DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 218

[Docket No. 250430–0074]

RIN 0648–BN17

Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Military Readiness Activities in the Atlantic Fleet Training and Testing Study Area

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; proposed letters of authorization; request for comments.

SUMMARY: NMFS has received a request from the U.S. Department of the Navy (including the U.S. Navy and the U.S. Marine Corps (Navy)) and on behalf of the U.S. Coast Guard (Coast Guard; hereafter, Navy and Coast Guard are collectively referred to as Action Proponents) for Incidental Take Regulations (ITR) and three associated Letters of Authorization (LOAs) pursuant to the Marine Mammal Protection Act (MMPA). The requested regulations would govern the authorization of take of marine mammals incidental to training and testing activities conducted in the Atlantic Fleet Training and Testing (AFTT) Study Area over the course of seven years from November 2025 through November 2032. NMFS requests comments on this proposed rule. NMFS will consider public comments prior to making any final decision on the promulgation of the requested ITR and issuance of the LOAs; agency responses to public comments will be summarized in the final rule, if issued. The Action Proponents' activities are considered military readiness activities pursuant to the MMPA, as amended by the National Defense Authorization Act for Fiscal Year 2004 (2004 NDAA).

DATES: Comments and information must be received no later than June 9, 2025.

ADDRESSES: A plain language summary of this proposed rule is available at *https://www.regulations.gov/docket/NOAA-NMFS-2024-0115.* You may submit comments on this document, identified by NOAA–NMFS–2024–0115, by any of the following methods:

- *Electronic Submission:* Submit all electronic public comments via the Federal e-Rulemaking Portal. Visit *https://www.regulations.gov* and type NOAA–NMFS–2024–0115 in the Search box. Click on the ''Comment'' icon, complete the required fields, and enter or attach your comments.
- *Mail:* Submit written comments to Jolie Harrison, Chief, Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910–3225.
- *Fax:* (301) 713–0376; Attn: Jolie Harrison.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on *https://www.regulations.gov* without change. All personal identifying information (*e.g.,* name, address, *etc.*), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter ''N/A'' in the required fields if you wish to remain anonymous). Attachments to electronic comments will be accepted in Microsoft Word, Excel, or Adobe PDF file formats only.

A copy of the Action Proponents' Incidental Take Authorization (ITA) application and supporting documents, as well as a list of the references cited in this document, may be obtained online at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-military-readiness-activities.* In case of problems accessing these documents, please call the contact listed below (see **FOR FURTHER INFORMATION CONTACT**).

FOR FURTHER INFORMATION CONTACT: Alyssa Clevenstine, Office of Protected Resources, NMFS, (301) 427–8401.

SUPPLEMENTARY INFORMATION:

Purpose and Need for Regulatory Action

This proposed rule, if promulgated, would provide a framework under the authority of the MMPA (16 U.S.C. 1361 *et seq.*) to allow for the authorization of take of marine mammals incidental to the Action Proponents' training and testing activities (which qualify as military readiness activities) involving the use of active sonar and other transducers, air guns, and explosives (also referred to as ''in-water detonations''); pile driving and vibratory extraction; and vessel movement in the AFTT Study Area. The AFTT Study Area includes air and water space of the western Atlantic Ocean along the east coast of North America, the Gulf of America (formerly Gulf of Mexico), and portions of the Caribbean Sea, covering approximately 2.6 million square nautical miles (nmi²; 8.9 million square kilometers (km²)) of ocean area (see figure 1.1–1 of the rulemaking and LOA application (hereafter referred to as the application)). Please see the Legal Authority for the Proposed Action section for relevant definitions.

Legal Authority for the Proposed Action

The MMPA prohibits the ''take'' of marine mammals, with certain exceptions. Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are proposed or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review and the opportunity to submit comment.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking; other ''means of effecting the least practicable adverse impact'' on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as ''mitigation''); and requirements pertaining to the monitoring and reporting of the takings. The MMPA defines ''take'' to mean to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal. The Preliminary Analysis and Negligible Impact Determination section discusses the definition of ''negligible impact.''

The 2004 NDAA (Pub. L. 108–136) amended section 101(a)(5) of the MMPA to remove the ''small numbers'' and ''specified geographical region'' provisions and amended the definition of ''harassment'' as applied to a ''military readiness activity'' to read as follows (section 3(18)(B) of the MMPA): (i) Any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A Harassment); or (ii) Any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered (Level B Harassment). The 2004 NDAA also amended the MMPA establishing that ''[f]or military readiness activity . . . , a determination of 'least practicable adverse impact' . . . shall include consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.'' On August 13, 2018, the NDAA for Fiscal Year 2019 (2019 NDAA) (Pub. L. 115–232) amended the MMPA to allow incidental take regulations for military readiness activities to be issued for up to 7 years.

Summary of Major Provisions Within the Proposed Rule

The major provisions of this proposed rule are:

(i) The proposed take of marine mammals by Level A harassment and/or Level B harassment;

(ii) The proposed take of marine mammals by mortality or serious injury (M/SI);

(iii) The proposed use of defined powerdown and shutdown zones (based on activity);

(iv) Proposed measures to reduce the likelihood of vessel strikes;

(v) Proposed activity limitations in certain areas and times that are biologically important (*i.e.,* for foraging, migration, reproduction) for marine mammals;

(vi) The proposed implementation of a Notification and Reporting Plan (for dead, live stranded, or marine mammals struck by any vessel engaged in military readiness activities); and

(vii) The proposed implementation of a robust monitoring plan to improve our understanding of the environmental effects resulting from the Action Proponents' training and testing activities.

This proposed rule includes an adaptive management component that allows for timely modification of mitigation, monitoring, and/or reporting measures based on new information, when appropriate.

Summary of Request

On May 28, 2024, NMFS received an application from the Action Proponents requesting authorization to take marine mammals, by Level A and Level B harassment, incidental to training and testing (characterized as military readiness activities) including the use of sonar and other transducers, in-water detonations, air guns, and impact and vibratory pile driving and extraction conducted within the AFTT Study Area. In addition, the Action Proponents are requesting authorization to take, by serious injury or mortality, a limited number of several marine mammal species from explosives during training exercises, ship shock trials, and vessel movement during military readiness activities conducted within the AFTT Study Area over the 7-year period of the LOAs. In response to our comments and following information exchange, the Action Proponents submitted a final revised application on August 16, 2024, that we determined was adequate and complete on August 19, 2024. On October 8, 2024, the Action Proponents submitted an updated application to revise take estimates on a subset of Navy activities. On September 20, 2024, we published a notice of receipt (NOR) of application in the **Federal Register** (89 FR 77106), requesting comments and information related to the Action Proponents' request for 30 days. During the 30-day public comment period on the NOR, we did not receive any public comments. On January 21, 2025, the Action Proponents submitted an updated application that removed ship shock trials and estimated take associated with that activity in Key West and within the Virginia Capes (VACAPES) Range Complex and, on February 13, 2025, the Action Proponents submitted an updated application containing minor revisions.

NMFS has previously promulgated incidental take regulations pursuant to the MMPA relating to similar military readiness activities in AFTT. NMFS published the first rule effective from January 22, 2009 through January 22, 2014 (74 FR 4844, January 27, 2009), the second rule effective from November 14, 2013 through November 13, 2018 (78 FR 73009, December 4, 2013), and the third rule effective from November 14, 2018 through November 13, 2023 (83 FR 57076, November 14, 2018), which was subsequently amended, extending the effective date until November 13, 2025 (84 FR 70712, December 23, 2019) pursuant to the 2019 NDAA. For this proposed rulemaking, the Action Proponents propose to conduct substantially similar training and testing activities within the AFTT Study Area that were conducted under previous rules.

The Action Proponents' application reflects the most up-to-date compilation of training and testing activities deemed necessary to accomplish military readiness requirements. The types and numbers of activities included in the proposed rule account for fluctuations in training and testing to meet evolving or emergent military readiness requirements. These proposed regulations would cover military readiness activities in the AFTT Study Area that would occur for a 7-year period following the expiration of the existing MMPA authorization on November 13, 2025.

Description of Proposed Activity

Overview

The Action Proponents request authorization to take marine mammals incidental to conducting military readiness activities. The Action Proponents have determined that acoustic and explosives stressors are most likely to result in take of marine mammals that could rise to the level of harassment, and take by serious injury or mortality may result from vessel movement, explosive use, and ship shock trials. Detailed descriptions of these activities are provided in chapter 2 of the 2024 AFTT Draft Supplemental Environmental Impact Statement (EIS)/ Overseas EIS (OEIS) (2024 AFTT Draft Supplemental EIS/OEIS) (*https://www.nepa.navy.mil/aftteis/*) and in the Action Proponents' application (*https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-military-readiness-activities*) and are summarized here.

The Navy's statutory mission is to organize, train, equip, and maintain combat-ready naval forces for the peacetime promotion of the national security interests and prosperity of the United States, and for prompt and sustained combat incident to operations essential to the prosecution of a naval campaign. These missions are mandated by Federal law (10 U.S.C. 8062 and 10 U.S.C. 8063), which requires the readiness of the naval forces of the United States. The Navy executes this responsibility by establishing and executing at-sea training and testing, often in designated operating areas (OPAREA) and testing and training ranges. The Navy must be able to access and utilize these areas and associated sea and air space to develop and maintain skills for conducting naval operations. The Navy's testing activities ensure naval forces are equipped with well-maintained systems that take advantage of the latest technological advances. The Navy's research and acquisition community conducts military readiness activities that involve testing. The Navy tests vessels, aircraft, weapons, combat systems, sensors, and related equipment, and conducts scientific research activities to achieve and maintain military readiness.

The mission of the Coast Guard is to ensure the maritime safety, security, and stewardship of the United States. To advance this mission, the Coast Guard must ensure its personnel can qualify and train jointly with, and independently of, the Navy and other services in the effective and safe operational use of Coast Guard vessels, aircraft, and weapons under realistic conditions. These activities help ensure the Coast Guard can safely assist in the defense of the United States by protecting the United States' maritime safety, security, and natural resources in accordance with its national defense mission (14 U.S.C. 102). Coast Guard training activities are described in more detail in appendix C of the 2024 AFTT Draft Supplemental EIS/OEIS and in the Action Proponents' application, and are summarized below.

Dates and Duration

The specified activities would occur at any time during the 7-year period of validity of the regulations. The proposed number of military readiness activities are described in the Detailed Description of the Specified Activity section (table 4 through table 9).

Specified Geographical Region

The AFTT Study Area includes areas of the western Atlantic Ocean along the east coast of North America, the Gulf of America, and portions of the Caribbean Sea, covering approximately 2.6 million nmi^2 (8.9 million km^2) of ocean area, oriented from the mean high tide line along the U.S. coast and extending east to 45-degree west longitude line, north to 65-degree north latitude line, and south to approximately the 20-degree north latitude line (figure 1). It also includes Navy and Coast Guard pierside locations and port transit channels, bays, harbors, inshore waterways (*e.g.,* channels, rivers), and civilian ports where military readiness activities occur as well as vessel and aircraft transit routes between homeports and OPAREAs. New to the Study Area are inshore waters adjacent to the Gulf of America and changes to ship shock trial areas. The VACAPES and Key West ship shock trial areas were removed from the Study Area, the Gulf of America ship shock trial area was moved south, and the Jacksonville ship shock trial area expanded. The vast majority of military readiness activities occur within appropriately designated range complexes and testing ranges that fall within the confines of the Study Area. Please refer to figure 1.1–1 of the application for a color map of the AFTT Study Area and figure 2.1–1 through figure 2.1–5 for additional maps of the range complexes and testing ranges. A summary of the AFTT Range Complexes and Testing Ranges are provided in table 1, Inshore Areas are provided in table 2, and Ports and Piers are provided in table 3.

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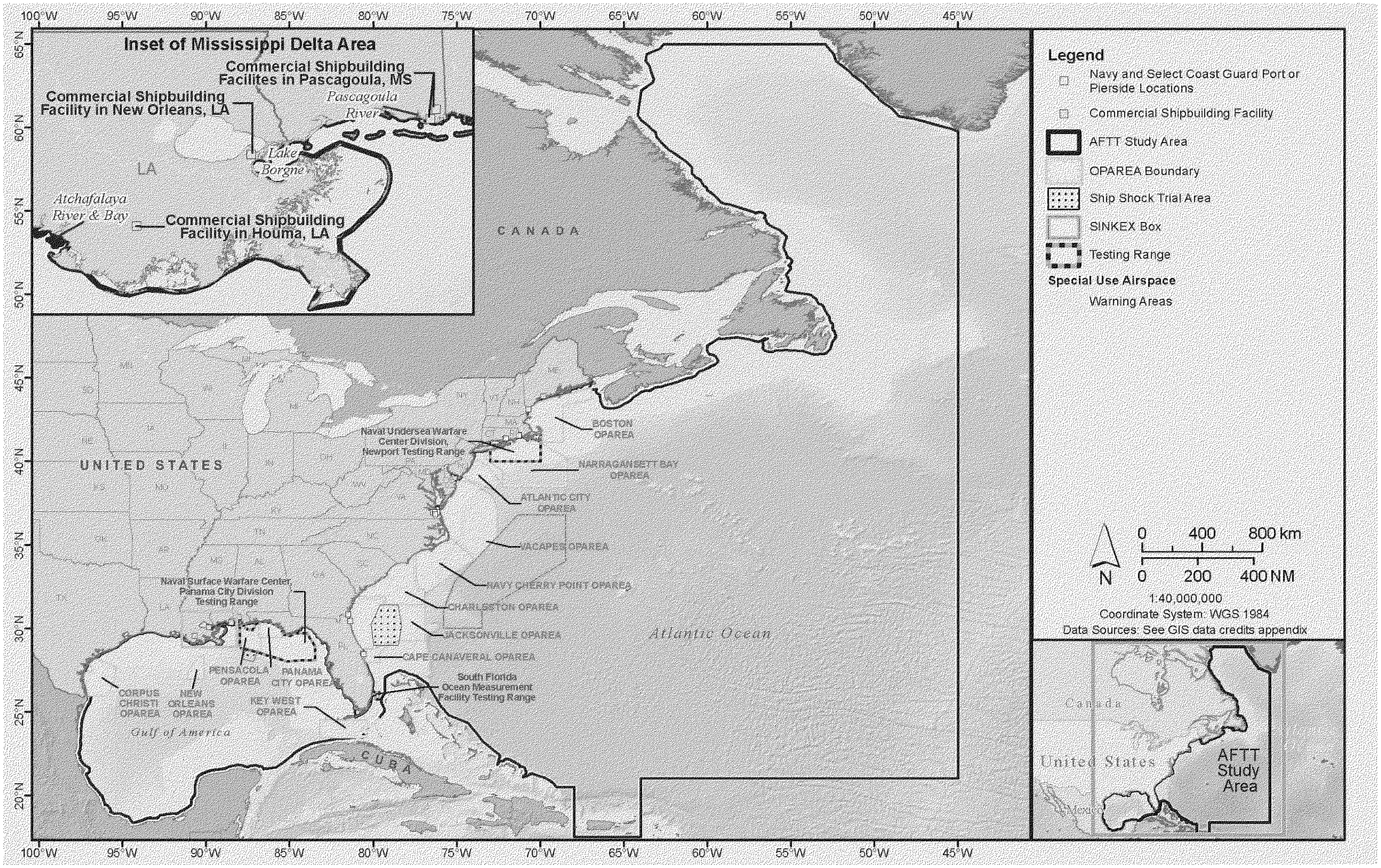

Figure 1 -- Map of the AFTT Study Area

TABLE 1—AFTT STUDY AREA TRAINING AND TESTING RANGES

Name	Basic location	Sea and undersea space	Air space
Northeast Range Complexes	750 miles along the coast from Maine to New Jersey.	46,000 nmi^2 of sea and undersea space. Includes three OPAREAs: Boston, Narragansett Bay, and Atlantic City.	29,000 nmi^2 of special use airspace.
Naval Undersea Warfare Center Division, Newport Testing Range.	Includes the waters of Narragansett Bay, Rhode Island Sound, Block Island Sound, Buzzards Bay, Vineyard Sound, and Long Island Sound.	11,000 nmi^2 of sea and undersea space. Includes three Restricted Areas: Coddington Cove, Narragansett Bay, and Rhode Island Sound.	Minimal testing occurs in airspace within the test area.
Virginia Capes Range Complex (VACAPES RC).	250 miles along the coast from Delaware to North Carolina, from the shoreline to 150 nmi seaward.	30,000 nmi^2 of sea and undersea space. Includes one OPAREA: Virginia Capes.	30,000 nmi^2 of special use airspace.
Navy Cherry Point Range Complex	Off the coast of North and South Carolina, from the shoreline to 120 nmi seaward.	19,000 nmi^2 of sea and undersea space. Includes one OPAREA: Navy Cherry Point.	19,000 nmi^2 of special use airspace.
Jacksonville Range Complex (JAX RC)	520 miles along the coast from North Carolina to Florida, from the shoreline to roughly 250 nmi seaward.	50,000 nmi^2 of sea and undersea space. Includes three OPAREAs: Charleston, Jacksonville and Cape Canaveral. Includes the Undersea Warfare Training Range.	64,000 nmi^2 of special use airspace.
Naval Surface Warfare Center, Carderock Division, South Florida Ocean Measurement Facility Testing Range (SFOMF).	Located adjacent to the Port Everglades entrance channel in Fort Lauderdale, Florida; out to roughly 25 nmi from shore.	500 nmi^2 of sea and undersea space	No associated special use airspace.
Key West Range Complex	Off the southwestern coast of mainland Florida and along the southern Florida Keys, extending into the Gulf of America and the Straits of Florida.	8,000 nmi^2 of sea and undersea space south of Key West. Includes one OPAREA: Key West.	23,000 nmi^2 of special use airspace.
Naval Surface Warfare Center, Panama City Division Testing Area.	Off the panhandle of Florida and Alabama, extending from the shoreline 120 nmi seaward and includes St. Andrew Bay.	23,000 nmi^2 of sea and undersea space. Includes two OPAREAs: Panama City and Pensacola.	23,000 nmi^2 of special use airspace.
Gulf Range Complex (Gulf RC)	Includes geographically separated areas throughout the Gulf of America.	20,000 nmi^2 of sea and undersea space. Includes four OPAREAs: Panama City, Pensacola, New Orleans, and Corpus Christi.	43,000 nmi^2 of special use airspace.

Note: nmi = nautical mile, nmi^2 = square nautical mile, areas and distances of locations, sea and undersea space, and airspace are approximations.

TABLE 2—AFTT STUDY AREA INSHORE LOCATIONS

Name	Associated inshore waters
Northeast Range Complexes Inshore	Thames River, Narragansett Bay, Rhode Island Sound, Block Island Sound.
Virginia Capes Range Complex (VACAPES RC) Inshore	Lower Chesapeake Bay, James River and tributaries, Broad Bay, York River.
Jacksonville Range Complex (JAX RC) Inshore	Blount Island, Southeast Kings Bay, Cooper River, St. Johns River, Port Canaveral.
Key West Range Complex Inshore	Truman Harbor, Demolition Key.
Gulf Range Complex (Gulf RC) Inshore	St. Andrew Bay, Atchafalaya Bay, Atchafalaya River, Lake Borgne, Pascagoula River, Mobile Bay.

Note: The Gulf Range Complex Inshore includes geographically separated areas throughout the Gulf of America.

TABLE 3—AFTT STUDY AREA PORTS AND PIERS

Pierside locations	Civilian ports	Coast Guard locations
Portsmouth Naval Shipyard	Bath, ME	Southwest Harbor, ME
Naval Submarine Base New London	Boston, MA	Boston, MA
Naval Station Newport	Earle, NJ	Cape Cod, MA
Naval Station Norfolk	Delaware Bay, DE	New London, CT *
Joint Expeditionary Base Little Creek Fort Story	Hampton Roads, VA	New Haven CT *
Norfolk Naval Shipyard	Morehead City, NC	Newport, RI *
Naval Submarine Base Kings Bay	Wilmington, NC	Montauk, NY
Naval Station Mayport	Kings Bay, GA	Staten Island, NY *
Port Canaveral	Savannah, GA	Atlantic City, NJ
	Mayport, FL	Chesapeake, VA
	Port Canaveral, FL	Virginia Beach, VA *
	Tampa, FL	Portsmouth, VA*
	Pascagoula, MS	Elizabeth City, NC
	Gulfport, MS	Charleston, SC *
	Beaumont, TX	Mayport, FL *
	Corpus Christi, TX	Cape Canaveral, FL *
		Fort Pierce, FL *
		Dania, FL *
		Miami, FL *
		Key West, FL *
		St. Petersburg, FL *
		Pensacola, FL *
		Opa Locka, FL
		New Orleans, LA
		Houston, TX
		Corpus Christi, TX

Note: CT: Connecticut; FL: Florida; GA: Georgia; LA: Louisiana; MA: Massachusetts; ME: Maine; MS: Mississippi; NC: North Carolina; NJ: New Jersey; NY: New York; RI: Rhode Island; SC: South Carolina; TX: Texas; VA: Virginia.

* Indicates Coast Guard cutter stations.

Detailed Description of the Specified Activity

The Action Proponents propose to conduct military readiness activities within the AFTT Study Area and have been conducting military readiness activities in the Study Area for well over a century and with active sonar for over 70 years. The tempo and types of military readiness activities have fluctuated due to the introduction of new technologies, the evolving nature of international events, advances in warfighting doctrine and procedures, and changes in force structure (organization of vessels, weapons, and personnel). Such developments influenced the frequency, duration, intensity, and location of required military readiness activities.

