energy of a laser beam projected into the ocean is rapidly absorbed, scattered, or otherwise lost within the water column within a few meters of the source (NSWC PCD 2009, SPAWAR Systems Center Pacific 2010); thus, the potential for effects will be greatest near the Q-20. The duration that any given area will be illuminated will be extremely short considering the RMMV and the Q-20 will be continuously moving within the test area and that the laser will only emit in 10-second intervals. Organisms that intercept the laser beam at very close range could be affected but since only a minute fraction of the water column would be briefly exposed, effects on invertebrate populations and productivity would be negligible. Additionally, no negative impacts are expected due to the small amount of energy emitted from such a system coupled with exposure times and attenuation within the water (SPAWAR Systems Center Pacific 2010).

Thus, the Navy concludes that there would be no significant harm to invertebrates as a result of implementing the Proposed Action.

3.4.3 Marine Fish

3.4.3.1 Affected Environment

Over 550 species of fish are found in the GOM (NSWC PCD 2009). These fish are taxonomically and ecologically diverse. Marine fish occupy an important part of the marine food chain, and serve as prey for many other species including other fish, seabirds, and marine mammals. Some species are economically important and support recreational and commercial fisheries.

Fish may be characterized by where they live in the water column (Table 3.4-1). Benthic and reef fish live at the bottom of waters and around artificial or natural reef systems. Pelagic fish spend most of their lives in the open waters of the GOM and make seasonal, latitudinal migrations along the west coast of Florida. These migrations are caused by seasonal changes in temperature, movement of their food resources, and spawning instincts. Predatory species such as jacks, bluefish, cobia, and King and Spanish mackerels leave their wintering areas in south Florida to move northward in the spring along the continental shelf possibly due to the presence of large congregations of prey species in those areas, such as herring and menhaden. These species spawn over the continental shelf from northwestern Florida to the northwestern GOM off of Texas (NSWC PCD 2009). Oceanic pelagic species are mainly found beyond the continental shelf off of the west coast of Florida but move through the Florida Straits into the Atlantic Ocean after spawning. Billfish, which include black marlin, white marlin, sailfish, and swordfish, spawn off northwestern Florida in areas beyond the continental shelf (NSWC PCD 2009). Table 3.4-1 summarizes the habitats and associated features and functions found within the NSWC PCD Testing Range and provides examples of fish assemblages that occur within each habitat type.

Table 3.4-1. Typical Fish Assemblages in the NSWC PCD Testing Range

Habitat Type	*Examples of Fish Supported*
Reef	Triggerfish Jacks Wrasses Snapper Tilefish Grouper Surgeonfish Parrotfish Damselfish

Table 3.4-1. Typical Fish Assemblages in the NSWC PCD Testing Range

Habitat Type	*Examples of Fish Supported*
Sea floor (Areas of vertical relief)	Seabass Damselfish Porgis Snapper
Open water of the GOM	Coastal migratory pelagic fish: Mackerel Cobia Cero Little tunny Dolphinfish (Mahi-mahi) Bluefish Pelagic offshore fish: Atlantic spadefish Tomtate Gray snapper Blue angelfish Belted sandfish Cubbyu White grunt

Source: NSWC PCD 2009

Listed Marine Fish and Critical Habitat

Two fish species in the GOM are protected under the ESA. No fish species in the GOM is presently a candidate under the ESA (http://www.nmfs.noaa.gov/pr/species/concern/). The subadult and adult Gulf sturgeon (*Acipenser oxyrinchus desotoi*) are currently listed as a threatened species, and the smalltooth sawfish (*Pristis pectinata*) is currently listed as an endangered species.

Gulf sturgeon subadults and adults may be found in the nearshore marine waters within close proximity to the boundary of the eastern GOM, particularly along the northern GOM. The Gulf sturgeon in this area has been observed 1.9 km (1 NM) from shore (Ross et al., 2002). The Gulf sturgeon is not expected to be present in the testing areas since it is a coastal inhabitant. Critical habitat was designated for the Gulf sturgeon in March 2003 (Department of the Interior and Department of Commerce 2003). Critical habitat is delineated along the nearshore waters of Florida from St. Joseph Bay to Pensacola Bay and includes Panama City's coastal waters of the GOM and extends from the mean high water line to 1.6 km (0.9 mi) offshore. Critical habitat for the Gulf sturgeon is far inshore of non-territorial waters in the NSWC PCD Testing Range.

The smalltooth sawfish, once common throughout the GOM from Texas to Florida, currently ranges primarily throughout peninsular and southern Florida and is only likely to be found in the Everglades region. It is usually found in shallow waters close to shore in sheltered bays and in estuaries or river mouths. The smalltooth sawfish is not expected to be present within the proposed action area. NMFS designated critical habitat for the smalltooth sawfish in September 2009 (NMFS 2009) in the southern and southwest portions of peninsular Florida.

3.4.3.2 Environmental Consequences

The two fish species protected under the ESA are not expected to occur in non-territorial waters of the NSWC PCD Testing Range, and designated critical habitat is far outside of the action area; thus, the Proposed Action will have no effect on listed fish species.

Use of sonar and laser equipment has the potential to affect fish. The sonar frequencies proposed in this OEA are at or above 35 kHz, and fish hearing predominantly occurs below 1 kHz, although some fish, notably clupeids – which include sardines, herring, anchovies, menhaden – are able to detect and may react to mid- or high-frequency sounds (NSWC PCD 2009). Fish within a few meters of the Q-20 could be affected due to the pressure differential associated with a high-energy sonar pulse (Popper 2008), but in the open ocean, the most likely response would be to avoid the source. There is no evidence of ecologically significant behavioral responses by fish to sonar (Popper 2008). Accordingly, sonar operations associated with the Proposed Action are expected to have only minor, localized, and temporary effects, if any, on fish populations.

Considering that the Q-20 would be continuously moving within the test area, the EOID laser will illuminate any given area for an extremely short duration. No direct research on the effects of laser beams on fish has been conducted (NSWC PCD 2009). However, SPAWAR Systems Center Pacific (2010) synthesized available laser and biological data to predict the potential for laser use to impact fish and other marine wildlife. Specifically, the conservative analysis considered the impacts of airborne LIDAR[1] on marine mammals, sea turtles, and fish, and determined that laser systems designed to meet the human maximum permissible exposure would also be safe to these animals. Moreover, the analysis concluded that "these animals could withstand laser exposures from more powerful systems." Based on this study, in combination with the minute area of the laser beam and the high absorption/attenuation of energy within a few meters of the source, injury or mortality to fishes would occur rarely, if at all, and no population-level effects would be expected.

In conclusion, the Navy finds that implementing the Proposed Action would not result in significant harm to fish.

3.4.4 Essential Fish Habitat (EFH)

This section constitutes the EFH Assessment per Navy policy (DoN 2011).