Primary Mission Areas

The Navy categorizes their activities into functional warfare areas called primary mission areas, while the Coast Guard categorizes their activities as operational mission programs. For the Navy, these activities generally fall into the following five primary mission areas (Coast Guard mission areas are discussed below). The Navy mission areas with activities that may result in incidental take of marine mammals (and stressors associated with training and testing activities within those mission areas) include the following:

(i) Amphibious warfare (in-water detonations);

(ii) Anti-submarine warfare (sonar and other transducers, in-water detonations);

(iii) Expeditionary warfare (in-water detonations, pile driving and extraction);

(iv) Mine warfare (sonar and other transducers, in-water detonations);

(v) Surface warfare (in-water detonations); and

(vi) Other (sonar and other transducers, air guns, vessel movement).

Most Navy activities conducted in AFTT are categorized under one of these primary mission areas; activities that do not fall within one of these areas are listed as ''other activities.'' In addition, ship shock (in-water detonations) trials, a specific Navy testing activity related to vessel evaluation, would be conducted. The testing community also categorizes most, but not all, of its testing activities under these primary mission areas. The testing community has three additional categories of activities: vessel evaluation (inclusive of ship shock trials), unmanned systems (*i.e.,* unmanned surface vehicles (USVs), unmanned underwater vehicles (UUVs)), and acoustic and oceanographic science and technology.

The Action Proponents describe and analyze the effects of their activities within the application (see the 2024 AFTT Draft Supplemental EIS/OEIS for additional details). In their assessment, the Action Proponents concluded that sonar and other transducers, underwater detonations, air guns, and pile driving/extraction were the stressors most likely to result in impacts on marine mammals that could rise to the level of harassment (and serious injury or mortality by explosives or by vessel movement) as defined under the MMPA. Therefore, the Action Proponents' application provides their assessment of potential effects from these stressors in terms of the primary warfare mission areas in which they would be conducted.

The Coast Guard has four major national defense missions:

(i) Maritime intercept operations;

(ii) Deployed port operations/security and defense;

(iii) Peacetime engagement; and

(iv) Environmental defense operations (which includes oil and hazardous substance response).

The Coast Guard manages 6 major operational mission programs with 11 statutory missions, which includes defense readiness. As part of the Coast Guard's defense mission, Title 14 U.S.C. 1 states the Coast Guard is ''at all times an armed force of the United States.'' As part of the Joint Forces, the Coast Guard maintains its readiness to carry out military operations in support of the policies and objectives of the U.S. government. As an armed force, the Coast Guard trains and operates in the joint military arena at any time and functions as a specialized service under the Navy in time of war or when directed by the President. Coast Guard service members are trained to respond immediately to support military operations and national security. Federal law created the framework for the relationship between the Navy and the Coast Guard (10 U.S.C. 101; 14 U.S.C. 2(7); 22 U.S.C.; 50 U.S.C.). To meet these statutory requirements and effectively carry out these missions, the Coast Guard's air and surface units train using realistic scenarios, including training with the Navy in their primary mission areas. Every Coast Guard unit is trained to support all statutory missions and, thus, trained to meet all mission requirements, which includes their defense mission requirements. Since all Coast Guard's missions entail the deployment of cutters or boats and either fixed-wing or rotary aircraft, the Coast Guard training requirements for one mission generally overlaps with the training requirements of other missions. Thus, when the Coast Guard is training for its defense mission, the same skill sets are utilized for its other statutory missions.

The Coast Guard's defense mission does not involve low- or mid-frequency active sonar (LFAS or MFAS), missiles, in-water detonations, pile driving and extraction, or air guns that would result in harassment of marine mammals. For additional information on all activities in the Coast Guard's mission programs see appendix C of the 2024 AFTT Draft Supplemental EIS/OEIS.

Below, we provide additional detail for each of the applicable primary mission areas.

Amphibious Warfare—

The mission of amphibious warfare is to project military power from the sea to the shore (*i.e.,* attack a threat on land by a military force embarked on ships) through the use of naval firepower and expeditionary landing forces. Amphibious warfare operations include Navy and Marine Corps small unit reconnaissance or raid missions to large-scale amphibious exercises involving multiple ships and aircraft combined into a strike group.

Amphibious warfare training ranges from individual, crew, and small unit events to large task force exercises. Individual and crew training include amphibious vehicles and naval gunfire support training. Such training includes shore assaults, boat raids, airfield or port seizures, reconnaissance, and disaster relief. Large-scale amphibious exercises involve ship-to-shore maneuvers, naval fire support such as shore bombardment, air strikes, and attacks on targets that are near friendly forces.

Testing of guns, munitions, aircraft, ships, and amphibious vessels and vehicles used in amphibious warfare are often integrated into training activities and, in most cases, the systems are used in the same manner in which they are used for training activities. Amphibious warfare tests, when integrated with training activities or conducted separately as full operational evaluations on existing amphibious vessels and vehicles following maintenance, repair, or modernization, may be conducted independently or in conjunction with other amphibious ship and aircraft activities. Testing is performed to ensure effective ship-to-shore coordination and transport of personnel, equipment, and supplies. Tests may also be conducted periodically on other systems, vessels, and aircraft intended for amphibious operations to assess operability and to investigate efficacy of new technologies.

Anti-Submarine Warfare—

The mission of anti-submarine warfare is to locate, neutralize, and defeat hostile submarine forces that threaten Navy forces. Anti-submarine warfare is based on the principle that surveillance and attack aircraft, ships, and submarines all search for hostile submarines. These forces operate together or independently to gain early warning and detection and to localize, track, target, and attack submarine threats.

Anti-submarine warfare training addresses basic skills such as detecting and classifying submarines, as well as evaluating sounds to distinguish between enemy submarines and friendly submarines, ships, and marine life. More advanced training integrates the full spectrum of anti-submarine warfare from detecting and tracking a submarine to attacking a target using either exercise torpedoes (*i.e.,* torpedoes that do not contain a warhead) or simulated weapons. These integrated anti-submarine warfare training exercises are conducted in coordinated, at-sea training events involving submarines, ships, and aircraft.

Testing of anti-submarine warfare systems is conducted to develop new technologies and assess weapon performance and operability with new systems and platforms, such as unmanned systems. Testing uses ships, submarines, and aircraft to demonstrate capabilities of torpedoes, missiles, countermeasure systems, and underwater surveillance and communications systems. Tests may be conducted as part of a large-scale fleet training event involving submarines, ships, fixed-wing aircraft, and helicopters. These integrated training events offer opportunities to conduct research and acquisition activities and to train aircrew in the use of new or newly enhanced systems during a large-scale, complex exercise.

Expeditionary Warfare—

The mission of expeditionary warfare is to provide security and surveillance in the littoral (at the shoreline), riparian (along a river), or coastal environments. Expeditionary warfare is wide ranging and includes defense of harbors, operation of remotely operated vehicles, defense against swimmers, and boarding/seizure operations.

Expeditionary warfare training activities include Navy, Marine Corps, and Coast Guard underwater construction team training, dive and salvage operations, and insertion/extraction via air, surface, and subsurface platforms.

Mine Warfare—

The mission of mine warfare is to detect, classify, and avoid or neutralize (disable) mines to protect U.S. ships and submarines, and to maintain free access to ports and shipping lanes. Mine warfare training for the Navy and Coast Guard falls into two primary categories: mine detection and classification, and mine countermeasure and neutralization. Mine warfare also includes offensive mine laying to gain control of or deny the enemy access to sea space. Naval mines can be laid by ships, submarines, UUVs, or aircraft.

Mine warfare neutralization training includes exercises in which aircraft, ships, submarines, underwater vehicles, unmanned vehicles, or marine mammal detection systems search for mine shapes. Personnel train to destroy or disable mines by attaching underwater explosives to or near the mine or using remotely operated vehicles to destroy the mine.

Mine warfare testing is similar to training but focuses on the development of mine warfare systems to improve sonar, laser, and magnetic detectors intended to hunt, locate, and record the positions of mines for avoidance or subsequent neutralization. Mine detection and classification testing involves the use of air, surface, and subsurface platforms using a variety of systems to locate and identify objects underwater. Mine countermeasure and neutralization testing includes the use of air, surface, and subsurface platforms to evaluate the effectiveness of tracking devices, countermeasure and neutralization systems, and explosive munitions to neutralize mine threats. Most neutralization tests use mine shapes, or non-explosive practice mines, to evaluate a new or enhanced capability; however, a small percentage require the use of high-explosive mines to evaluate and confirm effectiveness of various systems.

Surface Warfare—

The mission of surface warfare is to obtain control of sea space from which naval forces may operate and entails offensive action against other surface and subsurface targets while also defending against enemy forces. In surface warfare, aircraft use cannons, air-to-surface missiles, and other precision-guided munitions; ships employ torpedoes, naval guns, and surface-to-surface missiles; and submarines attack surface ships using torpedoes.

Surface warfare training includes Navy and Coast Guard surface-to-surface gunnery and missile exercises, air-to-surface gunnery, bombing, and missile exercises, submarine torpedo launch events, other munitions against surface targets, and amphibious operations in a contested environment.

Testing of weapons used in surface warfare is conducted to develop new technologies and to assess weapon performance and operability with new systems and platforms, such as unmanned systems. Tests include various air-to-surface guns and missiles, surface-to-surface guns and missiles, and bombing tests. Testing events may be integrated into training activities to test aircraft or aircraft systems in the delivery of ordnance on a surface target. In most cases the tested systems are used in the same manner in which they are used for training activities.

Overview of Training Activities Within the Study Area

The Action Proponents routinely train in the AFTT Study Area in preparation for national defense missions. Training activities and exercises covered in this proposed rule are briefly described below and in more detail within appendix A (Activity Descriptions) of the 2024 AFTT Draft Supplemental EIS/OEIS. The description, annual number of activities, and location of each training activity are provided by stressor category in table 4, table 5, and table 6. Each training activity described meets a requirement that can be traced ultimately to requirements set forth by the National Command Authority.

Within the Navy, a major training exercise (MTE) is comprised of multiple ''unit-level'' exercises conducted by several units operating together while commanded and controlled by a single commander (these units are collectively referred to as carrier and expeditionary strike groups). These exercises typically employ an exercise scenario developed to train and evaluate the strike group in tactical naval tasks. In a MTE, most of the operations and activities being directed and coordinated by the strike group commander are identical in nature to the operations conducted during individual, crew, and smaller unit-level training events. However, in MTEs, these disparate training tasks are conducted in concert rather than in isolation. Some integrated or coordinated anti-submarine warfare exercises are similar in that they are composed of several unit-level exercises but are generally on a smaller scale than a MTE, are shorter in duration, use fewer assets, and use fewer hours of hull-mounted sonar per exercise. Coordinated training exercises involve multiple units working together to meet unit-level training requirements, whereas integrated training exercises involve multiple units working together for deployment. Coordinated exercises involving the use of sonar are presented under the category of anti-submarine warfare. The anti-submarine warfare portions of these exercises are considered together in coordinated activities for the sake of acoustic modeling. When other training objectives are being met, those activities are described via unit-level training in each of the relevant primary mission areas.

With a smaller fleet of approximately 250 cutters, Coast Guard activities are not as extensive as Navy activities due to differing mission requirements. However, the Coast Guard does train with the Navy and conducts some of the same training as the Navy. The Coast Guard does not conduct any exercises similar in scale to Navy MTEs/integrated exercises, and the use of mid- or low-frequency sonar, missiles, and underwater detonations are examples of actions that are not a part of the Coast Guard's mission requirements. Coast Guard training generally occurs close to the vessel homeport or close to shore, on established Navy testing and training ranges, or in transit to a scheduled patrol/mission. There are approximately 1,600 Coast Guard vessels (cutters up to 418 feet (ft; 127.4 meters (m)) and boats less than 65 ft (19.8 m)), and the largest cutters would be underway for 3 to 4 months, whereas the smaller cutters would be underway from a few days to 4 weeks. The busiest regions for the Coast Guard are the Gulf of America due to the number of busy commercial ports, and Hampton Roads due to many of the cutters being based at facilities in that area.

The MTEs and integrated/coordinated training activities analyzed for this request are Navy-led exercises in which the Coast Guard may participate and described in table 4. For additional information on these activities, see table 1.3–1 of the application and appendix A (Activity Descriptions) of the 2024 AFTT Draft Supplemental EIS/OEIS. Table 5 describes the proposed Navy training activities analyzed within the AFTT Study Area while table 6 describes the proposed Coast Guard training activities analyzed within the AFTT Study Area. In addition to participating in Navy-led exercises, Coast Guard training activities include unit-level activities conducted independently of, and not in coordination with, the Navy.

TABLE 4—MAJOR TRAINING EXERCISES AND INTEGRATED/COORDINATED TRAINING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA

Training type	Exercise group	Description	Scale	Duration	Location (range complex)	Exercise examples	Typical hull-mounted sonar per event
Major Training Exercise.	Large Integrated ASW.	Larger-scale, longer duration integrated ASW exercises.	Greater than 6 surface ASW units (up to 30 with the largest exercises), 2 or more submarines, multiple ASW aircraft.	Generally greater than 10 days.	Jacksonville Range Complex, Navy Cherry Point Range Complex, Virginia Capes Range Complex.	COMPTUEX	<500 hours.
Major Training Exercise.	Medium Integrated ASW.	Medium-scale, medium duration integrated ASW exercises.	Approximately 3–8 surface ASW units, at least 1 submarine, multiple ASW aircraft.	Generally 4–10 days.	Jacksonville Range Complex, Navy Cherry Point Range Complex, Virginia Capes Range Complex.	Sustainment/Task Force Exercise.	100–300 hours.
Integrated/Coordinated Training.	Small Integrated ASW.	Small-scale, short duration integrated ASW exercises.	Approximately 3–6 surface ASW units, 2 dedicated submarines, 2–6 ASW aircraft.	Generally less than 5 days.	Jacksonville Range Complex, Navy Cherry Point Range Complex, Virginia Capes Range Complex.	SWATT, NUWTAC.	50–100 hours.
Integrated/Coordinated Training.	Medium Coordinated ASW.	Medium-scale, medium duration, coordinated ASW exercises.	Approximately 2–4 surface ASW units, possibly a submarine, 2–5 ASW aircraft.	Generally 3–10 days.	Jacksonville Range Complex, Navy Cherry Point Range Complex, Virginia Capes Range Complex.	ASW Tactical Development Exercise.	<100 hours.
Integrated/Coordinated Training.	Small Coordinated ASW.	Small-scale, short duration, coordinated ASW exercises.	Approximately 2–4 surface ASW units, possibly a submarine, 1–2 ASW aircraft.	Generally 2–4 days.	Jacksonville Range Complex, Navy Cherry Point Range Complex, Virginia Capes Range Complex.	ARG/MEU COMPTUEX.	<50 hours.

Note: ASW: anti-submarine warfare; COMPTUEX: Composite Training Unit Exercise; SWATT: Surface Warfare Advanced Tactical Training Exercise; NUWTAC: Navy Undersea Warfare Training Assessment Course; ARG/MEU: Amphibious Ready Group/Marine Expeditionary Unit.

TABLE 5—PROPOSED NAVY TRAINING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Acoustic	Major Training Exercise—Large Integrated ASW.	Composite Training Unit Exercise.	Aircraft carrier and carrier air wing integrate with surface and submarine and Coast Guard units in a challenging multi-threat operational environment that certifies them ready to deploy.	LFH, MFM, MFH, MF1, MF1C, Broadband (MF to HF).	2–3	17	Jacksonville Range Complex, Navy Cherry Point Range Complex, Virginia Capes Range Complex.
Acoustic	Major Training Exercise—Medium Integrated ASW.	Sustainment/Task Force Exercise.	Aircraft carrier and carrier air wing integrates with surface and submarine units in a challenging multi-threat operational environment to maintain ability to deploy.	LFH, MFM, MFH, MF1, MF1C, Broadband (MF to HF).	2	14	Jacksonville Range Complex, Navy Cherry Point Range Complex, Virginia Capes Range Complex.
Acoustic	Small Integrated ASW Training.	Navy Undersea Warfare Training Assessment Course.	Multiple ships, aircraft, and submarines integrate the use of their sensors, including sonobuoys, to search for, detect, classify, localize, and track a threat submarine.	LFH, MFM, MFH, MF1, MF1C, Broadband (MF to HF).	2	14	Jacksonville Range Complex, Navy Cherry Point Range Complex, Virginia Capes Range Complex.
Acoustic	Small Integrated ASW Training.	Surface Warfare Advanced Tactical Training.	Multiple ships and aircraft coordinate the use of sensors, including sonobuoys, to search, detect, and track a threat submarine. Surface Warfare Advanced Tactical Training (SWATT) exercises are not dedicated anti-submarine warfare exercises and involve multiple warfare areas.	LFH, MFM, MFH, MF1, MF1C, Broadband (MF to HF).	2	14	Jacksonville Range Complex, Navy Cherry Point Range Complex, Virginia Capes Range Complex.
Acoustic	Medium Coordinated ASW Training.	Tactical Development Exercise.	Multiple ships, aircraft, and submarines coordinate their efforts to search for, detect, and track submarines with the use of all sensors. Anti-Submarine Warfare Tactical Development Exercise is a dedicated anti-submarine warfare exercise.	MFM, MFH, MF1, MF1C, Broadband (MF to HF).	1	7	Jacksonville Range Complex.
Acoustic	Medium Coordinated ASW Training.	Tactical Development Exercise.	Multiple ships, aircraft, and submarines coordinate their efforts to search for, detect, and track submarines with the use of all sensors. Anti-Submarine Warfare Tactical Development Exercise is a dedicated anti-submarine warfare exercise.	MFM, MFH, MF1, MF1C, Broadband (MF to HF).	1	7	Virginia Capes Range Complex.
Acoustic	Small Coordinated ASW Training.	Group Sail	Surface ships, Coast Guard Cutters, and helicopters integrate to search for, detect, and track threat submarines. Group Sails are not dedicated anti-submarine warfare exercises and involve multiple warfare areas.	MFM, MFH, MF1, MF1C, Broadband (MF to HF).	5	35	Jacksonville Range Complex.
Acoustic	Small Coordinated ASW Training.	Group Sail	Surface ships, Coast Guard Cutters, and helicopters integrate to search for, detect, and track threat submarines. Group Sails are not dedicated anti-submarine warfare exercises and involve multiple warfare areas.	MFM, MFH, MF1, MF1C, Broadband (MF to HF).	4	28	Navy Cherry Point Range Complex.
Acoustic	Small Coordinated ASW Training.	Group Sail	Surface ships, Coast Guard Cutters, and helicopters integrate to search for, detect, and track threat submarines. Group Sails are not dedicated anti-submarine warfare exercises and involve multiple warfare areas.	MFM, MFH, MF1, MF1C, Broadband (MF to HF).	5	35	Virginia Capes Range Complex.
Acoustic	Small Coordinated ASW Training.	Amphibious Ready Group Marine Expeditionary Unit Composite Training Unit Exercise.	Amphibious Ready Group exercises are conducted to validate the Marine Expeditionary Unit's readiness for deployment and include small boat raids; visit, board, search, and seizure training; helicopter and mechanized amphibious raids; and non-combatant evacuation operations.	LFH, MFM, MFH, MF1, Broadband (MF to HF).	1	7	Navy Cherry Point Range Complex.
Explosive	Amphibious Warfare	Amphibious Operations in a Contested Environment.	Navy and Marine Corps forces conduct operations in coastal and offshore waterways against air, surface, and subsurface threats.	E1, E2, E3, E6, E9, E10.	45	315	Navy Cherry Point Range Complex.

Explosive	Amphibious Warfare	Amphibious Operations in a Contested Environment.	Navy and Marine Corps forces conduct operations in coastal and offshore waterways against air, surface, and subsurface threats.	E1, E2, E3, E6, E9, E10.	12	84	Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Torpedo Exercise—Helicopter.	Helicopter crews search for, track, and detect submarines. Recoverable air launched torpedoes are employed against submarine targets.	MFM, MFH, HFH, Broadband (MF to HF).	14	98	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Torpedo Exercise—Helicopter.	Helicopter crews search for, track, and detect submarines. Recoverable air launched torpedoes are employed against submarine targets.	MFM, MFH, HFH, Broadband (MF to HF).	4	28	Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Torpedo Exercise—Maritime Patrol Aircraft.	Maritime patrol aircraft crews search for, track, and detect submarines. Recoverable air launched torpedoes are employed against submarine targets.	MFM, HFH, Broadband (MF to HF).	14	98	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Torpedo Exercise—Maritime Patrol Aircraft.	Maritime patrol aircraft crews search for, track, and detect submarines. Recoverable air launched torpedoes are employed against submarine targets.	MFM, HFH, Broadband (MF to HF).	4	28	Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Torpedo Exercise—Ship.	Surface ship crews search for, track, and detect submarines. Exercise torpedoes are used during this exercise.	MF1, HFH, Broadband (MF to HF).	16	112	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Torpedo Exercise—Ship.	Surface ship crews search for, track, and detect submarines. Exercise torpedoes are used during this exercise.	MF1, HFH, Broadband (MF to HF).	5	35	Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Torpedo Exercise—Submarine.	Submarine crews search for, track, and detect submarines. Exercise torpedoes are used during this exercise.	HFH, Broadband (MF to HF).	12	84	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Torpedo Exercise—Submarine.	Submarine crews search for, track, and detect submarines. Exercise torpedoes are used during this exercise.	HFH, Broadband (MF to HF).	6	42	Northeast Range Complexes.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Torpedo Exercise—Submarine.	Submarine crews search for, track, and detect submarines. Exercise torpedoes are used during this exercise.	HFH, Broadband (MF to HF).	2	14	Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Helicopter.	Helicopter crews search for, track, and detect submarines.	MFM, MFH	3	21	Gulf Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Helicopter.	Helicopter crews search for, track, and detect submarines.	MFM, MFH	370	2,590	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Helicopter.	Helicopter crews search for, track, and detect submarines.	MFM, MFH	12	84	Navy Cherry Point Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Helicopter.	Helicopter crews search for, track, and detect submarines.	MFM, MFH	24	168	Other AFTT Areas.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Helicopter.	Helicopter crews search for, track, and detect submarines.	MFM, MFH	8	56	Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Maritime Patrol Aircraft.	Maritime patrol aircraft crews search for, track, and detect submarines.	LFM, LFH, MFM	475	3,325	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Maritime Patrol Aircraft.	Maritime patrol aircraft crews search for, track, and detect submarines.	LFM, LFH, MFM	35	245	Navy Cherry Point Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Maritime Patrol Aircraft.	Maritime patrol aircraft crews search for, track, and detect submarines.	LFM, LFH, MFM	80	560	Northeast Range Complexes.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Maritime Patrol Aircraft.	Maritime patrol aircraft crews search for, track, and detect submarines.	LFM, LFH, MFM	155	1,085	Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Ship.	Surface ship crews search for, track, and detect submarines. Exercise torpedoes may be used during this event.	MFH, MF1, MF1C, Broadband (MF to HF).	5	35	Gulf Range Complex.

TABLE 5—PROPOSED NAVY TRAINING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA—Continued

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Ship.	Surface ship crews search for, track, and detect submarines. Exercise torpedoes may be used during this event.	MFH, MF1, MF1C, Broadband (MF to HF).	290	2,030	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Ship.	Surface ship crews search for, track, and detect submarines. Exercise torpedoes may be used during this event.	MFH, MF1, MF1C, Broadband (MF to HF).	33	231	Navy Cherry Point Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Ship.	Surface ship crews search for, track, and detect submarines. Exercise torpedoes may be used during this event.	MFH, MF1, MF1C, Broadband (MF to HF).	5	35	Northeast Range Complexes.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Ship.	Surface ship crews search for, track, and detect submarines. Exercise torpedoes may be used during this event.	MFH, MF1, MF1C, Broadband (MF to HF).	55	385	Other AFTT Areas.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Ship.	Surface ship crews search for, track, and detect submarines. Exercise torpedoes may be used during this event.	MFH, MF1, MF1C, Broadband (MF to HF).	120	840	Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Submarine.	Submarine crews search for, track, and detect submarines.	LFH, MFH, HFH	13	91	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Submarine.	Submarine crews search for, track, and detect submarines.	LFH, MFH, HFH	1	7	Navy Cherry Point Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Submarine.	Submarine crews search for, track, and detect submarines.	LFH, MFH, HFH	18	126	Northeast Range Complexes.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Submarine.	Submarine crews search for, track, and detect submarines.	LFH, MFH, HFH	46	308	Other AFTT Areas.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Exercise—Submarine.	Submarine crews search for, track, and detect submarines.	LFH, MFH, HFH	6	42	Virginia Capes Range Complex.
Acoustic	Expeditionary Warfare	Port Damage Repair	Navy and Coast Guard Expeditionary forces train to repair critical port facilities.	Pile driving	4	28	Gulfport, MS.
Acoustic	Mine Warfare	Airborne Mine Countermeasures—Mine Detection.	Helicopter aircrew detect mines using towed or laser mine detection systems.	HFH	290	2,030	Gulf Range Complex.
Acoustic	Mine Warfare	Airborne Mine Countermeasures—Mine Detection.	Helicopter aircrew detect mines using towed or laser mine detection systems.	HFH	275	1,925	Jacksonville Range Complex.
Acoustic	Mine Warfare	Airborne Mine Countermeasures—Mine Detection.	Helicopter aircrew detect mines using towed or laser mine detection systems.	HFH	187	1,309	Key West Range Complex.
Acoustic	Mine Warfare	Airborne Mine Countermeasures—Mine Detection.	Helicopter aircrew detect mines using towed or laser mine detection systems.	HFH	321	2,247	Navy Cherry Point Range Complex.
Acoustic	Mine Warfare	Airborne Mine Countermeasures—Mine Detection.	Helicopter aircrew detect mines using towed or laser mine detection systems.	HFH	1,420	9,940	Virginia Capes Range Complex.
Acoustic	Mine Warfare	Civilian Port Defense—Homeland Security Anti-Terrorism/Force Protection Exercises.	Coast Guard and Navy Maritime security personnel train to protect civilian ports and harbors against enemy efforts to interfere with access to those ports.	MFH, HFM, HFH	0–1	4	Boston, MA; Beaumont, TX; Corpus Christi, TX; Delaware Bay, DE; Earle, NJ; Hampton Roads, VA; Kings Bay, GA; Mayport, FL; Morehead City, NC; Port Canaveral, FL; Savannah, GA; Tampa, FL; Wilmington, NC.

Acoustic and Explosive.	Mine Warfare	Mine Countermeasures—Mine Neutralization—Remotely Operated Vehicles.	Ship, small boat, and helicopter crews locate and disable mines using remotely operated underwater vehicles. All events include acoustic sources, only a fraction involve explosives.	HFM, E4	*66	*462	Gulf Range Complex.
Acoustic and Explosive.	Mine Warfare	Mine Countermeasures—Mine Neutralization—Remotely Operated Vehicles.	Ship, small boat, and helicopter crews locate and disable mines using remotely operated underwater vehicles. All events include acoustic sources, only a fraction involve explosives.	HFM, E4	36	252	Jacksonville Range Complex.
Acoustic and Explosive.	Mine Warfare	Mine Countermeasures—Mine Neutralization—Remotely Operated Vehicles.	Ship, small boat, and helicopter crews locate and disable mines using remotely operated underwater vehicles. All events include acoustic sources, only a fraction involve explosives.	HFM, E4	10	70	Key West Range Complex.
Acoustic and Explosive.	Mine Warfare	Mine Countermeasures—Mine Neutralization—Remotely Operated Vehicles.	Ship, small boat, and helicopter crews locate and disable mines using remotely operated underwater vehicles. All events include acoustic sources, only a fraction involve explosives.	HFM, E4	*36	*252	Navy Cherry Point Range Complex.
Acoustic and Explosive.	Mine Warfare	Mine Countermeasures—Mine Neutralization—Remotely Operated Vehicles.	Ship, small boat, and helicopter crews locate and disable mines using remotely operated underwater vehicles. All events include acoustic sources, only a fraction involve explosives.	HFM, E4	*315	*2,205	Virginia Capes Range Complex.
Acoustic	Mine Warfare	Mine Countermeasures—Ship Sonar.	Ship crews detect and avoid mines while navigating restricted areas or channels using active sonar.	HFH	22	*462	Gulf Range Complex.
Acoustic	Mine Warfare	Mine Countermeasures—Ship Sonar.	Ship crews detect and avoid mines while navigating restricted areas or channels using active sonar.	HFH	53	252	Jacksonville Range Complex.
Acoustic	Mine Warfare	Mine Countermeasures—Ship Sonar.	Ship crews detect and avoid mines while navigating restricted areas or channels using active sonar.	HFH	53	70	Virginia Capes Range Complex.
Explosive	Mine Warfare	Mine Neutralization Explosive Ordnance Disposal.	Personnel disable threat mines using explosive charges.	E6	*96	*672	Gulf Range Complex.
Explosive	Mine Warfare	Mine Neutralization Explosive Ordnance Disposal.	Personnel disable threat mines using explosive charges.	E5, E6	*100	*700	Jacksonville Range Complex.
Explosive	Mine Warfare	Mine Neutralization Explosive Ordnance Disposal.	Personnel disable threat mines using explosive charges.	E5, E6, E7	*30	*210	Key West Range Complex.
Explosive	Mine Warfare	Mine Neutralization Explosive Ordnance Disposal.	Personnel disable threat mines using explosive charges.	E5	*176	*1,232	Key West Range Complex Inshore.
Explosive	Mine Warfare	Mine Neutralization Explosive Ordnance Disposal.	Personnel disable threat mines using explosive charges.	E6	*86	*602	Navy Cherry Point Range Complex.
Explosive	Mine Warfare	Mine Neutralization Explosive Ordnance Disposal.	Personnel disable threat mines using explosive charges.	E5, E6, E7	*325	*2,275	Virginia Capes Range Complex.
Acoustic	Mine Warfare	Submarine Mine Laying	Submarine crews or UUVs deploy exercise mobile mines or mines.	MFM, HFL, HFM, VHFL.	2	14	Jacksonville Range Complex.
Acoustic	Mine Warfare	Surface Ship Object Detection.	Ship crews detect and avoid mines while navigating restricted areas or channels using active sonar.	MF1K	76	532	Jacksonville Range Complex.
Acoustic	Mine Warfare	Surface Ship Object Detection.	Ship crews detect and avoid mines while navigating restricted areas or channels using active sonar.	MF1K	162	1,134	Virginia Capes Range Complex.
Explosive	Surface Warfare	Bombing Exercise Air-to-Surface.	Fixed-wing aircrew deliver bombs against surface targets.	E9, E10	*47	*329	Gulf Range Complex.
Explosive	Surface Warfare	Bombing Exercise Air-to-Surface.	Fixed-wing aircrew deliver bombs against surface targets.	E9, E10	*260	1,820*	Jacksonville Range Complex.
Explosive	Surface Warfare	Bombing Exercise Air-to-Surface.	Fixed-wing aircrew deliver bombs against surface targets.	E9, E10, E12	*272	*1,904	Virginia Capes Range Complex.
Explosive	Surface Warfare	Gunnery Exercise Surface-to-Surface Boat Medium-Caliber.	Small boat crews fire medium-caliber guns at surface targets.	E1	*404	*2,828	Virginia Capes Range Complex.

TABLE 5—PROPOSED NAVY TRAINING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA—Continued

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Explosive	Surface Warfare	Gunnery Exercise Surface-to-Surface Ship Large-Caliber.	Surface ship crews fire large-caliber guns at surface targets.	E3, E5	*8	*56	Gulf Range Complex.
Explosive	Surface Warfare	Gunnery Exercise Surface-to-Surface Ship Large-Caliber.	Surface ship crews fire large-caliber guns at surface targets.	E3, E5	*46	*322	Jacksonville Range Complex.
Explosive	Surface Warfare	Gunnery Exercise Surface-to-Surface Ship Large-Caliber.	Surface ship crews fire large-caliber guns at surface targets.	E3, E5	*34	*238	Navy Cherry Point Range Complex.
Explosive	Surface Warfare	Gunnery Exercise Surface-to-Surface Ship Large-Caliber.	Surface ship crews fire large-caliber guns at surface targets.	E3, E5	*9	*63	Other AFTT Areas.
Explosive	Surface Warfare	Gunnery Exercise Surface-to-Surface Ship Large-Caliber.	Surface ship crews fire large-caliber guns at surface targets.	E3, E5	*63	*441	Virginia Capes Range Complex.
Explosive	Surface Warfare	Integrated Live Fire Exercise	Naval forces defend against a swarm of surface threats (ships or small boats) with bombs, missiles, rockets, and small-, medium- and large-caliber guns.	E10	2	14	Jacksonville Range Complex.
Explosive	Surface Warfare	Integrated Live Fire Exercise	Naval forces defend against a swarm of surface threats (ships or small boats) with bombs, missiles, rockets, and small-, medium- and large-caliber guns.	E10	2	14	Virginia Capes Range Complex.
Explosive	Surface Warfare	Missile Exercise Air-to-Surface—Rocket.	Helicopter aircrew fire both precision-guided and unguided rockets at surface targets.	E3	10	70	Gulf Range Complex.
Explosive	Surface Warfare	Missile Exercise Air-to-Surface—Rocket.	Helicopter aircrew fire both precision-guided and unguided rockets at surface targets.	E3	115	805	Jacksonville Range Complex.
Explosive	Surface Warfare	Missile Exercise Air-to-Surface—Rocket.	Helicopter aircrew fire both precision-guided and unguided rockets at surface targets.	E3	15	105	Navy Cherry Point Range Complex.
Explosive	Surface Warfare	Missile Exercise Air-to-Surface—Rocket.	Helicopter aircrew fire both precision-guided and unguided rockets at surface targets.	E3	100	700	Virginia Capes Range Complex.
Explosive	Surface Warfare	Missile Exercise Air-to-Surface.	Fixed-wing and helicopter aircrew fire air-to-surface missiles at surface targets.	E6, E8, E9	81	567	Jacksonville Range Complex.
Explosive	Surface Warfare	Missile Exercise Air-to-Surface.	Fixed-wing and helicopter aircrew fire air-to-surface missiles at surface targets.	E6	8	56	Key West Range Complex.
Explosive	Surface Warfare	Missile Exercise Air-to-Surface.	Fixed-wing and helicopter aircrew fire air-to-surface missiles at surface targets.	E6	72	504	Navy Cherry Point Range Complex.
Explosive	Surface Warfare	Missile Exercise Air-to-Surface.	Fixed-wing and helicopter aircrew fire air-to-surface missiles at surface targets.	E6, E8, E9	83	581	Virginia Capes Range Complex.
Explosive	Surface Warfare	Missile Exercise Surface-to-Surface.	Surface ship crews defend against surface threats (ships or small boats) and engage them with missiles.	E6, E9	19	133	Jacksonville Range Complex.
Explosive	Surface Warfare	Missile Exercise Surface-to-Surface.	Surface ship crews defend against surface threats (ships or small boats) and engage them with missiles.	E6, E9	15	105	Virginia Capes Range Complex.
Acoustic and Explosive.	Surface Warfare	Sinking Exercise	Aircraft, ship, cutter, and submarine crews deliberately sink a seaborne target, usually a decommissioned ship made environmentally safe for sinking according to U.S. Environmental Protection Agency standards, with a variety of ordnance.	HFH, E5, E8, E9, E11.	1	7	SINKEX Box.
Acoustic	Other Training Activities	Submarine Navigation	Submarine crews operate sonar for navigation and detection while transiting into and out of port during reduced visibility.	MFH	29	203	Jacksonville Range Complex.
Acoustic	Other Training Activities	Submarine Navigation	Submarine crews operate sonar for navigation and detection while transiting into and out of port during reduced visibility.	MFH	169	1,183	Northeast Range Complexes.

Acoustic	Other Training Activities	Submarine Navigation	Submarine crews operate sonar for navigation and detection while transiting into and out of port during reduced visibility.	MFH	84	588	Virginia Capes Range Complex, Virginia Capes Range Complex Inshore.
Acoustic	Other Training Activities	Submarine Sonar Maintenance and Systems Checks.	Maintenance of submarine sonar and other system checks are conducted pierside or at sea.	MFH	4	28	Jacksonville Range Complex.
Acoustic	Other Training Activities	Submarine Sonar Maintenance and Systems Checks.	Maintenance of submarine sonar and other system checks are conducted pierside or at sea.	MFH	2	14	Port Canaveral, FL.
Acoustic	Other Training Activities	Submarine Sonar Maintenance and Systems Checks.	Maintenance of submarine sonar and other system checks are conducted pierside or at sea.	MFH	2	14	NSB Kings Bay.
Acoustic	Other Training Activities	Submarine Sonar Maintenance and Systems Checks.	Maintenance of submarine sonar and other system checks are conducted pierside or at sea.	MFH	66	462	Northeast Range Complexes.
Acoustic	Other Training Activities	Submarine Sonar Maintenance and Systems Checks.	Maintenance of submarine sonar and other system checks are conducted pierside or at sea.	MFH	66	462	NSB New London.
Acoustic	Other Training Activities	Submarine Sonar Maintenance and Systems Checks.	Maintenance of submarine sonar and other system checks are conducted pierside or at sea.	MFH	12	84	Other AFTT Areas.
Acoustic	Other Training Activities	Submarine Sonar Maintenance and Systems Checks.	Maintenance of submarine sonar and other system checks are conducted pierside or at sea.	MFH	34	238	Virginia Capes Range Complex.
Acoustic	Other Training Activities	Submarine Sonar Maintenance and Systems Checks.	Maintenance of submarine sonar and other system checks are conducted pierside or at sea.	MFH	34	238	NS Norfolk.
Acoustic	Other Training Activities	Submarine Under Ice Certification.	Submarine crews operate sonar while transiting under ice. Ice conditions are simulated during training and certification events.	HFH	3	21	Jacksonville Range Complex.
Acoustic	Other Training Activities	Submarine Under Ice Certification.	Submarine crews operate sonar while transiting under ice. Ice conditions are simulated during training and certification events.	HFH	3	21	Navy Cherry Point Range Complex.
Acoustic	Other Training Activities	Submarine Under Ice Certification.	Submarine crews operate sonar while transiting under ice. Ice conditions are simulated during training and certification events.	HFH	9	63	Northeast Range Complexes.
Acoustic	Other Training Activities	Submarine Under Ice Certification.	Submarine crews operate sonar while transiting under ice. Ice conditions are simulated during training and certification events.	HFH	9	63	Virginia Capes Range Complex.
Acoustic	Other Training Activities	Surface Ship Sonar Maintenance and Systems Checks.	Maintenance of surface ship sonar and other system checks are conducted pierside or at sea.	MF1, MF1K	50	350	Jacksonville Range Complex.
Acoustic	Other Training Activities	Surface Ship Sonar Maintenance and Systems Checks.	Maintenance of surface ship sonar and other system checks are conducted pierside or at sea.	MF1, MF1K	50	350	NS Mayport.
Acoustic	Other Training Activities	Surface Ship Sonar Maintenance and Systems Checks.	Maintenance of surface ship sonar and other system checks are conducted pierside or at sea.	MF1, MF1K	120	840	Navy Cherry Point Range Complex.
Acoustic	Other Training Activities	Surface Ship Sonar Maintenance and Systems Checks.	Maintenance of surface ship sonar and other system checks are conducted pierside or at sea.	MF1, MF1K	175	1,225	NS Norfolk.
Acoustic	Other Training Activities	Surface Ship Sonar Maintenance and Systems Checks.	Maintenance of surface ship sonar and other system checks are conducted pierside or at sea.	MF1, MF1K	18	126	Other AFTT Areas.
Acoustic	Other Training Activities	Surface Ship Sonar Maintenance and Systems Checks.	Maintenance of surface ship sonar and other system checks are conducted pierside or at sea.	MF1, MF1K	175	1,225	Virginia Capes Range Complex.
Acoustic	Other Training Activities	Unmanned Underwater Vehicle Training—Certification and Development.	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads, for multiple purposes to ensure that the systems can be employed effectively in an operational environment.	MFH, HFL, HFM, VHFL, VHFM, VHFH, Broadband (MF to HF), Broadband (HF to VHF).	10	70	Gulf Range Complex.

TABLE 5—PROPOSED NAVY TRAINING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA—Continued

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Acoustic	Other Training Activities	Unmanned Underwater Vehicle Training—Certification and Development.	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads, for multiple purposes to ensure that the systems can be employed effectively in an operational environment.	MFH, HFL, HFM, VHFL, VHFM, VHFH, Broadband (MF to HF), Broadband (HF to VHF).	22	154	Jacksonville Range Complex.
Acoustic	Other Training Activities	Unmanned Underwater Vehicle Training—Certification and Development.	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads, for multiple purposes to ensure that the systems can be employed effectively in an operational environment.	MFH, HFL, HFM, VHFL, VHFM, VHFH, Broadband (MF to HF), Broadband (HF to VHF).	10	70	Navy Cherry Point Range Complex.
Acoustic	Other Training Activities	Unmanned Underwater Vehicle Training—Certification and Development.	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads, for multiple purposes to ensure that the systems can be employed effectively in an operational environment.	MFH, HFL, HFM, VHFL, VHFM, VHFH, Broadband (MF to HF), Broadband (HF to VHF).	12	84	Northeast Range Complexes.
Acoustic	Other Training Activities	Unmanned Underwater Vehicle Training—Certification and Development.	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads, for multiple purposes to ensure that the systems can be employed effectively in an operational environment.	MFH, HFL, HFM, VHFL, VHFM, VHFH, Broadband (MF to HF), Broadband (HF to VHF).	32	224	Virginia Capes Range Complex.
Acoustic	Other Training Activities	Unmanned Underwater Vehicle Training—Certification and Development.	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads, for multiple purposes to ensure that the systems can be employed effectively in an operational environment.	MFH, HFL, HFM, VHFL, VHFM, VHFH, Broadband (MF to HF), Broadband (HF to VHF).	21	147	Virginia Capes Range Complex Inshore.

Note: AFTT: Atlantic Fleet Training and Testing; DE: Delaware; FL: Florida; GA: Georgia; JEB: Joint Expeditionary Base; MA: Massachusetts; MS: Mississippi; NC: North Carolina; NJ: New Jersey; NS: Naval Station; NSB: Naval Submarine Base; SINKEX: Sinking Exercise; TX: Texas; VA: Virginia. The Gulf Range Complex includes geographically separated areas throughout the Gulf of America.

* Only a small subset of these activities include explosive ordnance.

TABLE 6—PROPOSED COAST GUARD TRAINING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Explosive	Surface Warfare	Gunnery Exercise Surface-to-Surface Ship Large-Caliber.	Surface ship crews fire large-caliber guns at surface targets.	E3	*29	203	Gulf Range complex.
Explosive	Surface Warfare	Gunnery Exercise Surface-to-Surface Ship Large-Caliber.	Surface ship crews fire large-caliber guns at surface targets.	E3	15	105	Jacksonville Range Complex.
Explosive	Surface Warfare	Gunnery Exercise Surface-to-Surface Ship Large-Caliber.	Surface ship crews fire large-caliber guns at surface targets.	E3	10	70	Navy Cherry Point Range Complex.
Explosive	Surface Warfare	Gunnery Exercise Surface-to-Surface Ship Large-Caliber.	Surface ship crews fire large-caliber guns at surface targets.	E3	*15	105	Northeast Range Complexes.