3.4.4.1 Affected Environment

NMFS and regional fishery councils are required to describe and identify EFH for all federally managed species under the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§ 1801 et seq.). EFH has been designated for all 26 fish species managed by the Gulf of Mexico Fisheries Management Council (GMFMC) and for 20 of the highly migratory fish species (tunas, sharks, swordfish, and billfish) managed by NMFS within the eastern GOM (NSWC PCD 2009). EFH for the brown shrimp also extends into the proposed test area. Finally, floating mats of Sargassum are also recognized as EFH and may occur in the test area.

The species that occur in non-territorial waters of the NSWC PCD Study Area and their habitat by life stage are presented in Table 3.4-2. Fish habitat utilized by a species can change with life history stage, abundance of the species and competition from other species, and environmental variability in time and space. The type of habitat available, its attributes, and its functions are important to species productivity and societal benefits. For maps depicting EFH of several fisheries species within the GOM, and for more

[1] Airborne LIDAR systems utilize lasers with higher energy output and smaller beam divergence than those typically used by laser line scan systems such as the Q-20.

information on EFH and specific EFH resources, refer to Appendix F, *Biological Resources*, in the NSWC PCD EIS/OEIS (2009).

Table 3.4-2. Representative Managed Species with Essential Fish Habitat in the Proposed Action Area

Species	*Life Stage*	*Habitat*
Black grouper	Adult, juveniles/subadults, larvae, eggs	Hardbottom; shore to 150 m (492.13 ft)
Blue marlin	Adult, juvenile/subadult	Pelagic; 100 to 2,000 m (328 to 6,562 ft) isobath
Bluefin tuna	Adult	Pelagic; from 100 m (328 ft) isobath to the U.S. EEZ boundary
Brown shrimp	Adult, juveniles	Soft bottom, estuarine dependent
Cobia	Adult, juveniles/subadults, larvae, eggs	Pelagic; drifting or stationary floating objects
Corals	All life stages	Hard bottom
Sargassum	All life stages	Pelagic
Dolphin (Mahi)	Adult, juveniles/subadults, larvae, eggs	Pelagic; floating objections
Dusky shark	Juvenile	Shallow coastal waters, inlets and estuaries to the 500 m (1640 ft) isobath
Gag grouper	Adult	Hard bottom
Greater amberjack	Adult, juveniles/subadults, larvae, eggs	Pelagic and epibenthic; reefs and wrecks; to 400 m (1312 ft)
Gray snapper	Adult	All bottom types; 0-130 m (0 to 427 ft)
Gray triggerfish	Adult	Hard bottom
King mackerel	Adult	Pelagic
Lesser amberjack	Adult, juveniles/subadults, larvae, eggs	Pelagic
Lane snapper	Adult, juveniles/subadults, larvae, eggs	Soft and hard bottom; 0-130 m (0-427 ft)
Little tunny	Adult, juveniles/subadults, larvae, eggs	Pelagic
Longfin mako shark	All life stages	Pelagic; 200 m (656 ft) isobath to U.S. EEZ
Oceanic whitetip shark	juveniles	Pelagic; 200 m (656 ft) to the U.S. EEZ
Pink shrimp	Adult	Soft, hard bottom; inshore to 65 m (213.26 ft)
Red drum	Adult	Soft bottom, oyster reefs, estuarine to 40 m (131.23 ft)
Red grouper	Adult, juveniles/subadults, larvae, eggs	Hard bottom; 3 to 200 m (9.84 to 656.17 ft)
Red snapper	Adult, juveniles/subadults, larvae, eggs	Hard bottom, pelagic
Sailfish	Adult, juveniles/subadults	Pelagic and coastal waters; 200 m to 2,000 m (656 to 6,562 ft) isobath; up to 50 m (164 ft) isobath near DeSoto Canyon
Sandbar shark	Adult, juveniles, neonates	Shallow coastal waters to the 90 m (295 ft) isobath
Scalloped hammerhead Shark	Juveniles, neonates	Shallow coastal waters, coastal bays, estuaries; 5 m (16 ft) to the 200 m (656 ft) isobath
Scamp	Adult	Hard bottom
Silky shark	Neonate	Pelagic, 200 to 2,000 m (656 to 6,562 ft) isobath
Skipjack tuna	Spawning adult, egg, larvae	Offshore waters from 200 m (656 ft) isobath to the U.S. EEZ
Stone crab	Adult	Soft, hard or vegetated bottom
Spiny lobster	Adult	Hard bottom

Table 3.4-2. Representative Managed Species with Essential Fish Habitat in the Proposed Action Area

Species	*Life Stage*	*Habitat*
Spanish mackerel	Adult, juveniles/subadults, larvae, eggs	Pelagic; inshore to 200 m (656 ft)
Swordfish	Adult, spawning adult, egg, larvae	Pelagic; 200 to 2,000 m (656 to 6,562 ft) isobath
Tiger shark	Adult, juveniles, neonates	Shallow coastal waters to the 200 m (656 ft) isobath
Tilefish	Adult	Soft bottom, steep slopes; 80 to 540 m (263 to 1772 ft)
Vermillion snapper	Adult, juveniles/subadults, larvae, eggs	Hard bottom; 20 to 200 m (65.6 to 656 ft)
White marlin	Adult, juveniles	Pelagic; 200 to 2,000 m (656 to 6,562 ft) isobath and along 50 m (164 ft) isobath along De Soto Canyon
White shrimp	Adult, juveniles/subadults, larvae, eggs	Soft bottom; inshore to 40 m (131 ft)
Yellowfin tuna	Adult, juveniles/subadults, larvae, eggs	Pelagic waters from the surface to 100 m (328 ft) deep and from 200 m (656 ft) isobath to the U.Z. EEZ
Yellowtail snapper	Adult, juveniles/subadults, larvae, eggs	Hard bottom; 0 to 180 m (0 to 591 ft)

Source: NSWC PCD 2009

3.4.4.2 Environmental Consequences

Apart from vessel movement and sonar operations in the water column, soft bottom areas will be the primary habitat type to be affected by proposed operations occurring in non-territorial waters. The only bottom-disturbing activity conducted will be the placement of mine shapes, inert mine-like objects, and versatile exercise mines (NSWC PCD 2009). All operations that have the potential to disturb the sea will be conducted outside the boundaries of seagrasses, hard bottom areas, coral reefs, and wrecks in accordance with the protective measures described in Chapter 5 of the NSWC PCD EIS/OEIS (2009). As noted previously, the disturbance of marine habitats in general would be minor, localized, and temporary, with no lasting effect on their productivity and capability to support populations of fishes and other marine organisms. Accordingly, the Proposed Action would not measurably decrease the quantity or quality of EFH, and, as a result, would not trigger the threshold for consultation with NMFS (DoN 2011).

Therefore, in accordance with EO 12114, there would be no significant harm to EFH as a result of implementing the Proposed Action.