Explosive	Surface Warfare	Gunnery Exercise Surface-to-Surface Ship Large-Caliber.	Surface ship crews fire large-caliber guns at surface targets.	E3	*20	140	Virginia Capes Range Complex.
Acoustic	Surface Warfare	Unmanned Underwater Vehicle Training—Certification and Development.	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads, for multiple purposes to ensure that the systems can be employed effectively in an operational environment.	MFH, HFL, HFM, VHFL, VHFM, VHFH, Broadband (MF to HF), Broadband (HF to VHF).	10	70	Gulf Range Complex.
Acoustic	Surface Warfare	Unmanned Underwater Vehicle Training—Certification and Development.	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads, for multiple purposes to ensure that the systems can be employed effectively in an operational environment.	MFH, HFL, HFM, VHFL, VHFM, VHFH, Broadband (MF to HF), Broadband (HF to VHF).	10	70	Jacksonville Range Complex.
Acoustic	Surface Warfare	Unmanned Underwater Vehicle Training—Certification and Development.	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads, for multiple purposes to ensure that the systems can be employed effectively in an operational environment.	MFH, HFL, HFM, VHFL, VHFM, VHFH, Broadband (MF to HF), Broadband (HF to VHF).	10	70	Navy Cherry Point Range Complex.
Acoustic	Surface Warfare	Unmanned Underwater Vehicle Training—Certification and Development.	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads, for multiple purposes to ensure that the systems can be employed effectively in an operational environment.	MFH, HFL, HFM, VHFL, VHFM, VHFH, Broadband (MF to HF), Broadband (HF to VHF).	20	140	Virginia Capes Range Complex.
Acoustic	Surface Warfare	Unmanned Underwater Vehicle Training—Certification and Development.	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads, for multiple purposes to ensure that the systems can be employed effectively in an operational environment.	MFH, HFL, HFM, VHFL, VHFM, VHFH, Broadband (MF to HF), Broadband (HF to VHF).	20	140	Virginia Capes Range Complex Inshore.

Note: The Gulf Range Complex includes geographically separated areas throughout the Gulf of America.
* Only a small subset of these activities include explosive ordnance.

Overview of Testing Activities Within the Study Area

While this proposed rule includes an evaluation of proposed training activities by both the Navy and Coast Guard, all testing activities evaluated in this proposed rule would only be conducted by the Navy. The Navy's research and acquisition community engages in a broad spectrum of testing activities, some of which ultimately support both Action Proponents. These activities include, but are not limited to, basic and applied scientific research and technology development; testing, evaluation, and maintenance of systems (*e.g.,* missiles, radar, and sonar) and platforms (*e.g.,* surface ships, submarines, and aircraft); and acquisition of systems and platforms to support Navy missions and give a technological edge over adversaries. The individual commands within the research and acquisition community included in the application are Naval Air Systems Command (NAVAIR), Naval Sea Systems Command (NAVSEA), and the Office of Naval Research (ONR).

The Action Proponents operate in an ever-changing strategic, tactical, financially-constrained, and time-constrained environment. Testing activities occur in response to emerging science or fleet operational needs. For example, future Navy studies to develop a better understanding of ocean currents may be designed based on advancements made by non-government researchers not yet published in the scientific literature. Similarly, future but yet unknown Navy and Coast Guard operations within a specific geographic area may require development of modified Navy assets to address local conditions. Such modifications must be tested in the field to ensure they meet fleet needs and requirements. Accordingly, generic descriptions of some of these activities are the best that can be articulated in a long-term, comprehensive document.

Some testing activities are similar to training activities conducted by the fleet (*e.g.,* both the fleet and the research and acquisition community fire torpedoes). While the firing of a torpedo might look identical to an observer, the difference is in the purpose of the firing. The fleet might fire the torpedo to practice the procedures for such a firing, whereas the research and acquisition community might be assessing a new torpedo guidance technology or testing it to ensure the torpedo meets performance specifications and operational requirements.

NAVAIR testing activities support its mission to provide full life cycle support of naval aviation aircraft, weapons, and systems to be operated by the Navy and Coast Guard. NAVAIR activities closely follow Navy primary mission areas, such as the testing of airborne mine warfare and anti-submarine warfare weapons and systems. NAVAIR activities include, but are not limited to, the testing of new aircraft platforms, weapons, and systems that have not yet been integrated into the Navy fleet and Coast Guard. In addition to testing new platforms and weapon systems, most aircraft and weapon systems that have been integrated into the fleet also require follow-on testing throughout their lifecycle in conjunction with maintenance and upgrades, such as software revisions, to ensure that they function as designed. While these types of activities do not fall within one of the fleet primary mission areas, most NAVAIR testing activities can be easily correlated to fleet training activities. Some testing activities may be conducted in different locations and in a different manner than similar fleet training activities and, therefore, the analysis for those events and the potential environmental effects may differ. Table 7 summarizes the proposed testing activities for NAVAIR analyzed within the AFTT Study Area.

TABLE 7—PROPOSED NAVAIR TESTING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Test (Fixed-Wing).	The test evaluates the sensors and systems used by fixed-wing aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.	LFM, LFH, MFM, HFM.	15	105	Gulf Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Test (Fixed-Wing).	The test evaluates the sensors and systems used by fixed-wing aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.	LFM, LFH, MFM, HFM.	19	133	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Test (Fixed-Wing).	The test evaluates the sensors and systems used by fixed-wing aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.	LFM, LFH, MFM, HFM.	12	84	Key West Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Test (Fixed-Wing).	The test evaluates the sensors and systems used by fixed-wing aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.	LFM, LFH, MFM, HFM.	15	105	Navy Cherry Point Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Test (Fixed-Wing).	The test evaluates the sensors and systems used by fixed-wing aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.	LFM, LFH, MFM, HFM.	45	315	Northeast Range Complexes.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Test (Fixed-Wing).	The test evaluates the sensors and systems used by fixed-wing aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.	LFM, LFH, MFM, HFM.	25	175	SINKEX Box.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Test (Fixed-Wing).	The test evaluates the sensors and systems used by fixed-wing aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.	LFM, LFH, MFM, HFM.	25	175	Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Torpedo Test.	This event is similar to the training event torpedo exercise. Test evaluates anti-submarine warfare systems onboard rotary-wing and fixed-wing aircraft and the ability to search for, detect, classify, localize, track, and attack a submarine or similar target.	HFH	20–43	209	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Torpedo Test.	This event is similar to the training event torpedo exercise. Test evaluates anti-submarine warfare systems onboard rotary-wing and fixed-wing aircraft and the ability to search for, detect, classify, localize, track, and attack a submarine or similar target.	HFH	40–121	523	Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Test (Rotary-Wing).	This event is similar to the training event anti-submarine tracking exercise–helicopter. The test evaluates the sensors and systems used to detect and track submarines and to ensure that helicopter systems used to deploy the tracking systems perform to specifications.	MFM, MFH	6	42	Gulf Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Test (Rotary-Wing).	This event is similar to the training event anti-submarine tracking exercise–helicopter. The test evaluates the sensors and systems used to detect and track submarines and to ensure that helicopter systems used to deploy the tracking systems perform to specifications.	MFM, MFH	23	161	Jacksonville Range Complex.

TABLE 7—PROPOSED NAVAIR TESTING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA—Continued

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Test (Rotary-Wing).	This event is similar to the training event anti-submarine tracking exercise–helicopter. The test evaluates the sensors and systems used to detect and track submarines and to ensure that helicopter systems used to deploy the tracking systems perform to specifications.	MFM, MFH	27	189	Key West Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Test (Rotary-Wing).	This event is similar to the training event anti-submarine tracking exercise–helicopter. The test evaluates the sensors and systems used to detect and track submarines and to ensure that helicopter systems used to deploy the tracking systems perform to specifications.	MFM, MFH	110	770	Northeast Range Complexes.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Tracking Test (Rotary-Wing).	This event is similar to the training event anti-submarine tracking exercise–helicopter. The test evaluates the sensors and systems used to detect and track submarines and to ensure that helicopter systems used to deploy the tracking systems perform to specifications.	MFM, MFH	280	1,960	Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Kilo Dip Test	Functional check of a helicopter deployed dipping sonar system prior to conducting a testing or training event using the dipping sonar system.	MFH	6	42	Gulf Range Complex.
Acoustic	Anti-Submarine Warfare	Kilo Dip Test	Functional check of a helicopter deployed dipping sonar system prior to conducting a testing or training event using the dipping sonar system.	MFH	6	42	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Kilo Dip Test	Functional check of a helicopter deployed dipping sonar system prior to conducting a testing or training event using the dipping sonar system.	MFH	6	42	Key West Range Complex.
Acoustic	Anti-Submarine Warfare	Kilo Dip Test	Functional check of a helicopter deployed dipping sonar system prior to conducting a testing or training event using the dipping sonar system.	MFH	4	28	Northeast Range Complexes.
Acoustic	Anti-Submarine Warfare	Kilo Dip Test	Functional check of a helicopter deployed dipping sonar system prior to conducting a testing or training event using the dipping sonar system.	MFH	40	280	Virginia Capes Range Complex.
Acoustic and Explosive.	Anti-Submarine Warfare	Sonobuoy Lot Acceptance Test.	Sonobuoys are deployed from surface vessels and aircraft to verify the integrity and performance of a lot or group of sonobuoys in advance of delivery to the fleet for operational use.	LFM, LFH, MFM, HFM E1, E3.	* 186	* 1,302	Key West Range Complex.
Acoustic	Mine Warfare	Airborne Dipping Sonar Minehunting Test.	A mine-hunting dipping sonar system that is deployed from a helicopter and uses high-frequency sonar for the detection and classification of bottom and moored mines.	HFH	32	224	NSWC Panama City Testing Range.
Acoustic	Mine Warfare	Airborne Dipping Sonar Minehunting Test.	A mine-hunting dipping sonar system that is deployed from a helicopter and uses high-frequency sonar for the detection and classification of bottom and moored mines.	HFH	40	280	Virginia Capes Range Complex.
Explosive	Mine Warfare	Airborne Mine Neutralization System Test.	A test of the airborne mine neutralization system evaluates the system's ability to detect and destroy mines from an airborne mine countermeasures capable helicopter. The airborne mine neutralization system uses up to four unmanned underwater vehicles equipped with high-frequency sonar, video cameras, and explosive and non-explosive neutralizers.	E4	* 27	* 189	NSWC Panama City Testing Range.

Explosive	Mine Warfare	Airborne Mine Neutralization System Test.	A test of the airborne mine neutralization system evaluates the system's ability to detect and destroy mines from an airborne mine countermeasures capable helicopter. The airborne mine neutralization system uses up to four unmanned underwater vehicles equipped with high-frequency sonar, video cameras, and explosive and non-explosive neutralizers.	E4	*25	*175	Virginia Capes Range Complex.
Acoustic	Mine Warfare	Airborne Minehunting Test—Sonobuoy.	A mine-hunting system made up of sonobuoys is deployed from a helicopter. A field of sonobuoys, using high-frequency sonar, is used for detection and classification of bottom and moored mines.	MFM	26	182	NSWC Panama City Testing Range.
Acoustic	Mine Warfare	Airborne Minehunting Test—Sonobuoy.	A mine-hunting system made up of sonobuoys is deployed from a helicopter. A field of sonobuoys, using high-frequency sonar, is used for detection and classification of bottom and moored mines.	MFM	12	84	Virginia Capes Range Complex.
Explosive	Surface Warfare	Air-to-Surface Gunnery Test	This event is similar to the training event gunnery exercise air-to-surface. Fixed-wing and rotary-wing aircrew evaluate new or enhanced aircraft guns against surface maritime targets to test that the gun, gun ammunition, or associated systems meet required specifications or to train aircrew in the operation of a new or enhanced weapons system.	E1	55	385	Jacksonville Range Complex.
Explosive	Surface Warfare	Air-to-Surface Gunnery Test	This event is similar to the training event gunnery exercise air-to-surface. Fixed-wing and rotary-wing aircrew evaluate new or enhanced aircraft guns against surface maritime targets to test that the gun, gun ammunition, or associated systems meet required specifications or to train aircrew in the operation of a new or enhanced weapons system.	E1	140	980	Virginia Capes Range Complex.
Explosive	Surface Warfare	Air-to-Surface Missile Test	This event is similar to the training event missile exercise air-to-surface. Test may involve both fixed-wing and rotary-wing aircraft launching missiles at surface maritime targets to evaluate the weapons system or as part of another systems integration test.	E9	5	35	Gulf Range Complex.
Explosive	Surface Warfare	Air-to-Surface Missile Test	This event is similar to the training event missile exercise air-to-surface. Test may involve both fixed-wing and rotary-wing aircraft launching missiles at surface maritime targets to evaluate the weapons system or as part of another systems integration test.	E6	*29	*203	Jacksonville Range Complex.
Explosive	Surface Warfare	Air-to-Surface Missile Test	This event is similar to the training event missile exercise air-to-surface. Test may involve both fixed-wing and rotary-wing aircraft launching missiles at surface maritime targets to evaluate the weapons system or as part of another systems integration test.	E6	*117	*819	Virginia Capes Range Complex.
Explosive	Surface Warfare	Rocket Test	Rocket tests are conducted to evaluate the integration, accuracy, performance, and safe separation of guided and unguided 2.75-inch rockets fired from a hovering or forward flying helicopter or tilt rotor aircraft.	E3	19	133	Jacksonville Range Complex.
Explosive	Surface Warfare	Rocket Test	Rocket tests are conducted to evaluate the integration, accuracy, performance, and safe separation of guided and unguided 2.75-inch rockets fired from a hovering or forward flying helicopter or tilt rotor aircraft.	E3	*35	*245	Virginia Capes Range Complex.

TABLE 7—PROPOSED NAVAIR TESTING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA—Continued

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Acoustic	Other Testing Activities	Undersea Range System Test	Following installation of a Navy underwater warfare training and testing range, tests of the nodes (components of the range) will be conducted to include node surveys and testing of node transmission functionality.	MFM, HFM	4–20	76	Jacksonville Range Complex.

Note: NAVAIR: Naval Air Systems Command; NSWC: Naval Surface Warfare Center. The Gulf Range Complex includes geographically separated areas throughout the Gulf of America.
* Only a small subset of these activities include explosive ordnance.

NAVSEA activities are aligned with its mission of new ship construction, life cycle management, and weapon systems development. NAVSEA activities include pierside and at-sea testing of vessel systems, including sonar, acoustic countermeasures, radars, launch systems, weapons, unmanned systems, and radio equipment; tests to determine how the vessel or Coast Guard Cutter performs at sea (sea trials); developmental and operational test and evaluation programs for new technologies and systems; and testing on all vessels and systems that have undergone overhaul or maintenance. In the application, pierside testing at Navy contractor shipyards would consist only of system testing. At-sea test firing of shipboard weapon systems, including guns, torpedoes, and missiles, is also conducted. Testing activities are conducted throughout the life of a vessel, from construction to verification of performance and mission capabilities, and further to deactivation from the fleet. Table 8 summarizes the proposed testing activities for the NAVSEA analyzed within the AFTT Study Area.

One ship of each new class (or major upgrade) of combat ships constructed for the Navy typically undergoes an at-sea ship shock trial. A ship shock trial consists of a series of underwater detonations that send shock waves through the ship's hull to simulate near misses during combat. A shock trial allows the Navy to assess the survivability of the hull and ship's systems in a combat environment as well as the capability of the ship to protect the crew.

TABLE 8—PROPOSED NAVSEA TESTING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Mission Package Testing.	Ships and their supporting platforms (*e.g.,* rotary-wing aircraft and unmanned aerial systems) detect, localize, and prosecute submarines.	MFH, MF1	1–2	11	Gulf Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Mission Package Testing.	Ships and their supporting platforms (*e.g.,* rotary-wing aircraft and unmanned aerial systems) detect, localize, and prosecute submarines.	MFH, MF1	2	14	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Anti-Submarine Warfare Mission Package Testing.	Ships and their supporting platforms (*e.g.,* rotary-wing aircraft and unmanned aerial systems) detect, localize, and prosecute submarines.	MFH, MF1	1–2	11	Northeast Range Complexes.
Acoustic	Anti-Submarine Warfare	At-Sea Sonar Testing	At-sea testing to ensure systems are fully functional in an open ocean environment.	MFL, MFM, MFH, MF1, MF1K, HFL, HFM, HFH, Broadband (LF to HF), Broadband (LF to MF), Broadband (MF to HF).	7–9	49	Gulf Range Complex; Jacksonville Range Complex; Navy Cherry Point Range Complex; Northeast Range Complexes; SFOMF; Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	At-Sea Sonar Testing	At-sea testing to ensure systems are fully functional in an open ocean environment.	MFL, MFM, MFH, MF1, MF1K, HFL, HFM, HFH, Broadband (LF to HF), Broadband (LF to MF), Broadband (MF to HF).	7–14	77	Gulf Range Complex.
Acoustic	Anti-Submarine Warfare	At-Sea Sonar Testing	At-sea testing to ensure systems are fully functional in an open ocean environment.	MFL, MFM, MFH, MF1, MF1K, HFL, HFM, HFH, Broadband (LF to HF), Broadband (LF to MF), Broadband (MF to HF).	4	28	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	At-Sea Sonar Testing	At-sea testing to ensure systems are fully functional in an open ocean environment.	MFL, MFM, MFH, MF1, MF1K, HFL, HFM, HFH, Broadband (LF to HF), Broadband (LF to MF), Broadband (MF to HF).	2	14	Navy Cherry Point Range Complex.
Acoustic	Anti-Submarine Warfare	At-Sea Sonar Testing	At-sea testing to ensure systems are fully functional in an open ocean environment.	MFL, MFM, MFH, MF1, MF1K, HFL, HFM, HFH, Broadband (LF to HF), Broadband (LF to MF), Broadband (MF to HF).	8–15	84	Northeast Range Complexes.

Acoustic	Anti-Submarine Warfare	At-Sea Sonar Testing	At-sea testing to ensure systems are fully functional in an open ocean environment.	MFL, MFM, MFH, MF1, MF1K, HFL, HFM, HFH, Broadband (LF to HF), Broadband (LF to MF), Broadband (MF to HF).	16–22	58	Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	At-Sea Sonar Testing	At-sea testing to ensure systems are fully functional in an open ocean environment.	MFL, MFM, MFH, MF1, MF1K, HFL, HFM, HFH, Broadband (LF to HF), Broadband (LF to MF), Broadband (MF to HF).	2	14	SFOMF.
Acoustic	Anti-Submarine Warfare	Pierside Sonar Testing	Pierside testing to ensure systems are fully functional in a controlled pierside environment prior to at-sea test activities and complete any required troubleshooting.	MFM, MFH, HFM, HFH, Broadband (MF to HF).	5–10	64	NSB New London; Gulf Range Complex Inshore; Jacksonville Range Complex; NSB Kings Bay; Newport, RI; NS Norfolk; Northeast Range Complexes; Port Canaveral, FL; Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Pierside Sonar Testing	Pierside testing to ensure systems are fully functional in a controlled pierside environment prior to at-sea test activities and complete any required troubleshooting.	MFM, MFH, HFM, HFH, Broadband (MF to HF).	10–20	110	Bath, ME.
Acoustic	Anti-Submarine Warfare	Pierside Sonar Testing	Pierside testing to ensure systems are fully functional in a controlled pierside environment prior to at-sea test activities and complete any required troubleshooting.	MFM, MFH, HFM, HFH, Broadband (MF to HF).	10–18	94	NS Mayport.
Acoustic	Anti-Submarine Warfare	Pierside Sonar Testing	Pierside testing to ensure systems are fully functional in a controlled pierside environment prior to at-sea test activities and complete any required troubleshooting.	MFM, MFH, HFM, HFH, Broadband (MF to HF).	63–84	455	NS Norfolk.
Acoustic	Anti-Submarine Warfare	Pierside Sonar Testing	Pierside testing to ensure systems are fully functional in a controlled pierside environment prior to at-sea test activities and complete any required troubleshooting.	MFM, MFH, HFM, HFH, Broadband (MF to HF).	10–20	110	Pascagoula, MS.
Acoustic	Anti-Submarine Warfare	Pierside Sonar Testing	Pierside testing to ensure systems are fully functional in a controlled pierside environment prior to at-sea test activities and complete any required troubleshooting.	MFM, MFH, HFM, HFH, Broadband (MF to HF).	16–24	152	Portsmouth Naval Shipyard.
Acoustic	Anti-Submarine Warfare	Surface Ship Sonar Testing/ Maintenance.	Pierside and at-sea testing of ship systems occurs periodically following major maintenance periods and for routine maintenance.	LFL, MFM, MF1, MF1K, Broadband (MF to HF).	1	7	Jacksonville Range Complex.
Acoustic	Anti-Submarine Warfare	Surface Ship Sonar Testing/ Maintenance.	Pierside and at-sea testing of ship systems occurs periodically following major maintenance periods and for routine maintenance.	LFL, MFM, MF1, MF1K, Broadband (MF to HF).	4	28	Virginia Capes Range Complex.
Acoustic and Explosive.	Anti-Submarine Warfare	Torpedo (Explosive) Testing	Air, surface, or submarine crews employ explosive and non-explosive torpedoes against artificial targets.	MFM, MFH, MF1, HFH, Broadband (MF to HF), E8, E11.	1–5	17	Gulf Range Complex; Jacksonville Range Complex; Key West Range Complex; Navy Cherry Point Range Complex; Northeast Range Complexes; Virginia Capes Range Complex.

TABLE 8—PROPOSED NAVSEA TESTING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA—Continued

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Acoustic	Anti-Submarine Warfare	Torpedo (Non-Explosive) Testing.	Air, surface, or submarine crews employ non-explosive torpedoes against targets, submarines, or surface vessels.	MFL, MFM, MFH, MF1, HFM, HFH, VHFH, Broadband (LF to HF), Broadband (MF to HF).	13–17	82	Gulf Range Complex; Jacksonville Range Complex; Key West Range Complex; Navy Cherry Point Range Complex; Northeast Range Complexes; SFOMF; Virginia Capes Range Complex.
Acoustic	Anti-Submarine Warfare	Torpedo (Non-Explosive) Testing.	Air, surface, or submarine crews employ non-explosive torpedoes against targets, submarines, or surface vessels.	MFL, MFM, MFH, MF1, HFM, HFH, VHFH, Broadband (LF to HF), Broadband (MF to HF).	30	210	NUWC Newport Testing Range.
Explosive	Mine Warfare	Mine Countermeasure and Neutralization Testing.	Air, surface, and subsurface vessels neutralize threat mines and mine-like objects.	E4	18–45	315	Gulf Range Complex.
Explosive	Mine Warfare	Mine Countermeasure and Neutralization Testing.	Air, surface, and subsurface vessels neutralize threat mines and mine-like objects.	E4	*24–48	*288	Virginia Capes Range Complex.
Acoustic	Mine Warfare	Mine Countermeasure Mission Package Testing.	Vessels and associated aircraft conduct mine countermeasure operations.	MFH, HFM, HFH	15	105	Gulf Range Complex.
Acoustic	Mine Warfare	Mine Countermeasure Mission Package Testing.	Vessels and associated aircraft conduct mine countermeasure operations.	MFH, HFM, HFH	8	56	Jacksonville Range Complex.
Acoustic	Mine Warfare	Mine Countermeasure Mission Package Testing.	Vessels and associated aircraft conduct mine countermeasure operations.	MFH, HFM, HFH	11	77	NSWC Panama City Testing Range.
Acoustic	Mine Warfare	Mine Countermeasure Mission Package Testing.	Vessels and associated aircraft conduct mine countermeasure operations.	MFH, HFM, HFH	2	14	SFOMF.
Acoustic	Mine Warfare	Mine Countermeasure Mission Package Testing.	Vessels and associated aircraft conduct mine countermeasure operations.	MFH, HFM, HFH	3	21	Virginia Capes Range Complex.
Acoustic	Mine Warfare	Mine Detection and Classification Testing.	Air, surface, and subsurface vessels and systems detect and classify mines and mine-like objects. Vessels also assess their potential susceptibility to mines and mine-like objects.	HFH	0–1	1	Jacksonville Range Complex, NSWC Panama City Testing Range, Port Canaveral, FL.
Acoustic	Mine Warfare	Mine Detection and Classification Testing.	Air, surface, and subsurface vessels and systems detect and classify mines and mine-like objects. Vessels also assess their potential susceptibility to mines and mine-like objects.	HFH	0–1	4	Jacksonville Range Complex.
Acoustic	Mine Warfare	Mine Detection and Classification Testing.	Air, surface, and subsurface vessels and systems detect and classify mines and mine-like objects. Vessels also assess their potential susceptibility to mines and mine-like objects.	HFH	286–287	2,005	NSWC Panama City Testing Range.
Acoustic and Explosive.	Acoustic and Oceanographic Science and Technology.	Acoustic and Oceanographic Research.	Research using active transmissions from sources deployed from ships, aircraft, and unmanned underwater vehicles. Research sources can be used as proxies for current and future Navy systems.	LFM, Broadband (LF to HF), E7.	0–1	1	Gulf Range Complex; Jacksonville Range Complex; Key West Range Complex.
Acoustic	Other Testing Activities	Acoustic and Oceanographic Research.	Research using active transmissions from sources deployed from ships, aircraft, and unmanned underwater vehicles. Research sources can be used as proxies for current and future Navy systems.	LFM, Broadband (LF to HF).	3	21	Northeast Range Complexes.
Acoustic and Explosive.	Other Testing Activities	Acoustic and Oceanographic Research.	Research using active transmissions from sources deployed from ships, aircraft, and unmanned underwater vehicles. Research sources can be used as proxies for current and future Navy systems.	LFM, Broadband (LF to HF), E7.	*0–1	*3	Key West Range Complex.

Acoustic	Other Testing Activities	Acoustic and Oceanographic Research.	Research using active transmissions from sources deployed from ships, aircraft, and unmanned underwater vehicles. Research sources can be used as proxies for current and future Navy systems.	LFM, Broadband (LF to HF).	0–1	2	Other AFTT Areas.
Acoustic	Other Testing Activities	Acoustic Component Testing	Various surface vessels, moored equipment, and materials are tested to evaluate performance in the marine environment.	LFL, MFL, MFH, HFM, HFH, VHFH, Broadband (LF to HF), Broadband (MF to HF).	33	231	SFOMF.
Acoustic	Other Testing Activities	Acoustic Component Testing	Various surface vessels, moored equipment, and materials are tested to evaluate performance in the marine environment.	LFL, MFL, MFH, HFM, HFH, VHFH, Broadband (LF to HF), Broadband (MF to HF).	1	7	Jacksonville Range Complex.
Acoustic	Other Testing Activities	Countermeasure Testing	Countermeasure testing involves the testing of systems that will detect, localize, track, and engage incoming weapons, including marine vessel targets and airborne missiles. Testing includes surface ship torpedo defense systems, marine vessel stopping payloads, and airborne decoys against air targets.	MFM, MFH, HFH, VHFH, Broadband (LF to HF), Broadband (MF to HF).	16–20	116	Gulf Range Complex; Jacksonville Range Complex; Key West Range Complex; Navy Cherry Point Range Complex; Northeast Range Complexes; Virginia Capes Range Complex; JEB Little Creek Fort Story.
Acoustic	Other Testing Activities	Countermeasure Testing	Countermeasure testing involves the testing of systems that will detect, localize, track, and engage incoming weapons, including marine vessel targets and airborne missiles. Testing includes surface ship torpedo defense systems, marine vessel stopping payloads, and airborne decoys against air targets.	MFM, MFH, HFH, VHFH, Broadband (LF to HF), Broadband (MF to HF).	8–10	63	Gulf Range Complex.
Acoustic	Other Testing Activities	Countermeasure Testing	Countermeasure testing involves the testing of systems that will detect, localize, track, and engage incoming weapons, including marine vessel targets and airborne missiles. Testing includes surface ship torpedo defense systems, marine vessel stopping payloads, and airborne decoys against air targets.	MFM, MFH, HFH, VHFH, Broadband (LF to HF), Broadband (MF to HF).	6	42	NUWC Newport Testing Range.
Acoustic	Other Testing Activities	Countermeasure Testing	Countermeasure testing involves the testing of systems that will detect, localize, track, and engage incoming weapons, including marine vessel targets and airborne missiles. Testing includes surface ship torpedo defense systems, marine vessel stopping payloads, and airborne decoys against air targets.	MFM, MFH, HFH, VHFH, Broadband (LF to HF), Broadband (MF to HF).	6–10	13	Virginia Capes Range Complex.
Acoustic	Other Testing Activities	Insertion/Extraction	Testing of submersibles capable of inserting and extracting personnel and payloads into denied areas from strategic distances.	LFH, HFM, Broadband (LF to MF).	501–502	3,514	Key West Range Complex; NSWC Panama City Testing Range.
Explosive	Other Testing Activities	Line Charge Testing	Surface vessels deploy line charges to test the capability to safely clear an area for expeditionary forces.	E4	4	28	NSWC Panama City Testing Range.
Acoustic and Explosive.	Other Testing Activities	Semi-Stationary Equipment Testing.	Semi-stationary equipment (*e.g.,* hydrophones) is deployed to determine functionality.	AG230, HFH, HFM, Broadband (LF), Broadband (LF to HF), Broadband (MF to HF), MFM, VHFH, VHFM, E4.	*8–14	*74	NSB New London;NS Mayport; NS Norfolk; Port Canaveral, FL; Virginia Capes Range Complex Inshore; Key West Range Complex Inshore.

TABLE 8—PROPOSED NAVSEA TESTING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA—Continued

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Acoustic and Explosive.	Other Testing Activities	Semi-Stationary Equipment Testing.	Semi-stationary equipment (*e.g.*, hydrophones) is deployed to determine functionality.	AG230, HFH, HFM, Broadband (LF), Broadband (LF to HF), Broadband (MF to HF), MFM, VHFH, VHFM, E4.	4	28	Newport, RI.
Acoustic and Explosive.	Other Testing Activities	Semi-Stationary Equipment Testing.	Semi-stationary equipment (*e.g.*, hydrophones) is deployed to determine functionality.	AG230, HFH, HFM, Broadband (LF), Broadband (LF to HF), Broadband (MF to HF), MFM, VHFH, VHFM, E4.	30	210	NSWC Panama City Testing Range.
Acoustic and Explosive.	Other Testing Activities	Semi-Stationary Equipment Testing.	Semi-stationary equipment (*e.g.*, hydrophones) is deployed to determine functionality.	AG230, HFH, HFM, Broadband (LF), Broadband (LF to HF), Broadband (MF to HF), MFM, VHFH, VHFM, E4.	*155–173	*1,139	NUWC Newport Testing Range.
Acoustic	Other Testing Activities	Towed Equipment Testing	Surface vessels or unmanned surface vehicles deploy and tow equipment to determine functionality of towed systems.	MFM, Broadband (LF).	43–49	319	NUWC Newport Testing Range.
Explosive	Surface Warfare	Gun Testing—Large-Caliber	Surface crews test large-caliber guns to defend against surface targets. Demonstration of large-caliber guns including the MK 45 5-inch gun and MK 41 Vertical Launch Systems using surface to air missiles.	E3, E5	*1–15	*20	Jacksonville Range Complex; Virginia Capes Range Complex.
Explosive	Surface Warfare	Gun Testing—Large-Caliber	Surface crews test large-caliber guns to defend against surface targets. Demonstration of large-caliber guns including the MK 45 5-inch gun and MK 41 Vertical Launch Systems using surface to air missiles.	E3, E5	1–2	11	Gulf Range Complex.
Explosive	Surface Warfare	Gun Testing—Large-Caliber	Surface crews test large-caliber guns to defend against surface targets. Demonstration of large-caliber guns including the MK 45 5-inch gun and MK 41 Vertical Launch Systems using surface to air missiles.	E3, E5	*2–4	*23	Jacksonville Range Complex.
Explosive	Surface Warfare	Gun Testing—Large-Caliber	Surface crews test large-caliber guns to defend against surface targets. Demonstration of large-caliber guns including the MK 45 5-inch gun and MK 41 Vertical Launch Systems using surface to air missiles.	E3, E5	1–2	11	Northeast Range Complexes.
Explosive	Surface Warfare	Gun Testing—Large-Caliber	Surface crews test large-caliber guns to defend against surface targets. Demonstration of large-caliber guns including the MK 45 5-inch gun and MK 41 Vertical Launch Systems using surface to air missiles.	E3, E5	*15	*105	NSWC Panama City Testing Range.

Explosive	Surface Warfare	Missile and Rocket Testing	Missile and rocket testing includes various missiles or rockets fired from submarines and surface combatants. Testing of the launching system and ship defense is performed.	E6, E7, E8, E10	*6–18	*49	Gulf Range Complex; Jacksonville Range Complex; Navy Cherry Point Range Complex; Virginia Capes Range Complex.
Explosive	Surface Warfare	Missile and Rocket Testing	Missile and rocket testing includes various missiles or rockets fired from submarines and surface combatants. Testing of the launching system and ship defense is performed.	E6, E7, E8, E10	*20–30	*78	Virginia Capes Range Complex.
Acoustic	Unmanned Systems	Unmanned Underwater Vehicle Testing.	Testing involves the production or upgrade of unmanned underwater vehicles. This may include testing of mine detection capabilities, evaluating the basic functions of individual platforms, or complex events with multiple vehicles.	LFL, MFL, MFM, MFH, HFM, HFH, VHFH, Broadband (LF to HF), Broadband (MF to HF).	208–209	1,459	NSWC Panama City Testing Range.
Acoustic	Unmanned Systems	Unmanned Underwater Vehicle Testing.	Testing involves the production or upgrade of unmanned underwater vehicles. This may include testing of mine detection capabilities, evaluating the basic functions of individual platforms, or complex events with multiple vehicles.	LFL, MFL, MFM, MFH, HFM, HFH, VHFH, Broadband (LF to HF), Broadband (MF to HF).	138	966	NUWC Newport Testing Range.
Acoustic	Unmanned Systems	Unmanned Underwater Vehicle Testing.	Testing involves the production or upgrade of unmanned underwater vehicles. This may include testing of mine detection capabilities, evaluating the basic functions of individual platforms, or complex events with multiple vehicles.	LFL, MFL, MFM, MFH, HFM, HFH, VHFH, Broadband (LF to HF), Broadband (MF to HF).	1	7	SFOMF.
Acoustic	Vessel Evaluation	In-Port Maintenance Testing	Each combat system is tested to ensure they are functioning in a technically acceptable manner and are operationally ready to support at-sea testing.	MF1	2	4	NS Mayport; NS Norfolk.
Acoustic	Vessel Evaluation	In-Port Maintenance Testing	Each combat system is tested to ensure they are functioning in a technically acceptable manner and are operationally ready to support at-sea testing.	MF1	2	14	NS Mayport.
Acoustic	Vessel Evaluation	In-Port Maintenance Testing	Each combat system is tested to ensure they are functioning in a technically acceptable manner and are operationally ready to support at-sea testing.	MF1	4	28	NS Norfolk.
Acoustic	Vessel Evaluation	Signature Analysis Operations.	Surface ship and submarine testing of electromagnetic, acoustic, optical, and radar signature measurements.	LFM, LFH, MFM, HFM, Broadband (LF).	0–1	4	Hampton Roads, VA.
Acoustic	Vessel Evaluation	Signature Analysis Operations.	Surface ship and submarine testing of electromagnetic, acoustic, optical, and radar signature measurements.	LFM, LFH, MFM, HFM, Broadband (LF).	79–94	579	SFOMF.
Explosive	Vessel Evaluation	Small Ship Shock Trial	Underwater detonations are used to test new ships or major upgrades.	E16	0–2	5	Jacksonville Range Complex; Gulf Range Complex.
Acoustic	Vessel Evaluation	Submarine Sea Trials—Weapons System Testing.	Submarine weapons and sonar systems are tested at-sea to meet the integrated combat system certification requirements.	MFL, MFH, HFM, HFH, Broadband (LF to HF).	3–7	22	Gulf Range Complex; Jacksonville Range Complex; NSB Kings Bay; Northeast Range Complexes; Port Canaveral, FL; Virginia Capes Range Complex.
Acoustic	Vessel Evaluation	Submarine Sea Trials—Weapons System Testing.	Submarine weapons and sonar systems are tested at-sea to meet the integrated combat system certification requirements.	MFL, MFH, HFM, HFH, Broadband (LF to HF).	2–4	28	Northeast Range Complexes.
Acoustic	Vessel Evaluation	Submarine Sea Trials—Weapons System Testing.	Submarine weapons and sonar systems are tested at-sea to meet the integrated combat system certification requirements.	MFL, MFH, HFM, HFH, Broadband (LF to HF).	1	6	Northeast Range Complexes Inshore.

TABLE 8—PROPOSED NAVSEA TESTING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA—Continued

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Acoustic	Vessel Evaluation	Submarine Sea Trials—Weapons System Testing.	Submarine weapons and sonar systems are tested at-sea to meet the integrated combat system certification requirements.	MFL, MFH, HFM, HFH, Broadband (LF to HF).	2–4	28	Virginia Capes Range Complex.
Acoustic and Explosive.	Vessel Evaluation	Surface Warfare Testing	Tests the capabilities of shipboard sensors to detect, track, and engage surface targets. Testing may include ships defending against surface targets using explosive and non-explosive rounds, gun system structural test firing and demonstration of the response to Call for Fire against land-based targets (simulated by sea-based locations).	HFH, E3, E5, E6, E7, E8.	*17–76	*206	Jacksonville Range Complex; Virginia Capes Range Complex.
Acoustic	Vessel Evaluation	Surface Warfare Testing	Tests the capabilities of shipboard sensors to detect, track, and engage surface targets. Testing may include ships defending against surface targets using non-explosive rounds, gun system structural test firing and demonstration of the response to Call for Fire against land-based targets (simulated by sea-based locations).	HFH	0–2	6	Gulf Range Complex.
Acoustic and Explosive.	Vessel Evaluation	Surface Warfare Testing	Tests the capabilities of shipboard sensors to detect, track, and engage surface targets. Testing may include ships defending against surface targets using explosive and non-explosive rounds, gun system structural test firing and demonstration of the response to Call for Fire against land-based targets (simulated by sea-based locations).	HFH, E3, E5, E6, E7, E8.	*4–6	*37	Jacksonville Range Complex.
Acoustic and Explosive.	Vessel Evaluation	Surface Warfare Testing	Tests the capabilities of shipboard sensors to detect, track, and engage surface targets. Testing may include ships defending against surface targets using explosive and non-explosive rounds, gun system structural test firing and demonstration of the response to Call for Fire against land-based targets (simulated by sea-based locations).	HFH, E3, E5, E6, E7, E8.	*5–7	*42	Virginia Capes Range Complex.
Acoustic and Explosive.	Vessel Evaluation	Undersea Warfare Testing	Ships demonstrate capability of countermeasure systems and underwater surveillance, weapons engagement and communications systems. This tests ships ability to detect, track, and engage undersea targets.	MFM, MFH, MF1, HFM, HFH, Broadband (LF to HF), E4.	6–24	105	Jacksonville Range Complex; Navy Cherry Point Range Complex; Northeast Range Complexes; SFOMF; Virginia Capes Range Complex.
Acoustic and Explosive.	Vessel Evaluation	Undersea Warfare Testing	Ships demonstrate capability of countermeasure systems and underwater surveillance, weapons engagement and communications systems. This tests ships ability to detect, track, and engage undersea targets.	MFM, MFH, MF1, HFM, HFH, Broadband (LF to HF), E4.	*4–6	*30	Jacksonville Range Complex.
Acoustic	Vessel Evaluation	Vessel Signature Evaluation	Surface ship, submarine, and auxiliary system signature assessments. This may include electronic, radar, acoustic, infrared and magnetic signatures.	MFM, HFM, HFH	1–4	9	Jacksonville Range Complex; Virginia Capes Range Complex.
Acoustic	Vessel Evaluation	Vessel Signature Evaluation	Surface ship, submarine, and auxiliary system signature assessments. This may include electronic, radar, acoustic, infrared and magnetic signatures.	MFM, HFM, HFH	0–1	2	Gulf Range Complex.
Acoustic	Vessel Evaluation	Vessel Signature Evaluation	Surface ship, submarine, and auxiliary system signature assessments. This may include electronic, radar, acoustic, infrared and magnetic signatures.	MFM, HFM, HFH	1–3	6	Hampton Roads, VA.

Acoustic	Vessel Evaluation	Vessel Signature Evaluation	Surface ship, submarine, and auxiliary system signature assessments. This may include electronic, radar, acoustic, infrared and magnetic signatures.	MFM, HFM, HFH	0–1	3	NUWC Newport Testing Range.
Acoustic	Vessel Evaluation	Vessel Signature Evaluation	Surface ship, submarine, and auxiliary system signature assessments. This may include electronic, radar, acoustic, infrared and magnetic signatures.	MFM, HFM, HFH	0–1	3	SFOMF.
Acoustic	Vessel Evaluation	Vessel Signature Evaluation	Surface ship, submarine, and auxiliary system signature assessments. This may include electronic, radar, acoustic, infrared and magnetic signatures.	MFM, HFM, HFH	0–1	4	Virginia Capes Range Complex.

Note: FL: Florida; GA: Georgia; JEB: Joint Expeditionary Base; LA: Louisiana; MS: Mississippi; NS: Naval Station; NSB: Naval Submarine Base; NSWC: Naval Surface Warfare Center; NUWC: Naval Undersea Warfare Center; RI: Rhode Island; SFOMF: South Florida Ocean Measurement Facility; VA: Virginia. The Gulf Range Complex and Gulf Range Complex Inshore includes geographically separated areas throughout the Gulf of America.

* Only a small subset of these activities include explosive ordnance.

The ONR, as the Department of the Navy's science and technology provider, provides technology solutions for Navy and Marine Corps needs. The ONR's mission, defined by law, is to plan, foster, and encourage scientific research in recognition of its paramount importance as related to the maintenance of future naval power and the preservation of national security. The ONR manages the Navy's basic, applied, and advanced research to foster transition from science and technology to higher levels of research, development, test, and evaluation. The ONR is also a parent organization for the Naval Research Laboratory, which operates as the Navy's corporate research laboratory and conducts a broad multidisciplinary program of scientific research and advanced technological development. Testing activities conducted by the ONR and the Naval Research Laboratory include activities such as acoustic and oceanographic research, UUV research, and next generation mine countermeasures research. Table 9 summarizes the proposed testing activities for the ONR analyzed within the AFTT Study Area.

TABLE 9—PROPOSED ONR TESTING ACTIVITIES ANALYZED WITHIN THE AFTT STUDY AREA

Stressor category	Activity type	Activity name	Description	Source bin	Number of activities 1-year	Number of activities 7-year	Location
Acoustic and Explosive.	Acoustic and Oceanographic Science and Technology.	Acoustic and Oceanographic Research.	Research using active transmissions from sources deployed from ships, aircraft, and unmanned vehicles. Research sources can be used as proxies for current and future Navy systems.	LFM, LFH, MFM, MFH, HFM, HFH, E1, E3, 3S3, AG232.	* 12–15	* 93	Gulf Range Complex; Jacksonville Range Complex; Northeast Range Complexes; Virginia Capes Range Complex.
Acoustic	Acoustic and Oceanographic Science and Technology.	Mine Countermeasure Technology Research.	Test involves the use of broadband acoustic sources on unmanned underwater vehicles.	MFH	4–5	35	Gulf Range Complex; Jacksonville Range Complex; Northeast Range Complexes; Virginia Capes Range Complex.

Note: The Gulf Range Complex includes geographically separated areas throughout the Gulf of America.
* Only a small subset of these activities include explosive ordnance.

Vessel Movement

Vessels used as part of the proposed activities include both surface and sub-surface operations of both manned and unmanned vessels (USVs, UUVs). Navy vessels include ships, submarines, and boats ranging in size from small, 22 ft (7 m) rigid hull inflatable boats to aircraft carriers with lengths up to 1,092 ft (333 m). Unmanned systems may include vehicles ranging from 4–16 ft (1.2–4.9 m) but typical size of USVs is 36–328 ft (11–100 m), while UUVs are 33–98 ft (10–30 m) in length. The Marine Corps operates small boats from 10–50 ft (3–15.2 m) in length and include small unit riverine craft, rigid hull inflatable boats and amphibious combat vehicles. Coast Guard vessels range in size from small boats between 13 and 65 ft (3.9 to 19.8 m) to large cutters with lengths up to 418 ft (127.4 m).