3.4.5 Birds

3.4.5.1 Affected Environment

The GOM is populated by both resident and migratory coastal and marine birds. Chapter 3 of the NSWC PCD EIS/OEIS (DoN, 2009) provides a discussion of the kinds of birds in the region, their distributions, hearing abilities, and diving, swimming, and foraging. No ESA-listed birds are expected to occur in the non-territorial waters of the NSWC PCD Testing Range (NSWC PCD 2009).

3.4.5.2 Environmental Consequences

Little is known about the general hearing or underwater hearing capabilities of birds, but research suggests an in-air maximum auditory sensitivity between 1 and 5 kHz (NSWC PCD 2009). No scientific evidence exists to show that birds can hear mid-frequency sounds underwater. Even if some diving bird

species are able to hear at moderately high frequencies, effects from the Proposed Action are unlikely for the following reasons (NSWC PCD 2009): there is no evidence that diving birds use underwater sound; they spend a small fraction of time submerged and could rapidly fly away from the area and disperse to other areas if disturbed; the minimum frequency used in the Proposed Action is 35 kHZ; and it is scientifically reasonable to extend these reasons to mid- and high-frequency active sonar. Furthermore, it is extremely unlikely that active sonar use will coincide with the dive of a bird, particularly because they spend a short period of time underwater (NSWC PCD 2009).

The likelihood of a bird being underwater within close range and in the path of the EOID's laser beam when it is utilized by the Q-20 to identify/classify a mine shape is so small as to be negligible; no effects on seabirds are anticipated.

Consistent with the NSWC PCD EIS/OEIS (2009), the Navy finds that the Proposed Action would result in no significant harm to birds in the overseas environment.

3.4.6 Sea Turtles

3.4.6.1 Affected Environment

Five species of sea turtles occur along the continental shelf of the eastern GOM: green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), Kemp's ridley turtle (*Lepidochelys kempii*), leatherback turtle (*Dermochelys coriacea*), and loggerhead turtle (*Caretta caretta*). Loggerheads and leatherbacks also occur over the slope region of the eastern GOM. Sea turtles spend their lives at sea and only come ashore to nest. Cape San Blas, approximately 60 mi east of the project area, has been documented as supporting the highest density of nesting sea turtles in northwest Florida (NSWC PCD 2009). Refer to Appendix F, Biological Resources, of the NSWC PCD EIS/OEIS (2009) for sea turtle species descriptions.

Of the five species protected by state and federal governments, all but the loggerhead are classified as endangered. The northwest Atlantic population of the loggerhead, including the Gulf of Mexico, is classified as a distinct population segment and listed as threatened under the ESA (NMFS 2011b). The loggerhead is also classified as threatened by the State of Florida (NSWC PCD 2009).

It is theorized that young turtles, between the time they enter the sea as hatchlings and their appearance as subadults, spend their time drifting in ocean currents among seaweed and marine debris (NSWC PCD 2009). Sargassum, a generally planktonic brown algae (seaweed), provides food and shelter to juvenile sea turtles. Sea turtle hatchlings are known to associate with pelagic Sargassum habitat during their "lost years" when they drift along with the planktonic mats. This nursery association is thought to play a vital role in the life of young turtles. The GOM is second to the Sargasso Sea in the quantity of Sargassum present in the area. Any Sargassum mats drifting at sea have the potential to host young sea turtles, since both are found with currents and can travel for long distances from their points of origin.

3.4.6.2 Environmental Consequences

Maximum sensitivity of the five species to underwater sound occurs in the low-frequency spectrum. The Q-20 only operates in the high-frequency range. There is no evidence of potential high-frequency sonar effects on sea turtles. The best available scientific data, including low audiometric and behavioral sensitivity of sea turtles to low-frequency sound, and their navigation techniques through sensory systems other than hearing, were presented in the NSWC PCD EIS/OEIS (2009), leading to the conclusion that sonar operations of all types, including the Q-20, would have no effect on sea turtles.

The greatest concern for marine species from laser operations is visual damage. As discussed for birds, the possibility that a sea turtle would be in close proximity to the path of the EOID's laser beam while it is operated by the Q-20 is remote, especially given the participation of marine observers as described in Chapter 2. Even in that extremely unlikely event, eye damage to sea turtles would not occur with exposures of less than 10 seconds (NSWC PCD 2009). Thus, an animal's eye would have to be exposed to a direct beam for at least 10 seconds or longer to sustain damage, which would be extremely unlikely given the attenuation of light energy through the water column, 10-second pulse durations, the RMMV's movement, and animal motion which, most likely, would be to avoid the RMMV and the Q-20. Considering the operation of LIDAR systems aimed at the water surface from helicopters, the NSWC PCD EIS/OEIS (2009), for reasons similar to those discussed above, concluded there would be no effects on sea turtles.

The Navy will maneuver to avoid sea turtles and will implement reasonable and prudent measures to avoid interactions between surface vessels and these animals. Protective measures incorporated into the Proposed Action (Chapter 2) will be implemented. As such, collisions or other negative interactions with sea turtles are not expected to occur. Considering all types of surface operations, the NSWC PCD EIS/OEIS (2009) concluded there would be no effect on sea turtles in the non-territorial waters.

The foregoing indicate that the Proposed Action in the non-territorial waters would have no effects on sea turtles listed under the ESA, and would not significantly harm sea turtles under EO 12114.

3.4.7 Marine Mammals

3.4.7.1 Affected Environment

Cetaceans (whales and dolphins) inhabiting the GOM may be grouped as mysticetes (baleen whales) or odontocetes (toothed whales, including dolphins). One baleen whale and 20 toothed whale species, including dolphins, regularly occur in the non-territorial waters of the NSWC PCD Study Area; information on their occurrence in the northern GOM, based on the NSWC PCD EIS/OEIS (2009), is summarized in Table 3.4-3. Eight additional whale species (North Atlantic right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaeangliae*), sei whale (*Balaenoptera borealis*), fin whale (*Balaenoptera physalus*), blue whale (*Balaenoptera musculus*), Minke whale (*Balaenoptera acutorostrata*), Sowerby's beaked whale (*Mesoplodon bidens*), and True's beaked whale (*Mesoplodon mirus*), as well as the West Indian manatee (*Trichechus manatus*), occur in the GOM but are considered extralimital to the proposed action area and are not further assessed. All cetaceans are afforded federal protection under the Marine Mammal Protection Act (MMPA).

Table 3.4-3. Marine Mammal Species of the Gulf of Mexico

Species	*ESA Status*	*Areas of Occurence*
Bryde's whale *Balaenoptera edeni*		Bryde's whales are expected to occur year-round in an area encompassing the DeSoto Canyon and an area off western Florida, from the shelf break to the 2,000 m (6,562 ft) isobaths.