Large ships greater than 65 ft (19.8 m) generally operate at speeds in the range of 10 to 15 knots (kn; 18.5 to 27.8 km per hour (km/hr)) for fuel conservation. Submarines generally operate at lower speeds in transit and even lower speeds for certain tactical maneuvers. Small craft (considered in this proposed rule to be less than 60 ft (18 m) in length) have much more variable speeds (dependent on the mission). While these speeds are representative of most events, some vessels need to temporarily operate outside of these parameters. For example, to produce the required relative wind speed over the flight deck, an aircraft carrier vessel group engaged in flight operations must adjust its speed through the water accordingly. Conversely, there are other instances such as launch and recovery of a small rigid hull inflatable boat, vessel boarding, search and seizure training events, or retrieval of a target when vessels will be stopped or moving slowly ahead to maintain steerage. Additionally, there are specific events including high speed tests of newly constructed vessels. High speed ferries may also be used to support Navy testing in Narragansett Bay.

The number of vessels used in the Study Area varies based on military readiness requirements, deployment schedules, annual budgets, and other unpredictable factors. Most military readiness activities involve the use of vessels. These activities could be widely dispersed throughout the Study Area, but would typically be conducted near naval ports, piers, and range areas. Activities involving vessel movements occur intermittently and are variable in duration, ranging from a few hours to multiple weeks.

Action Proponent vessel traffic would be concentrated near Naval Station Norfolk in Norfolk, Virginia and Naval Station Mayport in Jacksonville, Florida. There is no seasonal differentiation in vessel use. Large vessel movement primarily occurs with the majority of the traffic flowing between the installations and the OPAREAs and/or testing and training ranges. Support craft would be more concentrated in the coastal waters in the areas of naval installations, ports, and ranges.

The number of testing activities that include the use of vessels is around 12 percent lower than the number of training activities, but testing activities are more likely to include the use of larger unmanned vessels. In addition, testing often occurs jointly with a training event so it is likely that the testing activity would be conducted from a vessel that was also conducting a training activity. Vessel movement in conjunction with testing activities could occur throughout the Study Area, but would typically be conducted near naval ports, piers, and within range complexes.

Additionally, a variety of smaller craft will be operated within the Study Area. Small craft types, sizes, and speeds vary. During military readiness activities, speeds generally range from 10 to 14 kn (18.5 to 25.9 km/hr); however, vessels can and will, on occasion, operate within the entire spectrum of their specific operational capabilities. In all cases, the vessels/craft will be operated in a safe manner consistent with the local conditions.

Foreign Navies

Foreign militaries may participate in U.S. Navy training or testing activities in the AFTT Study Area. The Navy does not consider these foreign military activities as part of the ‘‘specified activity’’ under the MMPA, and NMFS defers to the applicant to describe the scope of its request for an authorization.

The participation of foreign navies varies from year to year but overall is infrequent compared with Navy's total training and testing activities. When foreign militaries are participating in a U.S. Navy-led exercise or event, foreign military use of sonar and explosives, when combined with the U.S. Navy's use of sonar and explosives, would not result in exceedance of the analyzed levels (within each Navy Acoustic Effects Model (NAEMO) modeled sonar and explosive bin) used for estimating predicted impacts, which formed the basis of our acoustic impacts effects analysis that was used to estimate take in this proposed rule. Please see the *Proposed Mitigation Measures* section and *Proposed Reporting* section of this proposed rule for information about mitigation and reporting related to foreign navy activities in the AFTT Study Area.

Standard Operating Procedures

For training and testing to be effective, Action Proponent personnel must be able to safely use their sensors, platforms, weapons, and other devices to their optimum capabilities and as intended for use in missions and combat operations. The Action Proponents have developed standard operating procedures through decades of experience to provide for safety and mission success. Because they are essential to safety and mission success, standard operating procedures are part of the Proposed Action and are considered in the environmental analysis for applicable resources (see chapter 3 (Affected Environment and Environmental Consequences) of the 2024 AFTT Draft Supplemental EIS/OEIS). Standard operating procedures recognized as providing a benefit to public safety or environmental resources are described in appendix A (Activity Descriptions) of the 2024 AFTT Draft Supplemental EIS/OEIS. While standard operating procedures are designed for the safety of personnel and equipment and to ensure the success of training and testing activities, their implementation often yields additional benefits on environmental, socioeconomic, public health and safety, and cultural resources.

Because standard operating procedures are essential to safety and mission success, the Action Proponents consider them to be part of the proposed activities and have included them in the environmental analysis. Standard operating procedures that are recognized as providing a potential secondary benefit on marine mammals during training and testing activities are noted below.

(i) Vessel safety;
(ii) Weapons firing safety;
(iii) Target deployment safety;
(iv) Towed in-water device safety;
(v) Pile driving safety; and
(vi) Coastal zones.

Standard operating procedures (which are implemented regardless of their secondary benefits) are different from mitigation measures (which are designed entirely for the purpose of avoiding or reducing impacts). Information on mitigation measures is provided in the Proposed Mitigation Measures section below. Additional information on standard operating procedures is discussed in more detail in appendix A (Activity Descriptions) of the 2024 AFTT Draft Supplemental EIS/OEIS.

Description of Stressors

The Action Proponents use a variety of sensors, platforms, weapons, and other devices, and military readiness activities using these systems may introduce sound and energy into the environment. The proposed military readiness activities were evaluated to identify specific components that would act as stressors by having direct or indirect impacts on marine mammals and their habitat. This analysis included identification of the spatial variation of the identified stressors. The following subsections describe the acoustic and explosive stressors for marine mammals and their habitat within the AFTT Study Area. Each description contains a list of activities that may generate the stressor. Stressor/resource interactions that were determined to have negligible (as defined for the purposes of the NEPA analyses) or impacts that do not rise to the level of take under the MMPA (*i.e.,* vessel, aircraft, or weapons noise) were not carried forward for analysis in the application. NMFS reviewed the Action Proponents' analysis and conclusions on *de minimis* sources (*i.e.,* those that are not likely to result in the take of marine mammals) and finds them complete and supportable (see section 3.7.4 of the technical report ''Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing'' (U.S. Department of the Navy, 2024)).

Acoustic Stressors

Acoustic stressors include acoustic signals emitted into the water for a specific purpose, such as sonar, other transducers (devices that convert energy from one form to another—in this case, into sound waves), and air guns, as well as incidental sources of broadband sound produced as a byproduct of vessel movement, aircraft transits, use of weapons or other deployed objects, vibratory pile extraction, and vibratory and impact pile driving. Explosives also produce broadband sound but are characterized separately from other acoustic sources due to their unique hazardous characteristics. Characteristics of each of these sound sources are described in the following sections.

To better organize and facilitate the analysis of approximately 300 sources of underwater sound used for training and testing by the Action Proponents, including sonars and other transducers, air guns, and explosives, a series of source classifications, or source bins, were used. The acoustic source classification bins do not include the broadband noise produced incidental to pile driving, vessel and aircraft transits, and weapons firing. Noise produced from vessel, aircraft, and weapons firing activities are not carried forward because those activities were found to have *de minimis* or no acoustic impacts, as stated above. Of note, the source bins used in this analysis have been revised from previous (Phase III) acoustic modeling to more efficiently group similar sources and use the parameters of the bin for propagation, making a comparison to previous bins impossible in most cases as some sources are modeled at different propagation parameters. For example, in previous analyses, non-impulsive narrowband sound sources were grouped into bins that were defined by their acoustic properties (*i.e.,* frequency, source level, beam pattern, duty cycle) or, in some cases, their purpose or application. In the current analysis, these sources are binned based only on their acoustic properties and not on their purpose or application. As such, sources that previously fell into a single ''purpose-based'' bin now, in many cases, fall into multiple bins while sources with similar acoustic parameters that were previously sorted into separate bins due to different purposes now share a bin. Therefore, the acoustic source bins used in the current analysis do not represent a one-for-one replacement with previous bins, making direct comparison not possible in most cases.

The use of source classification bins provides the following benefits:

(i) Allows new sensors or munitions to be used under existing authorizations as long as those sources fall within the parameters of a ''bin'';

(ii) Improves efficiency of source utilization data collection and reporting requirements anticipated under the MMPA authorizations;

(iii) Ensures that impacts are not underestimated, as all sources within a given class are modeled as the most impactful source (highest source level, longest duty cycle, or largest net explosive weight) within that bin;

(iv) Allows analyses to be conducted in a more efficient manner, without any compromise of analytical results; and

(v) Provides a framework to support the reallocation of source usage (hours/explosives) between different source bins, as long as the total numbers of takes remain within the overall analyzed and authorized limits. This flexibility is required to support evolving training and testing requirements, which are linked to real world events.

Sonar and Other Transducers—

Active sonar and other transducers emit non-impulsive sound waves into the water to detect objects, navigate safely, and communicate. Passive sonars differ from active sound sources in that they do not emit acoustic signals; rather, they only receive acoustic information about the environment, or listen. In this proposed rule, the terms sonar and other transducers will be used to indicate active sound sources unless otherwise specified.

The Action Proponents employ a variety of sonars and other transducers to obtain and transmit information about the undersea environment. Some examples are mid-frequency hull-mounted sonars used to find and track enemy submarines; high-frequency small object detection sonars used to detect mines; high-frequency underwater modems used to transfer data over short ranges; and extremely high-frequency (greater than 200 kilohertz (kHz)) Doppler sonars used for navigation, like those used on commercial and private vessels. The characteristics of these sonars and other transducers, such as source level (SL), beam width, directivity, and frequency, depend on the purpose of the source. Higher frequencies can carry more information or provide more information about objects off which they reflect, but attenuate more rapidly. Lower frequencies attenuate less rapidly, so they may detect objects over a longer distance, but with less detail.

Propagation of sound produced underwater is highly dependent on environmental characteristics such as bathymetry, seafloor type, water depth, temperature, and salinity. The sound received at a particular location will be different than near the source due to the interaction of many factors, including propagation loss; how the sound is reflected, refracted, or scattered; the potential for reverberation; and interference due to multi-path propagation. In addition, absorption greatly affects the distance over which higher-frequency sounds propagate. The effects of these factors are explained in appendix D (Acoustic and Explosive Impacts Supporting Information) of the 2024 AFTT Draft Supplemental EIS/OEIS. Because of the complexity of analyzing sound propagation in the ocean environment, the Action Proponents rely on acoustic models in their environmental analyses that consider sound source characteristics and varying ocean conditions across the AFTT Study Area. For additional information on how propagation is accounted for, see the technical report

''Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing'' (U.S. Navy, 2024).

The sound sources and platforms typically used in military readiness activities analyzed in the application are described in appendix A (Activity Descriptions) of the 2024 AFTT Draft Supplemental EIS/OEIS. Sonars and other transducers used to obtain and transmit information underwater during military readiness activities generally fall into several categories of use described below.

Anti-Submarine Warfare

Sonar used during anti-submarine warfare training and testing would impart the greatest amount of acoustic energy of any category of sonar and other transducers analyzed in this proposed rule. Types of sonars used to detect potential enemy vessels include hull-mounted, towed, line array, sonobuoy, helicopter dipping, and torpedo sonars. In addition, acoustic targets and decoys (countermeasures) may be deployed to emulate the sound signatures of vessels or repeat received signals.

Most anti-submarine warfare sonars are mid-frequency (1–10 kHz) because mid-frequency sound balances sufficient resolution to identify targets with distance over which threats can be identified. However, some sources may use higher or lower frequencies. Duty cycles can vary widely, from rarely used to continuously active. Anti-submarine warfare sonars can be wide-ranging in a search mode or highly directional in a track mode.

Most anti-submarine warfare activities involving submarines or submarine targets would occur in waters greater than 600 ft (182.9 m) deep due to safety concerns about running aground at shallower depths. Sonars used for anti-submarine warfare activities would typically be used beyond 12 nmi (22.2 km) from shore. Exceptions include use of dipping sonar by helicopters, pierside testing and maintenance of systems while in port, and system checks while transiting to or from port.

Mine Warfare, Object Detection, and Imaging

Sonars used to locate mines and other small objects, as well as those used in imaging (*e.g.,* for hull inspections or imaging of the seafloor), are typically high-frequency or very high-frequency. Higher frequencies allow for greater resolution and, due to their greater attenuation, are most effective over shorter distances. Mine detection sonar can be deployed (towed or vessel hull-mounted) at variable depths on moving platforms (ships, helicopters, or unmanned vehicles) to sweep a suspected mined area. Hull-mounted anti-submarine sonars can also be used in an object detection mode known as ''Kingfisher'' mode. Sonars used for imaging are usually used in close proximity to the area of interest, such as pointing downward near the seafloor.

Mine detection sonar use would be concentrated in areas where practice mines are deployed, typically in water depths less than 200 ft (60.9 m), and at established training or testing minefields or temporary minefields close to strategic ports and harbors. Kingfisher mode on vessels is most likely to be used when transiting to and from port. Sound sources used for imaging would be used throughout the AFTT Study Area.

Navigation and Safety

Similar to commercial and private vessels, the Action Proponents' vessels employ navigational acoustic devices, including speed logs, Doppler sonars for ship positioning, and fathometers. These may be in use at any time for safe vessel operation. These sources are typically highly directional to obtain specific navigational data.

Communication

Sound sources used to transmit data (such as underwater modems), provide location (pingers), or send a single brief release signal to seafloor-mounted devices (acoustic release) may be used throughout the AFTT Study Area. These sources typically have low duty cycles and are usually only used when it is necessary to send a detectable acoustic message.

Classification of Sonar and Other Transducers

Sonars and other transducers are grouped into bins based on their acoustic properties. Sonars and other transducers are now grouped into bins based on the frequency or bandwidth, source level, duty-cycle, and three-dimensional beam coverage. Unless stated otherwise, a reference distance of decibel (dB) microPascal (µPa) at 1 m (3.3 ft) is used for sonar and other transducers.

(i) Frequency of the non-impulsive acoustic source:

a. Low-frequency sources operate below 1 kHz;

b. Mid-frequency sources operate at or above 1 kHz, up to and including 10 kHz;

c. High-frequency sources operate above 10 kHz, up to and including 100 kHz; and

d. Very high-frequency sources operate above 100 kHz but below 200 kHz.

(ii) Sound pressure level (SPL):

a. Greater than 160 dB referenced to 1 microPascal (re 1 µPa), but less than 185 dB re 1 µPa;

b. Equal to 185 dB re 1 µPa and up to 205 dB re 1 µPa; and

c. Greater than 205 dB re 1 µPa.

Active sonar and other transducer use that was quantitatively analyzed in the Study Area are shown in table 10.

TABLE 10—SONAR AND OTHER TRANSDUCERS QUANTITATIVELY ANALYZED IN THE AFTT STUDY AREA

Source type	Source category	Description	Unit	Navy training annual	Navy training 7-year total	Coast Guard training annual	Coast Guard training 7-year total	Navy testing annual	Navy testing 7-year total
Broadband	LF	<205 dB	H	-	-	-	-	206–252	1,580
Broadband	LF to MF	<205 dB	H	-	-	-	-	1,501–1,503	10,519
Broadband	LF to HF	<205 dB	C	-	-	-	-	791–1,020	5,101
Broadband	LF to HF	<205 dB	H	-	-	-	-	2,367–2,571	16,356
Broadband	MF to HF	<205 dB	C	133	931	-	-	-	-
Broadband	MF to HF	<205 dB	H	935–951	6,595	280	1,960	2,749–2,950	19,308
Broadband	HF to VHF	<205 dB	H	10	70	-	-	-	-
Low-frequency acoustic.	LFL	160 dB to 185 dB	H	-	-	-	-	1,969	13,783
Low-frequency acoustic.	LFM	185 dB to 205 dB	C	-	-	-	-	360	2,520
Low-frequency acoustic.	LFM	185 dB to 205 dB	H	746	5,219	-	-	5,386–6,106	39,862
Low-frequency acoustic.	LFH	>205 dB	C	1,920–2,020	13,760	-	-	6,078–6,084	42,588

TABLE 10—SONAR AND OTHER TRANSDUCERS QUANTITATIVELY ANALYZED IN THE AFTT STUDY AREA—Continued

Source type	Source category	Description	Unit	Navy training annual	Navy training 7-year total	Coast Guard training annual	Coast Guard training 7-year total	Navy testing annual	Navy testing 7-year total
Low-frequency acoustic.	LFH	>205 dB	H	144	1,008	-	-	414–479	3,101
Mid-frequency acoustic.	MFL	160 dB to 185 dB	H	-	-	-	-	3,238–3,582	22,336
Mid-frequency acoustic.	MFM	185 dB to 205 dB	C	6,825–6,964	48,196	-	-	16,017–16,040	111,849
Mid-frequency acoustic.	MFM	185 dB to 205 dB	H	2	14	-	-	3,081–3,509	23,012
Mid-frequency acoustic.	MFH	>205 dB	H	2,343–2,466	16,794	-	-	7,203–7,943	52,542
High-frequency acoustic.	HFL	160 dB to 185 dB	H	169	1,183	-	-	96	672
High-frequency acoustic.	HFM	185 dB to 205 dB	C	-	-	-	-	860–1,660	8,420
High-frequency acoustic.	HFM	185 dB to 205 dB	H	1,253–1,255	8,777	210	1,470	4,125–4,489	29,941
High-frequency acoustic.	HFH	>205 dB	C	138	966	-	-	1,621–1,858	11,684
High-frequency acoustic.	HFH	>205 dB	H	3,892–3,940	27,436	-	-	3,779–4,580	28,383
Very high-frequency acoustic.	VHFL	160 dB to 185 dB	H	12	84	-	-	-	-
Very high-frequency acoustic.	VHFM	185 dB to 205 dB	H	918	6,426	-	-	120	840
Very high-frequency acoustic.	VHFH	>205 dB	C	-	-	-	-	69–103	520
Very high-frequency acoustic.	VHFH	>205 dB	H	579	4,051	140	980	5,584	−39,088
Hull-mounted surface ship sonar.	MF1C	Hull-mounted surface ship sonar with duty cycle >80% (previously MF11).	H	661–722	4,811	-	-	1,139	7,974
Hull-mounted surface ship sonar.	MF1K	Hull-mounted surface ship sonar in Kingfisher mode.	H	280	1,957	-	-	108	759
Hull-mounted surface ship sonar.	MF1	Hull-mounted surface ship sonar.	H	3,498–3,870	25,602	-	-	1,102–1,390	8,464

Note: < = less than, C = count, dB = decibel, H = hours; - = not applicable.

Air Guns—

Air guns are essentially stainless steel tubes charged with high-pressure air via a compressor. An impulsive sound is generated when the air is almost instantaneously released into the surrounding water. Small air guns with capacities up to 60 cubic inches (in^3) would be used during testing activities in various offshore areas in the AFTT Study Area.

Generated impulses would have short durations, typically a few hundred milliseconds, with dominant frequencies below 1 kHz. The root-mean-square (RMS) SPL and peak pressure (SPL peak) at a distance 1 m (3.3 ft) from the air gun would be approximately 215 dB re 1 μPa and 227 dB re 1 μPa, respectively, if operated at the full capacity of 60 in^3. The size of the air gun chamber can be adjusted, which would result in lower SPLs and sound exposure level (SEL) per shot. The air gun and non-explosive impulsive sources that were quantitatively analyzed in the Study Area are shown in table 11.

TABLE 11—TESTING AIR GUN AND NON-EXPLOSIVE IMPULSIVE SOURCES QUANTITATIVELY ANALYZED IN THE AFTT STUDY AREA

Source class category	Description	Unit	Testing annual	Testing 7-year total
NEI	Non-explosive impulsive	C	192–240	1,488
AG	Air gun	C	4,400–5,400	33,800

Note: C: count.

Pile Driving—

Impact and vibratory pile driving and extraction would occur during Expeditionary Warfare, Port Damage Repair training in Gulfport, MS. The pile driving method, pile type and size, and assumptions for acoustic impact analysis are presented in table 12. This training activity would occur up to four times per year. Training events are typically 5 days each, for a total of 20 days per year. The training would involve the installation and extraction of 27-inch (0.69 m) steel sheets, installation of timber or plastic round 16-inch (0.41 m) piles using impact (impulsive) and vibratory (non-impulsive) methods, and the extraction of timber or plastic round 16-inch piles. When training events are complete, all piles and sheets are extracted using vibratory or dead pull methods. Crews would extract up to 12 piles in a 24-hour period.

TABLE 12—PORT DAMAGE REPAIR TRAINING PILES QUANTITATIVELY ANALYZED AND ASSOCIATED UNDERWATER SOUND LEVELS

Method	Pile size and type	Number of piles annual	Number of piles 7-year total	Peak SPL (dB re 1 µPa)	SEL (single strike; dB re 1 µPa2 ·s)	RMS SPL (dB re 1 µPa)	Reference
Impact	16-inch timber or plastic round.	80	560	180	160	170	Caltrans (2020)—Ballena Isle Marina.
Vibratory	16-inch timber or plastic round.	160	1,120			162	Caltrans (2020)—Norfolk Naval Station.
Vibratory	27-inch steel sheet	240	1,680			159	Naval Facilities Engineering Command Southwest (2020).

Note: Impact method is for installation only.

Only one hammer would be used at any given point in time; there would not be any instances where multiple piles would be driven simultaneously. All piles and sheets would be extracted using the vibratory hammer. Timber or plastic piles would also be extracted using a dead pull method.

Impact pile driving would involve the use of an impact hammer with both it and the pile held in place by a crane. When the pile driving starts, the hammer part of the mechanism is raised up and allowed to fall, transferring energy to the top of the pile. The pile is thereby driven into the sediment by a repeated series of these hammer blows. Each blow results in an impulsive sound emanating from the length of the pile into the water column as well as from the bottom of the pile through the sediment. Broadband impulsive signals are produced by impact pile driving methods, with most of the acoustic energy concentrated below 1,000 hertz (Hz) (Hildebrand, 2009). For the purposes of this analysis, the Action Proponents assume the impact pile driver would generally operate on average 60 strikes per pile.

Vibratory installation and extraction would involve the use of a vibratory hammer suspended from the crane and attached to the top of a pile. The pile is then vibrated by hydraulic motors rotating eccentric weights in the mechanism, causing a rapid up and down vibration in the pile, driving the pile into the sediment. During extraction, the vibration causes the sediment particles in contact with the pile to lose frictional grip on the pile. The crane slowly lifts the vibratory driver and pile until the pile is free of the sediment. In some cases, the crane may be able to lift the pile and vibratory driver without vibrations from the driver (dead pull), in which case no noise would be introduced into the water. Vibratory driving and extraction create broadband, continuous, non-impulsive noise at low source levels, for a short duration with most of the energy dominated by lower frequencies. Port Damage Repair training would occur in shallow water, and sound would be transmitted on direct paths through the water, be reflected at the water surface or bottom, or travel through seafloor substrate. Soft substrates such as sand would absorb or attenuate the sound more readily than hard substrates (rock), which may reflect the acoustic wave. The predicted sound levels produced by pile driving by method, pile size, and type for Port Damage Repair training are presented in table 12.

In addition to underwater noise, the installation and extraction of piles also results in airborne noise in the environment, denoted dBA. dBA is an A-weighted decibel level that represents the relative loudness of sounds as perceived by the human ear. A-weighting gives more value to frequencies in the middle of human hearing and less value to frequencies at the edges as compared to a flat or unweighted decibel level. Impact pile driving creates in-air impulsive sound about 100 dBA re 20 µPa at a range of 15 m for 24-inch (0.61 m) steel piles (Illingworth and Rodkin, 2016). During vibratory extraction, the three aspects that generate airborne noise are the crane, the power plant, and the vibratory extractor. The average sound level recorded in air during vibratory extraction was about 85 dBA re 20 µPa (94 dB re 20 µPa) within a range of 32.8–49.2 ft (10–15 m) (Illingworth and Rodkin, 2015).

Explosive Stressors

This section describes the characteristics of explosions during military readiness activities. The activities analyzed in the application that use explosives are described in appendix A (Activity Descriptions) of the 2024 AFTT Draft Supplemental EIS/OEIS, and terminology and metrics used when describing explosives in the application are in appendix D (Acoustic and Explosive Impacts Supporting Information) of the 2024 AFTT Draft Supplemental EIS/OEIS.

The near-instantaneous rise from ambient to an extremely high peak pressure is what makes an explosive shock wave potentially damaging. Farther from an explosive, the peak pressures decay and the explosive waves propagate as an impulsive, broadband sound. Several parameters influence the effect of an explosive: the weight of the explosive warhead, the type of explosive material, the boundaries and characteristics of the propagation medium, and the detonation depth in water. The net explosive weight (NEW), the explosive power of a charge expressed as the equivalent weight of trinitrotoluene (commonly referred to as TNT), accounts for the first two parameters.

Explosions in Water—

Explosive detonations during military readiness activities are associated with high-explosive munitions, including, but not limited to bombs, missiles, rockets, naval gun shells, torpedoes, mines, demolition charges, and explosive sonobuoys. Explosive detonations during military readiness activities involving the use of high-explosive munitions, including bombs, missiles, and naval gun shells, would occur in the air or near the water's surface. Explosive detonations associated with torpedoes and explosive sonobuoys would occur in the water column; mines and demolition charges would be detonated in the water column or on the ocean floor. The Coast Guard usage of explosives is limited to medium- and large-caliber munitions used during gunnery exercises. Most detonations would occur in waters greater than 200 ft (60.9 m) in depth and greater than 3 nmi (5.6 km) from shore, although mine warfare, demolition, and some testing detonations would occur in shallow water close to shore.

To better organize and facilitate the analysis of explosives used by the Action Proponents during military readiness activities that would detonate in water or at the water surface, explosive classification bins were developed. The use of explosive classification bins provides the same benefits as described for acoustic source classification bins in the Sonar and Other Transducers section. Explosives detonated in water are binned by NEW. Table 13 shows explosives use that was quantitatively analyzed in the Study Area. A range of annual use indicates that occurrence is anticipated to vary annually, consistent with the variation in the number of annual activities described in chapter 2 (Description of Proposed Action and Alternatives) of the 2024 AFTT Draft Supplemental EIS/OEIS. The 7-year total takes that variability into account.

TABLE 13—EXPLOSIVE SOURCES QUANTITATIVELY ANALYZED PROPOSED FOR USE UNDERWATER OR AT THE WATER SURFACE

Bin	Net explosive weight	Example explosive source	Navy training annual	Navy training 7-year	Coast Guard training annual	Coast Guard training 7-year	Navy testing annual	Navy testing 7-year
E1	0.1–0.25	Medium-caliber projectile	3,002	21,014	-	-	1,825	12,775
E2	>0.25–0.5	LAW rocket	60	420	-	-	-	-
E3	>0.5–2.5	2.75-inch rocket	5,078	35,546	180	1,260	1,069–1,971	8,705
E4	>2.5–5	Mine neutralization charge	82	574	-	-	2,893–4,687	30,889
E5	>5–10	Large-caliber projectile	1,109	7,763	-	-	1,268–1,860	11,540
E6	>10–20	Hellfire missile	508	3,556	-	-	17–25	125
E7	>20–60	Demo block/shaped charge	10	70	-	-	8–22	62
E8	>60–100	Maverick missile	20	140	-	-	10–13	41
E9	>100–250	500 lb bomb	138	966	-	-	5	35
E10	>250–500	Harpoon missile	71	497	-	-	4	28
E11	>500–675	Torpedo	1	7	-	-	1–2	8
E12	>675–1,000	2,000 lb bomb	20	140	-	-	-	-
E16	>7,250–14,500	Small ship shock trial	-	-	-	-	0–6	15

Note: > = greater than, lb = pound, - = not applicable.

Propagation of explosive pressure waves in water is highly dependent on environmental characteristics such as bathymetry, seafloor type, water depth, temperature, and salinity, which affect how the pressure waves are reflected, refracted, or scattered; the potential for reverberation; and interference due to multi-path propagation. In addition, absorption greatly affects the distance over which higher-frequency components of explosive broadband noise can propagate. Appendix D (Acoustic and Explosive Impacts Supporting Information) of the 2024 AFTT Draft Supplemental EIS/OEIS explains the characteristics of explosive detonations and how the above factors affect the propagation of explosive energy in the water. Because of the complexity of analyzing sound propagation in the ocean environment, the Action Proponents rely on acoustic models in their environmental analyses that consider sound source characteristics and varying ocean conditions across the Study Area.

Vessel Strike

NMFS also considered the likelihood that vessel movement during military readiness activities could result in an incidental, but intentional, strike of a marine mammal in the AFTT Study Area, which has the potential to result in serious injury or mortality. Vessel strikes are not specific to any specific military readiness activity but rather, a limited, sporadic, and incidental result of the Action Proponents' vessel movement during military readiness activities within the Study Area. Vessel strikes from commercial, recreational, and military vessels are known to seriously injure and occasionally kill cetaceans (Abramson *et al.,* 2011; Berman-Kowalewski *et al.,* 2010; Calambokidis, 2012, Crum *et al.,* 2019, Douglas *et al.,* 2008, Laggner, 2009, Lammers *et al.,* 2003, Van der Hoop *et al.,* 2012, Van der Hoop *et al.,* 2013), although reviews of the literature on vessel strikes mainly involve collisions between commercial vessels and whales (Jensen and Silber, 2003, Laist *et al.,* 2001). Vessel speed, size, and mass are all important factors in determining both the potential likelihood and impacts of a vessel strike to marine mammals (Blondin *et al.,* 2025; Conn and Silber, 2013; Garrison *et al.,* 2025; Gende *et al.,* 2011; Redfern *et al.,* 2019; Silber *et al.,* 2010; Szesciorka *et al.,* 2019; Vanderlaan and Taggart, 2007; Wiley *et al.,* 2016). For large vessels, speed and angle of approach can influence the severity of a strike.

The Action Proponents' vessels transit at speeds that are optimal for fuel conservation or to meet training and testing requirements. From unpublished Navy data, average median speed for large Navy ships in the other Navy ranges from 2011–2015 varied from 10 to 15 kn (18.5 to 27.8 km/hr) depending on ship class and geographic location (*i.e.,* slower speeds close to the coast). Similar patterns are anticipated in the AFTT Study Area. A full description of the Action Proponents' vessels proposed for use during military readiness activities can be found in chapter 2 (Description of Proposed Action and Alternatives) of the 2024 AFTT Draft Supplemental EIS/OEIS.

While these speeds for large Navy vessels are representative of most events, some of the Action Proponents' vessels may need to temporarily operate outside of these parameters. For example, to produce the required relative wind speed over the flight deck, an aircraft carrier engaged in flight operations must adjust its speed through the water accordingly. There are a few specific events, including high speed tests of newly constructed vessels, where the Action Proponents' vessel would operate at higher speeds. High speed ferries may also be used to support Navy testing in Narragansett Bay. By comparison, there are other instances when the Action Proponents vessel would be stopped or moving slowly ahead to maintain steerage, such as launch and recovery of a small rigid hull inflatable boat; vessel boarding, search, and seizure training events; or retrieval of a target.

Large Navy vessels (greater than 65 ft (19.8 m)) and Coast Guard vessels within the offshore areas of range complexes and testing ranges operate differently from commercial vessels, which may reduce potential vessel strikes of large whales. Surface ships operated by or for the Navy have multiple personnel assigned to stand watch at all times, when a ship or surfaced submarine is moving through the water (underway). A primary duty of personnel standing watch on surface ships is to detect and report all objects and disturbances sighted in the water that may indicate a threat to the vessel and its crew, such as debris, a periscope, surfaced submarine, or surface disturbance. Per vessel safety requirements, personnel standing watch also report any marine mammals sighted in the path of the vessel as a standard collision avoidance procedure. All vessels proceed at a safe speed so they can take proper and effective action to avoid a collision with any sighted object or disturbance and can stop within a distance appropriate to the prevailing circumstances and conditions. As described in the Standard Operating Procedures section, the Action Proponents utilize Lookouts to avoid collisions, and Lookouts are trained to spot marine mammals so that vessels may change course or take other appropriate action to avoid collisions. Despite the precautions, should a vessel strike occur, NMFS anticipates that it would likely result in incidental take in the form of serious injury and/or mortality, though it is possible that it could result in non-serious injury (Level A harassment). Accordingly, for the purposes of this analysis, NMFS assumes that any vessel strike would result in serious injury or mortality.

Proposed mitigation, monitoring, and reporting measures are described in detail later in this document (please see Proposed Mitigation Measures section, Proposed Monitoring section, and Proposed Reporting section).

Description of Marine Mammals in the Area of Specified Activities

Marine mammal species and their associated stocks that have the potential to occur in the AFTT Study Area are presented in table 14 along with each stock's Endangered Species Act (ESA) and MMPA statuses, abundance estimate and associated coefficient of variation (CV) value, minimum abundance estimate, potential biological removal (PBR), annual M/SI, and potential occurrence in the AFTT Study Area. The Action Proponents request authorization to take individuals of 41 species (81 stocks) by Level A and Level B harassment incidental to military readiness activities from the use of sonar and other transducers, in-water detonations, air guns, pile driving/extraction, and vessel movement in the AFTT Study Area. Of note, the 2019 AFTT Final Rule (84 FR 70712, December 23, 2019) refers to the Northern Gulf of America stock of Bryde's whales (*Balaenoptera edeni*). These whales were subsequently described as a new species, Rice's whale (*Balaenoptera ricei*) (Rosel *et al.,* 2021), and NMFS refers to them as Rice's whale throughout this rulemaking. Currently, the North Atlantic right whale (NARW; *Eubalaena glacialis*) has critical habitat designated under the ESA in the AFTT Study Area, and the Rice's whale has proposed ESA-designated critical habitat in the AFTT Study Area (see *Critical Habitat* section below).

Sections 3 and 4 of the application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history of the potentially affected species. NMFS fully considered all of this information, and we refer the reader to these descriptions, instead of reprinting the information. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SARs; *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments*), and more general information about these species (*e.g.,* physical and behavioral descriptions) may be found on NMFS' website (*https://www.fisheries.noaa.gov/find-species).* Additional information on the general biology and ecology of marine mammals is included in the 2024 AFTT Draft Supplemental EIS/OEIS.

Table 14 incorporates the best available science, including data from the U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessment Report (Hayes *et al.,* 2024) (now referred to as the Gulf of America; see *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments),* and 2024 draft SAR, as well as monitoring data from the Navy's marine mammal research efforts (note, the application includes information from the 2022 final SAR but does not include information from the 2023 final SAR and 2024 draft SAR as they were not available at the time of application submission).

TABLE 14—MARINE MAMMAL OCCURRENCE IN THE AFTT STUDY AREA [1]

Common name	Scientific name	Stock	ESA/MMPA status; strategic (Y/N) [2]	Stock abundance (CV, N_{min}, most recent abundance survey) [3]	PBR	Annual M/SI [4]	Occurrence in range complexes	Occurrence in associated inshore waters	Occurrence in port and pierside locations
Order Artiodactyla—Cetacea—Mysticeti (baleen whales)									
Family Balaenidae:									
North Atlantic Right Whale [5].	*Eubalaena glacialis*	Western	E, D, Y	372 (0, 367, 2023).	0.73	14.8	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC (extralimital), NSWC Panama City Division Testing Range (extralimital), Gulf RC (extralimital), SINKEX Box, Other AFTT Areas.	Northeast RC Inshore, Jacksonville RC Inshore.	Civilian Ports: Boston, MA, Earle, NJ, Delaware Bay, DE, Hampton Roads, VA, Morehead City, NC, Wilmington, NC, Kings Bay, GA, Savannah, GA, Mayport, FL, Port Canaveral, FL (extralimital); Coast Guard Stations: Boston, MA, Virginia Beach, VA, Charleston, SC, Mayport, FL, Cape Canaveral, FL (extralimital).
Family Balaenopteridae (rorquals):									
Blue Whale	*Balaenoptera musculus.*	Western North Atlantic.	E, D, Y	UNK (UNK, 402, See SAR) [6].	0.8	0	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SINKEX Box, Other AFTT Areas.	N/A	N/A.
Bryde's Whale	*Balaenoptera edeni*	Primary	([7] [8])				Other AFTT Areas	N/A	N/A.
Fin Whale	*Balaenoptera physalus.*	Western North Atlantic.	E, D, Y	6,802 (0.24, 5,573, 2021).	11	2.05	Northeast RC, VACAPES RC, Navy Cherry Point RC, JAX RC, Key West RC, Gulf RC (extralimital), NSWC Panama City Testing Range (extralimital), SINKEX Box, Other AFTT Areas.		
Fin Whale	*Balaenoptera physalus.*	Gulf of St. Lawrence					Other AFTT Areas.		
Fin Whale	*Balaenoptera physalus.*	West Greenland					Other AFTT Areas.		
Humpback Whale.	*Megaptera novaeangliae.*	Gulf of Maine	-, -, N	1,396 (0, 1380, 2016).	22	12.15	Northeast RC, NUWC Division, Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, SINKEX Box, Other AFTT Areas.	Northeast RC Inshore, VACAPES Inshore, Jacksonville RC Inshore.	Civilian Ports: Boston, MA, Earle, NJ, Delaware Bay, DE, Hampton Roads, VA, Morehead City, NC, Wilmington, NC; Coast Guard Stations: Boston, MA, Newport, RI, Virginia Beach, VA, Charleston, SC, Mayport, FL, Cape Canaveral, FL, Fort Pierce, FL, Dania, FL, Miami, FL, Key West, FL, St. Petersburg, FL, Pensacola, FL, New Orleans, LA, Corpus Christi, TX.

TABLE 14—MARINE MAMMAL OCCURRENCE IN THE AFTT STUDY AREA [1]—Continued

Common name	Scientific name	Stock	ESA/ MMPA status; strategic (Y/N) [2]	Stock abundance (CV, N_{min}, most recent abundance survey) [3]	PBR	Annual M/SI [4]	Occurrence in range complexes	Occurrence in associated inshore waters	Occurrence in port and pierside locations
Minke Whale	*Balaenoptera acutorostrata.*	Canadian East Coast.	-, -, N	21,968 (0.31, 17,002, 2021).	170	9.4	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, SINKEX Box, Other AFTT Areas.	Northeast RC Inshore, VACAPES Inshore, Jacksonville RC Inshore.	Civilian Ports: Boston, MA, Earle, NJ, Delaware Bay, DE, Hampton Roads, VA, Morehead City, NC, Wilmington, NC, Kings Bay, GA, Savannah, GA; Coast Guard Stations: Boston, MA, Newport, RI, Virginia Beach, VA, Charleston, SC, Mayport, FL, Cape Canaveral, FL, Fort Pierce, FL, Dania, FL, Miami, FL, Key West, FL, St. Petersburg, FL, Pensacola, FL, New Orleans, LA, Corpus Christi, TX.
Minke Whale	*Balaenoptera acutorostrata.*	West Greenland	([9])				Other AFTT Areas.		
Rice's Whale	*Balaenoptera ricei*	Northern Gulf of America.	E, -, Y	51 (0.5, 34, 2018).	0.1	[10] 0.5	Gulf RC, Key West RC, NSWC Panama City Testing Range.	Gulf RC Inshore	Civilian Ports: Tampa, FL, Beaumont, TX, Corpus Christi, TX.
Sei Whale	*Balaenoptera borealis.*	Nova Scotia	E, D, Y	6,292 (1.02, 3,098, 2021).	6.2	0.6	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, Gulf RC, SINKEX Box, Other AFTT Areas.	N/A	N/A.
Sei Whale	*Balaenoptera borealis.*	Labrador Sea	([11])				Other AFTT Areas.		
Odontoceti (toothed whales, dolphins, and porpoises)									
Family Physeteridae:									
Sperm Whale	*Physeter macrocephalus.*	North Atlantic	E, D, Y	5,895 (0.29, 4,639, 2021).	9.28	0.2	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, Gulf RC, SINKEX Box, Other AFTT Areas.	N/A	N/A.
Sperm Whale	*Physeter macrocephalus.*	Northern Gulf of America.	E, D, Y	1,180 (0.22, 983, 2018).	2	9.6	Gulf, NSWC Panama City Testing Range.	N/A	N/A.
Sperm Whale	*Physeter macrocephalus.*	Puerto Rico and U.S. Virgin Islands.	E, D, Y	UNK (UNK, UNK, See SAR).	UNK	UNK	Other AFTT Areas	N/A	N/A.
Family Kogiidae:									
Dwarf Sperm Whale.	*Kogia sima*	Northern Gulf of America [12].	-, -, N	336 (0.35, 253, 2018).	2.5	31	Gulf RC	N/A	N/A.
Dwarf Sperm Whale.	*Kogia sima*	Western North Atlantic [13].	-, -, N	9,474 (0.36, 7,080, 2021).	57	UNK	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Pygmy Sperm Whale.	*Kogia breviceps*	Northern Gulf of America [12].	-, -, N	336 (0.35, 253, 2018).	2.5	31	Gulf RC	N/A	N/A.

Pygmy Sperm Whale.	*Kogia breviceps*	Western North Atlantic [13].	-, -, N	9,474 (0.36, 7,080, 2021).	57	UNK	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Family Ziphiidae (beaked whales):									
Blainville's Beaked Whale.	*Mesoplodon densirostris.*	Northern Gulf of America.	-, -, N	98 (0.46, 68, 2018).	0.7	5.2	Gulf RC	N/A	N/A.
Blainville's Beaked Whale.	*Mesoplodon densirostris.*	Western North Atlantic [14].	-, -, N	2,936 (0.26, 2,374, 2021).	24	0	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, Gulf RC, Other AFTT Areas.	N/A	N/A.
Goose-Beaked Whale.	*Ziphius cavirostris*	Northern Gulf of America.	-, -, N	18 (0.75, 10, 2018).	0.1	5.2	Gulf RC	N/A	N/A.
Goose-Beaked Whale.	*Ziphius cavirostris*	Puerto Rico and U.S. Virgin Islands.	-, -, Y	UNK (UNK, UNK, N/A).	UNK	UNK	Other AFTT Areas	N/A	N/A.
Goose-Beaked Whale.	*Ziphius cavirostris*	Western North Atlantic.	-, -, N	4,260 (0.24, 3,817, 2021).	38	0.2	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Other AFTT Areas.	N/A	N/A.
Gervais' Beaked Whale.	*Mesoplodon europaeus.*	Northern Gulf of America.	-, -, N	20 (0.98, 10, 2018).	0.1	5.2	Gulf RC	N/A	N/A.
Gervais' Beaked Whale.	*Mesoplodon europaeus.*	Western North Atlantic [15].	-, -, N	8,595 (0.24, 7,022, 2021).	70	0	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, Gulf RC, Other AFTT Areas.	N/A	N/A.
Northern Bottlenose Whale.	*Hyperoodon ampullatus.*	Western North Atlantic.	-, -, N	UNK (UNK, UNK, 2016).	UNK	0	Other AFTT Areas	N/A	N/A.
Sowerby's Beaked Whale.	*Mesoplodon bidens*	Western North Atlantic.	-, -, N	492 (0.50, 340, 2021).	3.4	0	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, Gulf RC, Other AFTT Areas.	N/A	N/A.
True's Beaked Whale.	*Mesoplodon mirus*	Western North Atlantic.	-, -, N	4,480 (0.34, 3,391, 2021).	34	0.2	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, Gulf RC, Other AFTT Areas.	N/A	N/A.
Family Delphinidae:									
Atlantic Spotted Dolphin.	*Stenella frontalis*	Northern Gulf of America.	-, -, N	21,506 (0.26, 17,339, 2018).	166	36	Gulf RC, Other AFTT Areas	N/A	N/A.
Atlantic Spotted Dolphin.	*Stenella frontalis*	Puerto Rico and U.S. Virgin Islands.	-, -, Y	UNK (UNK, UNK, N/A).	UNK	UNK	Other AFTT Areas	N/A	N/A.
Atlantic Spotted Dolphin.	*Stenella frontalis*	Western North Atlantic.	-, -, N	31,506 (0.28, 25,042, 2021).	250	0	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Atlantic White-Sided Dolphin.	*Lagenorhynchus acutus.*	Western North Atlantic.	-, -, N	93,233 (0.71, 54,443, 2021).	544	28	Northeast RC, VACAPES RC, Other AFTT Areas.	N/A	Civilian Ports: Boston, MA; Coast Guard Stations: Boston, MA.
Bottlenose Dolphin.	*Tursiops truncatus*	Biscayne Bay	-, -, N	241 (0.04, 233, 2019).	2.3	1	Other AFTT Areas	N/A	N/A.