Table 3.4-3. Marine Mammal Species of the Gulf of Mexico

Species	***ESA Status***	***Areas of Occurence***
Sperm whale *Physeter macrocephalus*	FE	The most abundant of the federally listed endangered whales in the GOM. Occurs primarily along and seaward of the continental shelf break, with areas of relatively high abundance in the Mississippi River Delta and De Soto Canyon. Based on the analysis of largely the same data set compiled in the GOM MRA (DoN 2007) and used to estimate "sightings per unit effort," sperm whales have a zero probability of being seen in the vicinity of the proposed test area except during spring (April-July). The low (non-zero) probability of occurrence during spring reflects a lone sighting as shown in the stock assessment report (NMFS, 2010b). Not expected in the testing area.
Pygmy sperm whale *Kogia breviceps* and Dwarf sperm whale *Kogia simus*		Based on the distribution of the available sighting records and the known preference of both *Kogia* sp. for deep waters, pygmy and dwarf sperm whales are expected to occur between the continental shelf break and the 3,000 m (9,843 ft) isobath.
Cuvier's beaked whale *Ziphius cavirostris*		All three species of beaked whales can be expected to occur throughout the GOM in waters off the continental shelf break in the eastern GOM. Occurrence is assumed to be the same year-round.
Gervais' beaked whale *Mesoplodon europaeus*		All three species of beaked whales can be expected to occur throughout the GOM in waters off the continental shelf break in the eastern GOM. Occurrence is assumed to be the same year-round.
Blainville's beaked whale *Mesoplodon densirostris*		All three species of beaked whales can be expected to occur throughout the GOM in waters off the continental shelf break in the eastern GOM. Occurrence is assumed to be the same year-round.
Killer whale *Orcinus orca*		Killer whales are expected to occur in an area south of the Mississippi River Delta from the shelf break into waters with an approximate bottom depth of 2,000 m (6,562 ft), with a low possibility of occurrence in shallower waters.
False killer whale *Pseudorca crassidens*		Occurs primarily in waters greater than 200 m (656 ft) deep in the GOM, i.e. seaward of the continental shelf break. Distribution of species is expected to be consistent throughout the year.
Pygmy killer whale *Feresa attenuata*		Based on confirmed sightings of the pygmy killer whale in the GOM and this species' propensity for deeper water, pygmy killer whales are expected to occur between the continental shelf break and the 3,000 m (9,843 ft) isobath.
Short-finned pilot whale *Globicephala macrorhynchus*		Distribution in the Atlantic ranges from New Jersey to Venezuela, including GOM. Pilot whales are found over the continental shelf break, in slope waters, and in areas of high topographic relief; sometimes seen in waters over the continental shelf.
Risso's dolphin *Grampus griseus*		Expected to occur in areas of steep bottom topography, between the continental shelf break and the 2,000 m (6,562 ft) isobath throughout the year. There is a concentrated occurrence of the Risso's dolphin south of the Mississippi River Delta to approximately where the DeSoto Canyon begins, from the shelf break to the vicinity of the 1,000 m (3,281 ft) isobath.
Melon-headed whale *Peponocephala electra*		Distribution is worldwide tropical to warm-temperate waters including the Atlantic Ocean and GOM. Expected to occur between the continental shelf break and the 3,000 m (9,843 ft) isobath.
Rough-toothed dolphin *Steno bredanensis*		Expected to occur throughout the year in the GOM, primarily in deep water, seaward of the continental shelf break but possible on the continental shelf.

Table 3.4-3. Marine Mammal Species of the Gulf of Mexico

Species	*ESA Status*	*Areas of Occurence*
Atlantic bottlenose dolphin *Tursiops truncatus*		Bottlenose dolphins are commonly sighted in groups throughout the coastal, continental shelf, and slope waters of the NSWC PCD Study Area. Expected to occur from the shoreline to the 1,000 m (3,281 ft) isobath.
Atlantic spotted dolphin *Stenella frontalis*		Diet of the Atlantic spotted dolphin consists of squid and fish from the surface and epipelagic zones of the GOM. Expected to occur in waters over the continental shelf, less commonly in deeper waters.
Pantropical spotted dolphin *Stenella attenuata*		Year-round inhabitants of the GOM and Atlantic having been sighted during all seasons, primarily in waters greater than 200 m (656 ft). Expected to occur from the continental shelf break to the 3,000 m (9,843 ft) isobath.
Striped dolphin *Stenella coeruleoalba*		Primarily found in deeper waters off the continental shelf and have been sighted in the Atlantic and northern GOM. Expected to occur from the continental shelf break to the 2,000 m (6,562 ft) isobath.
Spinner dolphin *Stenella longirostris*		Distribution in the Atlantic ranges from eastern Newfoundland to the Lesser Antilles, including northern and eastern GOM waters. Expected to occur seaward from the continental shelf break to the 2,000 m (6,562 ft) isobath.
Clymene dolphin *Stenella clymene*		Distribution in Atlantic ranges from New Jersey to Lesser Antilles, including GOM. Primarily sighted outside the NSWC PCD Study Area, seaward of the continental shelf break.
Fraser's dolphin *Lagenodelphis hosei*		Species is tropically distributed; should be expected in pelagic waters of all oceans. Expected to occur from the continental shelf break to the 3,000 m (9,843 ft) isobath.

Note: FE = Federeally listed as Endangered under the Endangered Species Act
Source: NSWC PCD 2009

ESA-Listed Marine Mammals and Designated Critical Habitat

The sperm whale is the only marine mammal occurring in the proposed action area that is listed under the ESA. Sperm whales are classified as endangered under the ESA, although they are globally not in any immediate danger of extinction. The sperm whale population in the northern GOM as a stock is considered to be distinct from the U.S. Atlantic stock (NSWC PCD 2009). No critical habitat has been designated for the species (http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.html).

3.4.7.2 Environmental Consequences

Sonar Operations

Two of the Q-20's four mine reconnaissance sensors require consideration under the MMPA. The VSS operates at a source level of 212 dB and frequency of 35 kHz and the FLS operates at a source level of 207 dB and frequency of 85 kHz. Since the VSS operates at lower frequency and higher source level, it presents the greatest potential for exposures that would constitute takes under the MMPA and has been used as a worst case to model potential effects of the Q-20 sonars; all sonar operations are assumed to involve the VSS. The other two sensors, the SLS and GFS, operate at very high frequencies (i.e., >200 kHz), well above the hearing sensitivities of any marine mammals, and thus are not required to be quantitatively analyzed. The modeling analysis described in the NSWC PCD EIS/OEIS (NSWC PCD 2009) was used to predict the potential exposures for the proposed Q-20 testing from the RMMV. The model also had been used to predict the marine mammal exposures for the MMPA Final Rule associated with that document (NMFS 2011a). Background information and the methodology for evaluating

potential exposures of marine mammals to active sonar is presented in Chapter 4 of the NSWC PCD EIS/OEIS (2009).

Analysis of Potential Hearing Effects (PTS/TTS)

The same model that was used in the NSWC PCD EIS/OEIS (NSWC PCD 2009) and in the estimation of takes under the current LOA (NMFS 2011a) associated with it was used to model the potential hearing effects (PTS or TTS) of Q-20 operations on marine mammal in the non-territorial waters, assuming a worst-case 10 hours per day of VSS operation over 42 days of testing. Zero exposures that predicted to result in PTS or TTS would occur due to the Proposed Action.

Risk Function Analysis (Non-TTS Behavioral Exposures)

The risk function is defined as the percentage of a population that is predicted to react to a given sound pressure level (SPL). In the SAIC model, the volume of water ensonified at a given SPL per ping is computed in a series of SPL bins. The resulting histogram is multiplied by the behavioral risk function (NMFS, January 2008), yielding the percentage of the exposed population within the corresponding volume of water that is likely to react. There is no accumulation of sound exposure level in the risk function, but multiple pings increase the volume of water ensonified in proportion to the repetition rate and speed of the vessel. Animal densities compiled in the NSWC PCD EIS/OEIS (2009) are incorporated to yield a harassment rate per hour of sonar usage (based on pings per hour). This hourly rate is then programmed into a spreadsheet (modeling workbook) for the user to calculate exposures for test activities.

Based on the definition of the risk function and its implementation within the Marine Mammal Acoustic Effects Analysis Model, the predicted exposures are based on sonar usage within a 24-hour period (1 mission test) and to calculate the predicted takes per day. The particulars of the test plan dictate how many hours of sonar operation occur per day, and how many days of testing will occur. This approach is consistent with Navy-NMFS agreement and with the modeling conducted for the NSWC PCD Final EIS/OEIS that an animal can only be taken once in a 24-hour period. The predicted takes per day are then summed over the number of days the Q-20 would be operated annually (considering both summer and winter seasons).

The agreed-upon modeling methodology is conservative by design and thus overestimates the number of acoustic exposures that would constitute takes under the MMPA. The Q-20 test requirements from the RMMV are well defined; therefore, a refined exposure count is provided based on the modeled hourly harassment rate. Tables 3.4-4 and 3.4-5 provide the predicted sub-TTS exposure per typical Q-20 test event and then the annual exposures based on the number of planned test events. The raw model output shows marine mammal exposures that would constitute takes under the MMPA are limited to Level B sub-TTS exposure for six species. No above-threshold exposures would occur for ESA-listed species.

Table 3.4-4. Winter Season Raw Modeling Output for NSWC PCD Non-Territorial OPAREA (TACSIT Channel). Sub-TTS Potential Exposures for single Q-20 mission (24 hour period).

Species	*Sub-TTS Behavioral Exposure Rate per Hour*	*MMPA/ESA Exposures per 24-hr period (based on the worst-case sonar use of 10 hrs)*	*Total MMPA/ESA sub-TTS Exposures for Winter Season (21 days of testing)*
Bryde's whale *Balaenoptera edeni*	0.000268	0	0

Table 3.4-4. Winter Season Raw Modeling Output for NSWC PCD Non-Territorial OPAREA (TACSIT Channel). Sub-TTS Potential Exposures for single Q-20 mission (24 hour period).

Species	*Sub-TTS Behavioral Exposure Rate per Hour*	*MMPA/ESA Exposures per 24-hr period (based on the worst-case sonar use of 10 hrs)*	*Total MMPA/ESA sub-TTS Exposures for Winter Season (21 days of testing)*
Sperm whale* *Physeter macrocephalus*	0.002277	0	0
Pygmy/Dwarf sperm whale *Kogia sp.*	0.001782	0	0
Beaked whale *(Various sp.)*	0.00000497	0	0
Killer whale *Orcinus orca*	0.000844	0	0
False killer whale *Pseudorca crassidens*	0.006584	0	0
Pygmy killer whale *Feresa attenuata*	0.002588	0	0
Short-finned pilot whale *Globicephala macrorhynchus*	0.013673	0	0
Risso's dolphin *Grampus griseus*	0.025128	0	0
Melon-headed whale *Peponocephala electra*	0.021064	0	0
Rough-toothed dolphin *Steno bredanensis*	0.002837	0	0
Atlantic bottlenose dolphin *Tursiops truncatus*	0.986664	10	210
Atlantic spotted dolphin *Stenella frontalis*	0.712107	7	147
Pantropical spotted dolphin *Stenella attenuata*	0.29865	3	63
Striped dolphin *Stenella coeruleoalba*	0.060405	1	21
Spinner dolphin *Stenella longirostris*	0.262104	3	63
Clymene dolphin *Stenella clymene*	0.104314	1	21
Fraser's dolphin *Lagenodelphis hosei*	0.004431	0	0

* indicates the species is protected under the Endangered Species Act.

Table 3.4-5. Summer Season Raw Modeling Output for NSWC PCD Non-Territorial OPAREA (TACSIT Channel). Sub-TTS Potential Exposures for single Q-20 mission (24 hour period).

Species	*Sub-TTS Behavioral Exposure Rate per Hour*	*MMPA/ESA Exposures per 24-hr period (based on the worst-case sonar use of 10 hrs)*	*Total MMPA/ESA sub-TTS Exposures for Summer Season (21 days of testing)*
Bryde's whale *Balaenoptera edeni*	0.00029	0	0
Sperm whale* *Physeter macrocephalus*	0.002061	0	0

Table 3.4-5. Summer Season Raw Modeling Output for NSWC PCD Non-Territorial OPAREA (TACSIT Channel). Sub-TTS Potential Exposures for single Q-20 mission (24 hour period).

Species	*Sub-TTS Behavioral Exposure Rate per Hour*	*MMPA/ESA Exposures per 24-hr period (based on the worst-case sonar use of 10 hrs)*	*Total MMPA/ESA sub-TTS Exposures for Summer Season (21 days of testing)*
Pygmy/Dwarf sperm whale *Kogia sp.*	0.002203	0	0
Beaked whale *(Various sp.)*	0.00000573	0	0
Killer whale *Orcinus orca*	0.000912	0	0
False killer whale *Pseudorca crassidens*	0.007119	0	0
Pygmy killer whale *Feresa attenuata*	0.002798	0	0
Short-finned pilot whale *Globicephala macrorhynchus*	0.014964	0	0
Risso's dolphin *Grampus griseus*	0.027119	0	0
Melon-headed whale *Peponocephala electra*	0.022724	0	0
Rough-toothed dolphin *Steno bredanensis*	0.00305	0	0
Atlantic bottlenose dolphin *Tursiops truncatus*	0.941569	9	189
Atlantic spotted dolphin *Stenella frontalis*	0.777504	8	168
Pantropical spotted dolphin *Stenella attenuata*	0.284565	3	63
Striped dolphin *Stenella coeruleoalba*	0.066139	1	21
Spinner dolphin *Stenella longirostris*	0.282948	3	63
Clymene dolphin *Stenella clymene*	0.11261	1	21
Fraser's dolphin *Lagenodelphis hosei*	0.004781	0	0

* indicates the species is protected under the Endangered Species Act.

ESA and MMPA Compliance

The sperm whale is the only ESA-listed species potentially occurring in the test area and predictive modeling yields no takes of this species (Tables 3.4-4 and 3.4-5). Based on the best available science and evidence, sperm whales are very unlikely to occur in the relatively shallow waters of the proposed test area. As shown in the latest stock assessment report (NMFS 2010b), systematic surveys by the NOAA Southeast Fisheries Science Center have detected sperm whales almost exclusively in the vicinity of the 1,000 m isobaths and deeper. As stated in the stock assessment report, the best abundance estimate available for northern GOM sperm whales is 1,665 (CV=0.20) (Mullin 2007: Table 1). This estimate is pooled from summer 2003 and spring 2004 oceanic surveys covering waters from the 200-m isobath to

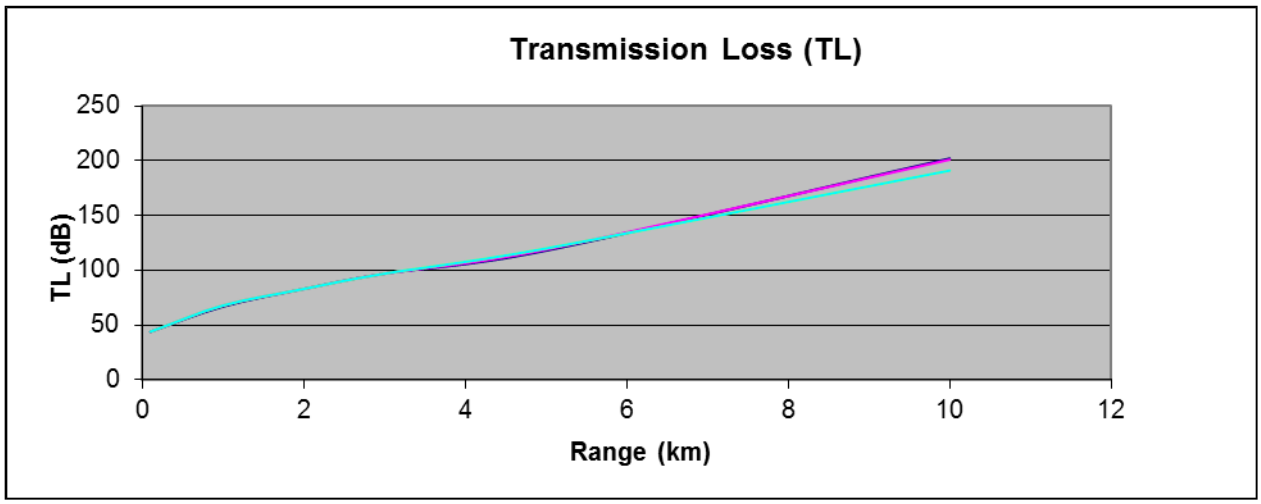
the seaward extent of the U.S. Exclusive Economic Zone (EEZ). Based on the analysis of largely the same data set compiled in the GOMEX Marine Resources Assessment (DoN 2007) and used to estimate "sightings per unit effort," sperm whales have a zero probability of being seen in the vicinity of the proposed test area except during spring (April-July). The low (non-zero) probability of occurrence during spring reflects a lone sighting as shown in the stock assessment report. Consistent with this information, the following statement is from the NMFS Biological Opinion dated 2011:

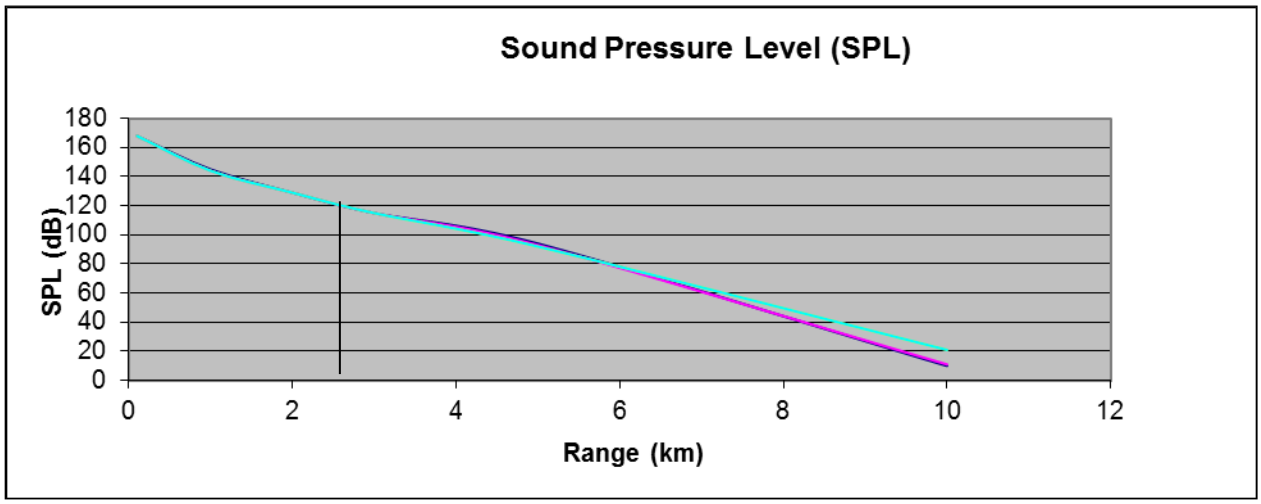
> There has also been recent extensive work on the movements and habitat use of sperm whales in the northern Gulf of Mexico, such as the studies conducted by the Sperm Whale Acoustic Monitoring Program (SWAMP) and the Sperm Whale Seismic Study (SWSS). These studies include habitat cruises, physical oceanographic analyses, and long term satellite tag deployments. Several satellite tags have operated for over 12 months and indicate movements generally along the shelf break (700-1,000 m depth) throughout the Gulf, with some animals (more frequently males) using deeper oceanic waters (Jochens et al. 2008; Jochens et al. 2006; Jochens and Biggs 2004).

In the SWSS, the median maximum depth of the tagged female sperm whales was 884 m and males was 1171 m. Female sperm whales were located more frequently on the upper continental slope of the northern Gulf of Mexico while males moved into the central Gulf or over the lower continental slope and abyssal plain. The SWSS research also noted an area of concentrated occurrence corresponding to the break in slope and dynamic oceanographic conditions between De Soto Canyon, (20 nm southwest of the proposed test area) and Mississippi Canyon (farther to the west).

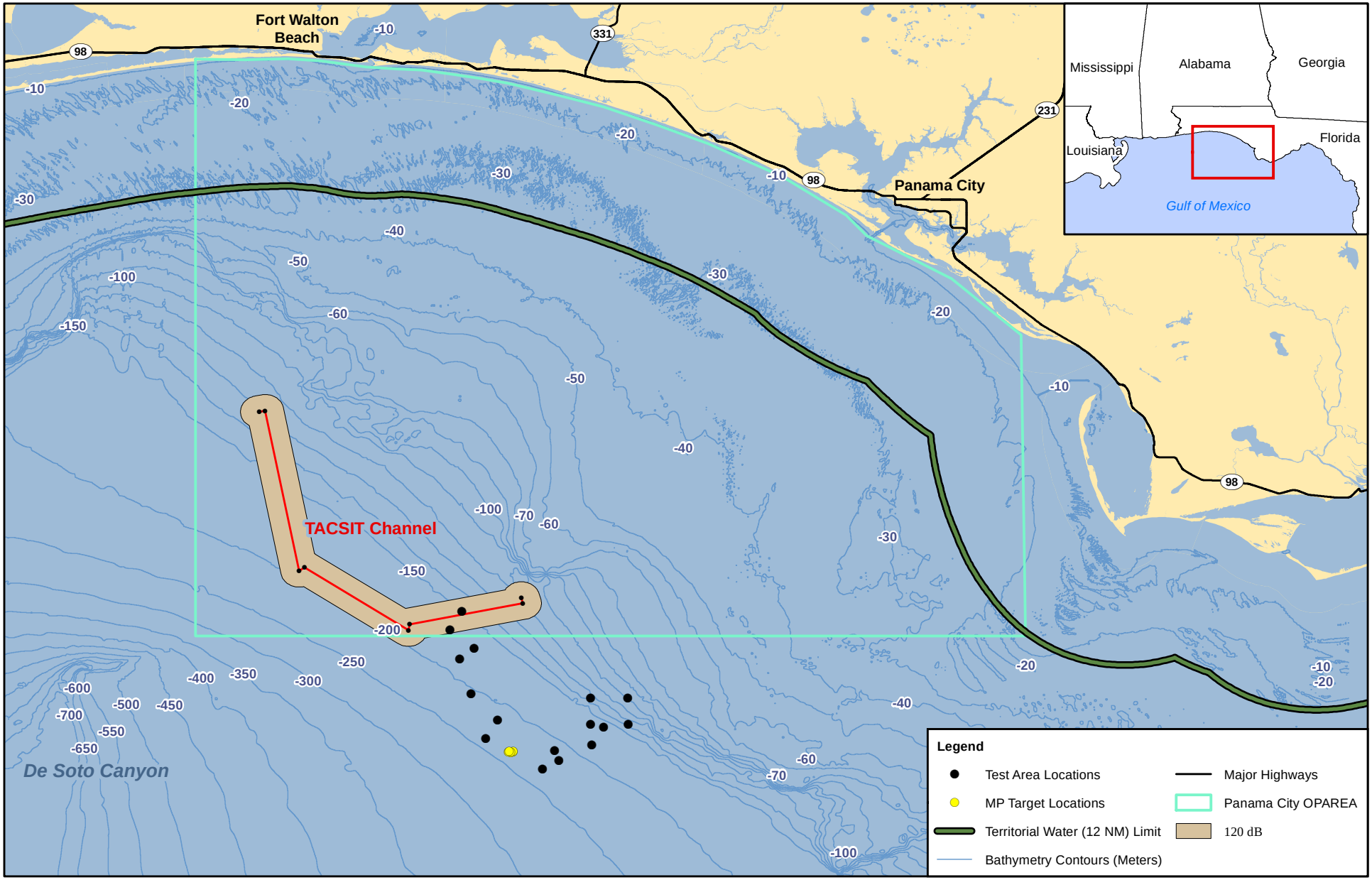
To further examine the possibility of sperm whale exposures from the proposed testing, CASS-GRAB sound modeling software was used to estimate transmission losses and received sound pressure levels (SPLs) from the Q-20 when operating in the test area. Specifically, four radials out towards De Soto Canyon were calculated. The results (Figure 3-1), indicate the relatively rapid attenuation of sound pressure levels with distance from the source, which is not surprising given the high frequency of the source. Figure 3-2 shows the "zone of influence" for Q-20 testing along the TACSIT Channel, using the 120 dB "basement value" of the risk function to define the zone of influence for potential effects on marine mammals. Below 120dB, the risk of significant change in a biologically important behavior approaches zero. This threshold is reached at a distance of only 2.8 km (1.5 nm) from the source. With the density of sperm whales being near zero in this potential zone of influence, this calculation reinforces the conclusion of no effect on sperm whales. It should also be noted that by reference to Figures 3-1 and 3-2, that DeSoto Canyon is well beyond the distance at which sound pressure levels from the Q-20 attenuate to zero.

Figure 3-1. Attenuation of Sound Pressure Levels with Distance from the Q-20 Source





Note: Vertical line inserted to show distance at which SPL falls to 120 dB.



0 10 20 Nautical Miles

0 10 20 Kilometers

Figure 3-2
Zone of Influence for Q-20 Testing

Notes:
-NM = Nautical Mile

The appearance of a fractional sperm whale exposure in the risk function predictive modeling is a result of the modeling methodology which incorporates two critical assumptions that were necessary for the modeling of diffuse RDT&E activities throughout the PCD study region: 1) the modeled source, in this case the Q-20, transmits simultaneously throughout the study area (Appendix M of the NSWC PCD EIS/OEIS); and 2) use of the model-derived estimate for sperm whale density (EIS/OEIS Table 4-31) results in the application of a single average density throughout the study area.

Finally, the VSS and FLS operate at 35 kHz and 85 kHz respectively, whereas the dominant vocalization and hearing frequencies of the sperm whale range from 2 to 4 kHz and 10 to 16 kHz, although the full hearing frequency range is from 0.1 to 60 kHz (NMFS 2011a). Therefore, the operation of the VSS and FLS are above the dominant hearing frequencies of the sperm whale and for that reason are unlikely to interfere with communication or cause a behavioral reaction that would constitute a take.

Given the foregoing, the appropriate conclusion under the ESA is "no effect," indicating that formal consultation under the ESA is not required.

Of the 17 non-listed ESA marine mammal species potentially affected by the proposed testing, predicted exposures are limited to Level B, behavioral harassment without TTS, for six species (Tables 3.4-4 & 3.4-5). Considering the conservatism built into the predictive model's raw output, coupled with the NSWC PCD's standard protective measures defined in the NSWC PCD Final EIS/OEIS that will be implemented, the Q-20 testing will have minor, if any, effects on behavior, negligible impacts on the vital rates of any species or stock of marine mammals, and will not reduce annual rates of survival or recruitment.

The six species having Level B exposures, behavioral harassment without TTS, can be effectively mitigated with the application of the protective measures; hence the actual number of exposures is likely to be much lower. The NSWC PCD EIS/OEIS concluded that there would be no significant impact or harm for all sonar-related non-TTS Level B harassments for all marine mammal species. The same reasoning would indicate that there would be no significant impact or harm from the proposed testing of the Q-20 if the same protective measures in the NSWC PCD Final EIS/OEIS are applied to the proposed testing of the Q-20.

Other Operations

Potential non-acoustic effects on marine mammals are from vessel operation and from EOID laser testing. Q-20 testing presents a potential hazard for collision or entanglement with marine species. Trauma to soft or hard tissues could result from collisions of marine mammals with the Q-20 or with the RMMV or surrogate platforms such as a range support craft or contractor vessel. Entanglement of large whale species with the Q-20 tether is considered a remote possibility and discountable in terms of risk given marine mammal observers and protective procedures (Section 2.7), the low abundance of large whales in the test area, continuous movement of the RMMV, and minimal slack in the tether while the Q-20 is under tow.

Avoiding collision and entanglement with any object is critical to testing success. Both marine mammal observers and sensors on the RMMV and the Q-20 would be actively scanning for navigation hazards, including marine mammals. Q-20 testing would occur at slow speeds (less than 12 knots), allowing marine mammals and test operators time to maneuver and avoid collision. Test operators would manually control the RMMV and Q-20 and monitor via real-time encrypted data communications modes, with response times of 5 – 15 seconds, to effect changes in course and speed. Observers would be authorized to immediately curtail operations should the need arise. Protective measures from the EIS/OEIS have

been incorporated into the Proposed Action as detailed in Section 2.7. Applying these protective measures to the Proposed Action would avoid collision or entanglement with marine mammals.

The greatest concern for marine mammals from laser operations is visual damage. Given the brief pulse duration (10 seconds) of the downward-looking EOID laser, the loss of light energy through the water column, and the independent movements of the RMMV/Q-20 and any swimming whale or dolphin in near-field, the possibility is remote and discountable that an individual marine mammal's eye or other tissues could be directly exposed to the LIDAR beam in close enough proximity for a period of time sufficient to cause injury (NSWC PCD 2009, SPAWAR Systems Center Pacific 2010).

Based on this information and the discussion in the NSWC PCD EIS/OEIS (2009), the Navy finds, in accordance with EO 12114, that there will be no significant harm to marine mammals in non-territorial waters from the Proposed Action.

3.5 NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed testing of the Q-20 would not occur in the NSWC PCD Testing Range in 2012-2014. As a result, the impacts identified for the Proposed Action (testing the Q-20) would not occur. There would be no harm to the resources of the global commons due to implementation of the No Action Alternative.

CHAPTER 4
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CHAPTER 5
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CHAPTER 6
CONCLUSIONS

Based upon this OEA, in accordance with EO 12114, it is determined that the Proposed Action to conduct Q-20 testing in the NSWC PCD Testing Range within the non-territorial waters of the U.S. Exclusive Economic Zone will not significantly harm the environment of the global commons, and that the Proposed Action does not require an OEIS. The facts pertinent to this decision are the following:

- Essentially similar RDT&E activities were previously analyzed in the NSWC PCD EIS/OEIS and found not to have significant impacts given the implementation of protective measures from the EIS/OEIS. The relevant protective measures, for marine mammals in particular, would be implemented as part of the Proposed Action.
- The Q-20 sonar is a high frequency, relatively low power system, the use of which would only result in non-injury Level B behavioral takes of marine mammals under the MMPA. An IHA for the Proposed Action was issued by NMFS on 26 July 2012.
- There would be no effects on air quality or ESA-listed species.
- The action would not adversely affect EFH.

APPENDIX A
AIR QUALITY CALCULATIONS

EMISSIONS SUMMARY

Vessel Type	HP	HR/YR	Emission Factors (g/hp-hr) NOx	CO	VOC	SOx	PM	CO_2	CH_4	# ENG	CF (g to tons)	Emissions tons/year NOx	CO	VOC	SOx	PM	CO_2	CH_4	N_20
Small Support Vessel (gas)	100	504	4.99	3.16	6.80	0.27	0.327	489.88	0.01	1	0.000001102	0.28	0.18	0.38	0.01	0.02	27.21	0.00	0.26
Large Support Vessel (diesel)	600	504	14.06	3.03	1.12	0.93	1.12	521.63	0.01	1	0.000001102	4.69	1.01	0.37	0.31	0.37	173.83	0.00	4.45
HMMV (diesel)	370	504	6.90	8.50	1.00	0.93	1.12	521.63	0.01	1	0.000001102	1.42	1.75	0.21	0.19	0.23	107.20	0.00	1.35
											TOTAL	**6.38**	**2.93**	**0.96**	**0.52**	**0.62**	**308.23**	**0.00**	**6.06**

SH-60 Helicopter Emissions				Emission Indices (lbs/1000 lbs fuel)'								Emissions, lbs							
Mode of Operation	**Fuel Use per engine, lbs/hr**	**No of Engines**	**Hours of Operation**	**CO**	**NOx**	**VOCs**	**SO2**	**PM10**	**CO2**	**CH4**	**N2O**	**CO**	**NOx**	**VOCs**	**SO2**	**PM10**	**CO2**	**CH4**	**N2O**
Cruise	600	2	100	6.25	6.4	0.55	0.4	4.2	3100	0.09	0.1	750	768	66	48	504	372000	10.8	12
											Emissions, tons/year	0.375	0.384	0.033	0.024	0.252	186	0.005	0.01

Emissions	Emissions (Metric tons/year) CO_2	CH_4	N_20	CO_{2e}
Total Activities	448.36	0.01	5.50	2155

Notes:

Conversion to Metrix Tons = 1 short ton = 0.90718474 metric tons

N_20 = NOx * 0.095

$CO_{2e} = (CO_2*1)+ (CH_4*21)+(N_2O*310)$

Notes & References:

1) Emissions estimates for surface vessels (gasoline & diesel powered) were calculated using USEPA AP-42 emission factors for Uncontrolled Gasoline and Diesel Industrial Engines (Table 3.3-1) and then multiplied by the engine horsepower and hours of operation.

2) Emissions Formula used: ***Emissions = HP x HR/YR x EF x ENG x CF***

Emissions = Surface craft emissions
HP = Horsepower
HR/YR = Hours per year
EF = Emission factor for specific engine type
ENG = Number of engines
CF = Conversion factor for grams to tons per year

3) USEPA. 2011. Emissions Factors & AP-42, Compilation of Air Pollutant Emission Factors. AP-42, Fifth Addition, Vol I. Section 3.3, Gasoline and Diesel (last updated March 2009). http://www.epa.gov/ttn/chief/ap42/Industrial Engines.