TABLE 14—MARINE MAMMAL OCCURRENCE IN THE AFTT STUDY AREA [1]—Continued

Common name	Scientific name	Stock	ESA/MMPA status; strategic (Y/N) [2]	Stock abundance (CV, N_{min}, most recent abundance survey) [3]	PBR	Annual M/SI [4]	Occurrence in range complexes	Occurrence in associated inshore waters	Occurrence in port and pierside locations
Tamanend's bottlenose dolphin.	*Tursiops erebennus*	Western North Atlantic, Central Florida Coastal.	-, -, Y	2,541 (0.46, 1,760, 2021).	18	0.2	JAX RC	JAX RC Inshore	Civilian Ports: Port Canaveral, FL.
Bottlenose Dolphin.	*Tursiops truncatus*	Central GA Estuarine.	-, -, N	UNK (UNK, UNK, 2008–2009).	UND	0.4	Other AFTT Areas	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Charleston Estuarine	-, -, Y	UNK (UNK, UNK, 2005–2006).	UND	2.2	Other AFTT Areas	JAX RC Inshore	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Gulf of America Bay, Sound, and Estuaries [16].	Y				Gulf RC	Gulf RC Inshore	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Gulf of America Eastern Coastal.	-, -, N	16,407 (0.17, 14,199, 2018).	114	9.2	Gulf RC	Gulf RC Inshore	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Gulf of America Northern Coastal.	-, -, N	11,543 (0.19, 9,881, 2018).	89	28	Gulf RC	Gulf RC Inshore	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Northern Gulf of America Oceanic.	-, -, N	7,462 (0.31, 5,769, 2018).	58	32	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Gulf of America Western Coastal.	-, -, N	20,759 (0.13, 18,585, 2018).	167	36	Gulf RC	Gulf RC Inshore	Civilian Ports: Beaumont, TX, Corpus Christi, TX, Pascagoula, MS; Coast Guard Stations: Corpus Christi, TX.
Bottlenose Dolphin.	*Tursiops truncatus*	Florida Bay	-, -, N	UNK (UNK, UNK, 2003).	UNK	0.2	Other AFTT Areas	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Indian River Lagoon Estuarine.	-, -, Y	1,032 (0.03, 1,004, 2016–2017).	10	5.7	Other AFTT Areas	JAX RC Inshore	Civilian Ports: Port Canaveral, FL.
Bottlenose Dolphin.	*Tursiops truncatus*	Jacksonville Estuarine.	-, -, Y	UNK (UNK, UNK, n/a).	UNK	2	JAX RC	JAX RC Inshore	Civilian Ports: Port Canaveral, FL.
Bottlenose Dolphin.	*Tursiops truncatus*	MS Sound, Lake Borgne, Bay Boudreau.	-, -, Y	1,265 (0.35, 947, 2018).	8.5	59	Gulf RC	Gulf Inshore	N/A.
Tamanend's bottlenose Dolphin.	*Tursiops erebennus*	Western North Atlantic, Northern Florida Coastal.	-, -, Y	3,619 (0.35, 2,711, 2021).	27	0.2	Other AFTT Areas	JAX RC Inshore	Civilian Ports: Kings Bay, GA, Savannah, GA.
Bottlenose Dolphin.	*Tursiops truncatus*	Northern GA/Southern SC Estuarine.	-, -, Y	UNK (UNK, UNK, See SAR).	UNK	1.5	Other AFTT Areas	JAX RC Inshore	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Northern Gulf of America Continental Shelf.	-, -, N	63,280 (0.11, 57,917, 2018).	556	65	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Western North Atlantic, Northern Migratory Coastal.	-, -, Y	6,639 (0.41, 4,759, 2016).	48	12.2–21.5	VACAPES RC, Navy Cherry Point RC, JAX RC, Key West RC, Other AFTT Areas.	VACAPES RC Inshore.	Civilian Ports: Earle, NJ, Delaware Bay, DE, Hampton Roads, VA, Morehead City, NC; Coast Guard Stations: Virginia Beach, VA.
Bottlenose Dolphin.	*Tursiops truncatus*	Northern NC Estuarine.	-, -, Y	823 (0.06, 782, 2017).	7.8	7.2–30	Other AFTT Areas	N/A	Civilian Ports: Morehead City, NC, Wilmington, NC.
Bottlenose Dolphin.	*Tursiops truncatus*	Northern SC Estuarine.	-, -, N	453 (0.28, 359, 2016).	3.6	0.5	Other AFTT Areas	JAX RC Inshore	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Nueces Bay, Corpus Christi.	-, -, Y	58 (0.61, UNK, 1992).	UND	0.2	Gulf RC	N/A	Civilian Ports: Corpus Christi, TX.
Bottlenose Dolphin.	*Tursiops truncatus*	Sabine Lake	-, -, N	122 (0.19, 104, 2017).	0.9	0	Gulf RC	N/A	Civilian Ports: Beaumont, TX.

Tamanend's bottlenose Dolphin.	*Tursiops erebennus*	Western North Atlantic South Carolina/Georgia Coastal.	-, -, Y	9,121 (0.28, 7,261, 2021).	73	0.2–0.6	Other AFTT Areas	JAX RC Inshore	Civilian Ports: Kings Bay, GA, Savannah, GA.
Bottlenose Dolphin.	*Tursiops truncatus*	Southern GA Estuarine System.	-, -, N	UNK (UNK, UNK, 2008–2009).	UND	0.1	Other AFTT Areas	JAX RC Inshore	Civilian Ports: Kings Bay, GA, Savannah, GA.
Bottlenose Dolphin.	*Tursiops truncatus*	Western North Atlantic, Southern Migratory Coastal.	-, -, Y	3,751 (0.6, 2,353, 2016).	24	0–18.3	Navy Cherry Point RC, JAX RC, Key West RC, Other AFTT Areas.	JAX RC Inshore	Civilian Ports: Hampton Roads, VA, Morehead City, NC, Wilmington, NC, Kings Bay, GA, Savannah, GA; Coast Guard Stations: Virginia Beach, VA.
Bottlenose Dolphin.	*Tursiops truncatus*	Southern NC Estuarine System.	-, -, Y	UNK (UNK, UNK, 2017).	UND	0.4	Other AFTT Areas	N/A	Civilian Ports: Morehead City, NC, Wilmington, NC.
Bottlenose Dolphin.	*Tursiops truncatus*	Western North Atlantic Offshore [17].	-, -, N	64,587 (0.24, 52,801, 2021).	507	28	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, Other AFTT Areas.	N/A	Civilian Ports: Morehead City, NC, Wilmington, NC.
Bottlenose Dolphin.	*Tursiops truncatus*	Puerto Rico and U.S. Virgin Islands.	-, -, Y	UNK (UNK, UNK, N/A).	UNK	UNK	Other AFTT Areas	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Apalachee Bay	-, -, Y	491 (0.39, UNK, 1993).	UND	0	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Barataria Bay Estuarine System.	-, -, Y	2,071 (0.06, 1,971, 2019).	18	35	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Calcasieu Lake	-, -, Y	0 (N/A, N/A, 1992).	UND	0.2	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Caloosahatchee River.	-, -, Y	0 (N/A, N/A, 1985).	UND	0.4	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Choctawhatchee Bay	-, -, Y	179 (0.04, UNK, 2007).	UND	0.4	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Chokoloskee Bay, Ten Thousand Islands, Gullivan Bay.	-, -, Y	UNK (N/A, UNK, N/A).	UND	0.2	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Copano Bay, Aransas Bay, San Antonio Bay, Redfish Bay, Espiritu Santo Bay.	-, -, Y	55 (0.82, UNK, 1992).	UND	0.6	Gulf RC	N/A	Civilian Ports: Corpus Christi, TX.
Bottlenose Dolphin.	*Tursiops truncatus*	Estero Bay	-, -, Y	UNK (N/A, UNK, N/A).	UND	0.4	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Florida Keys	-, -, Y	UNK (N/A, UNK, N/A).	UND	0.2	Gulf RC	Key West Range Complex Inshore.	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Galveston Bay, East Bay, Trinity Bay.	-, -, N	842 (0.08, 787, 2016).	6.3	1	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Laguna Madre	-, -, Y	80 (1.57, UNK, 1992).	UND	0.8	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Matagorda Bay, Tres Palacios Bay, Lavaca Bay.	-, -, Y	61 (0.45, UNK, 1992).	UND	0.4	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Mobile and Bonsecour Bays.	-, -, Y	122 (0.34, UNK, 1993).	UND	16	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	MS River Delta	-, -, N	1,446 (0.19, 1,238, 2018).	11	9.2	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Pensacola and East Bays.	-, -, Y	33 (0.8, UNK, 1993).	UND	0.4	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Perdido Bay	-, -, Y	0 (N/A, N/A, 1993).	UND	0.8	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Pine Island Sound, Charlotte Harbor, Gasparilla Sound, Lemon Bay.	-, -, Y	826 (0.09, UNK, 2006).	UND	1	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Sarasota Bays	-, -, N	158 (0.27, 126, 2015).	1	0.2	Gulf RC	N/A	N/A.

TABLE 14—MARINE MAMMAL OCCURRENCE IN THE AFTT STUDY AREA [1]—Continued

Common name	Scientific name	Stock	ESA/ MMPA status; strategic (Y/N) [2]	Stock abundance (CV, N_{min}, most recent abundance survey) [3]	PBR	Annual M/SI [4]	Occurrence in range complexes	Occurrence in associated inshore waters	Occurrence in port and pierside locations
Bottlenose Dolphin.	*Tursiops truncatus*	St. Andrew Bay	-, -, N	199 (0.09, 185, 2016).	1.5	0.2	Gulf RC	Gulf Inshore	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	St. Joseph Bay	-, -, N	142 (0.17, 123, 2011).	1	UNK	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	St. Joseph Sound, Clearwater Harbor.	-, -, Y	UNK (N/A, UNK, N/A).	UND	0.8	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	St. Vincent Sound, Apalachicola Bay, St. George Sound.	-, -, Y	439 (0.14, UNK, 2007).	UND	0.2	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Tampa Bay	-, -, Y	UNK (N/A, UNK, N/A).	UND	3	Gulf RC	N/A	Civilian Ports: Tampa, FL.
Bottlenose Dolphin.	*Tursiops truncatus*	Terrebonne and Timbalier Bays Estuarine System.	-, -, N	3,870 (0.15, 3,426, 2016).	27	0.2	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Vermillion Bay, West Cote Blanche Bay, Atchafalaya Bay.	-, -, Y	0 (N/A, N/A, 1992).	UND	0	Gulf RC	Gulf Inshore	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Waccasassa Bay, Withlacoochee Bay, Crystal Bay.	-, -, Y	UNK (N/A, UNK, N/A).	UND	0.4	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	West Bay	-, -, N	37 (0.05, 35, 2015).	0.3	0	Gulf RC	N/A	N/A.
Bottlenose Dolphin.	*Tursiops truncatus*	Whitewater Bay	-, -, Y	UNK (N/A, UNK, N/A).	UND	0	Gulf RC	N/A	N/A.
Clymene Dolphin	*Stenella clymene*	Northern Gulf of America.	-, -, Y	513 (1.03, 250, 2018).	2.5	8.4	Gulf RC, Other AFTT Areas	N/A	N/A.
Clymene Dolphin	*Stenella clymene*	Western North Atlantic.	-, -, N	21,778 (0.72, 12,622, 2021).	126	0	Northeast RC, NUWC Division, Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Common Dolphin	*Delphinus delphis*	Western North Atlantic.	-, -, N	93,100 (0.56, 59,897, 2021).	1,452	414	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
False Killer Whale.	*Pseudorca crassidens.*	Northern Gulf of America.	-, -, N	494 (0.79, 276, 2018).	2.8	2.2	Gulf RC, Other AFTT Areas	N/A	N/A.
False Killer Whale.	*Pseudorca crassidens.*	Western North Atlantic.	-, -, N	1,298 (0.72, 775, 2021).	7.6	0	NUWC Division, Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Fraser's Dolphin	*Lagenodelphis hosei*	Northern Gulf of America.	-, -, N	213 (1.03, 104, 2018).	1	UNK	Gulf RC	N/A	N/A.

Fraser's Dolphin	*Lagenodelphis hosei*	Western North Atlantic.	-, -, N	UNK (UNK, UNK, 2021).	UNK	0	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Killer Whale	*Orcinus orca*	Northern Gulf of America.	-, -, N	267 (0.75, 152, 2018).	1.5	UNK	Gulf RC	N/A	N/A.
Killer Whale	*Orcinus orca*	Western North Atlantic.	-, -, N	UNK (UNK, UNK, 2016).	UNK	0	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Long-Finned Pilot Whale.	*Globicephala melas*	Western North Atlantic.	-, -, N	39,215 (0.30, 30,627, 2021).	306	5.7	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Melon-Headed Whale.	*Peponocephala electra*.	Northern Gulf of America.	-, -, N	1,749 (0.68, 1,039, 2018).	10	9.5	Gulf RC	N/A	N/A.
Melon-Headed Whale.	*Peponocephala electra*.	Western North Atlantic.	-, -, N	UNK (UNK, UNK, 2021).	UNK	0	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Pantropical Spotted Dolphin.	*Stenella attenuata*	Northern Gulf of America.	-, -, N	37,195 (0.24, 30,377, 2018).	304	241	Gulf RC	N/A	N/A.
Pantropical Spotted Dolphin.	*Stenella attenuata*	Western North Atlantic.	-, D, N	2,757 (0.50, 1,856, 2021).	19	0	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Pygmy Killer Whale.	*Feresa attenuata*	Northern Gulf of America.	-, -, N	613 (1.15, 283, 2018).	2.8	1.6	Gulf RC	N/A	N/A.
Pygmy Killer Whale.	*Feresa attenuata*	Western North Atlantic.	-, -, N	UNK (UNK, UNK, 2021).	UNK	0	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Risso's Dolphin	*Grampus griseus*	Northern Gulf of America.	-, -, N	1,974 (0.46, 1,368, 2018).	14	5.3	Gulf RC	N/A	N/A.

TABLE 14—MARINE MAMMAL OCCURRENCE IN THE AFTT STUDY AREA [1]—Continued

Common name	Scientific name	Stock	ESA/MMPA status; strategic (Y/N) [2]	Stock abundance (CV, N_{min}, most recent abundance survey) [3]	PBR	Annual M/SI [4]	Occurrence in range complexes	Occurrence in associated inshore waters	Occurrence in port and pierside locations
Risso's Dolphin	*Grampus griseus*	Western North Atlantic.	-, -, N	44,067 (0.19, 30,662, 2021).	307	18	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Rough-Toothed Dolphin.	*Steno bredanensis*	Northern Gulf of America.	-, -, N	UNK (N/A, UNK, 2018).	UND	39	Gulf RC	N/A	N/A.
Rough-Toothed Dolphin.	*Steno bredanensis*	Western North Atlantic.	-, -, N	UNK (UNK, UNK, 2021).	UND	0	Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Short-Finned Pilot Whale.	*Globicephala macrorhynchus.*	Northern Gulf of America.	-, -, N	1,321 (0.43, 934, 2018).	7.5	3.9	Gulf RC	N/A	N/A.
Short-Finned Pilot Whale.	*Globicephala macrorhynchus.*	Puerto Rico and U.S. Virgin Islands.	-, -, Y	UNK (UNK, UNK, N/A).	UNK	UNK	Other AFTT Areas	N/A	N/A.
Short-Finned Pilot Whale.	*Globicephala macrorhynchus.*	Western North Atlantic.	-, -, Y	18,726 (0.33, 14,292, 2021).	143	218	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Spinner Dolphin	*Stenella longirostris*	Northern Gulf of America.	-, -, Y	2,991 (0.54, 1,954, 2018).	20	113	Gulf RC	N/A	N/A.
Spinner Dolphin	*Stenella longirostris*	Puerto Rico and U.S. Virgin Islands.	-, -, Y	UNK (UNK, UNK, N/A).	UNK	UNK	Other AFTT Areas	N/A	N/A.
Spinner Dolphin	*Stenella longirostris*	Western North Atlantic.	-, D, N	3,181 (0.65, 1,930, 2021).	19	0	Northeast RC, NUWC Division, Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Striped Dolphin	*Stenella coeruleoalba.*	Northern Gulf of America.	-, -, Y	1,817 (0.56, 1,172, 2018).	12	13	Gulf RC	N/A	N/A.
Striped Dolphin	*Stenella coeruleoalba.*	Western North Atlantic.	-, -, N	48,274 (0.29, 38,040, 2021).	529	0	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.

White-Beaked Dolphin.	*Lagenorhynchus albirostris.*	Western North Atlantic.	-, -, N	536,016 (0.31, 415,344, 2016).	4,153	0	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC, JAX RC, SFOMF, Key West RC, NSWC Panama City Division Testing Range, Gulf RC, Other AFTT Areas.	N/A	N/A.
Family Phocoenidae (porpoises):									
Harbor Porpoise	*Phocoena phocoena*	Gulf of Maine/Bay of Fundy.	-, -, N	85,765 (0.53, 56,420, 2021).	649	142.4	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC.	Northeast RC Inshore, VACAPES RC Inshore, JAX RC Inshore.	Civilian Ports: Boston, MA, Earle, NJ, Delaware Bay, DE, Hampton Roads, VA; Coast Guard Stations: Boston, MA, Virginia Beach, VA.
Harbor Porpoise	*Phocoena phocoena*	Greenland	(18 19 20)				Other AFTT Areas.		
Harbor Porpoise	*Phocoena phocoena*	Gulf of St. Lawrence	(18 19 20)				Other AFTT Areas.		
Harbor Porpoise	*Phocoena phocoena*	Newfoundland	(18 19 20)				Other AFTT Areas.		
Order Carnivora—Pinnipedia									
Family Phocidae (earless seals):									
Gray Seal	*Halichoerus grypus*	Western North Atlantic.	-, -, N	27,911 (0.20, 23,624, 2021).	756	4,491	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC.	Northeast RC Inshore, VACAPES RC Inshore, JAX RC Inshore.	Civilian Ports: Boston, MA, Earle, NJ, Delaware Bay, DE, Hampton Roads, VA, Morehead City, NC; Coast Guard Stations: Boston, MA, Virginia Beach, VA.
Harbor Seal	*Phoca vitulina*	Western North Atlantic.	-, -, N	61,336 (0.08, 57,637, 2018).	1,729	339	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC.	Northeast RC Inshore, VACAPES RC Inshore, JAX RC Inshore.	Civilian Ports: Boston, MA, Earle, NJ, Delaware Bay, DE, Hampton Roads, VA, Morehead City, NC; Coast Guard Stations: Boston, MA, Virginia Beach, VA.
Harp Seal	*Pagophilus groenlandicus.*	Western North Atlantic.	-, -, N	7.6M (UNK, 7.1M, 2019).	426,000	178,573	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC.	N/A	N/A.
Hooded Seal	*Cystophora cristata*	Western North Atlantic.	-, -, N	UNK (UNK, UNK, n/a).	UNK	1,680	Northeast RC, NUWC Division Newport Testing Range, VACAPES RC, Navy Cherry Point RC.	N/A	Civilian Ports: Boston, MA.

Note: %: percent; AFTT: Atlantic Fleet Training and Testing; CV: coefficient of variation; EEZ: Exclusive Economic Zone; EIS: Environmental Impact Statement; ESA: Endangered Species Act; JAX: Jacksonville; Min.: minimum; MMPA: Marine Mammal Protection Act; NMFS: National Marine Fisheries Service; NSWC: Naval Surface Warfare Center; NUWC: Naval Undersea Warfare Center; RC: Range Complex; SAR: Stock Assessment Report; SFOMF: Naval Surface Warfare Center, Carderock Division, South Florida Ocean Measurement Facility Testing Range; U.S.: United States; USFWS: U.S. Fish and Wildlife Service; VACAPES: Virginia Capes. Marine mammals in the Gulf of America are named in the most recent SARs (Hayes *et al.,* 2024) with reference to the formerly named "Gulf of Mexico." This Notice refers to these marine mammal stocks as Northern Gulf of America stocks. The geographical location of the stocks remains the same.

[1] Information on the classification of marine mammal species can be found on the web page for The Society for Marine Mammalogy's Committee on Taxonomy (*https://marinemammalscience.org/science-and-publications/list-marine-mammal-species-subspecies/*).

[2] Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Under the MMPA, a strategic stock is one for which the level of direct human-caused mortality exceeds PBR or which is determined to be declining and likely to be listed under the ESA within the foreseeable future. Any species or stock listed under the ESA is automatically designated under the MMPA as depleted and as a strategic stock.

[3] NMFS marine mammal stock assessment reports online at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.* CV is coefficient of variation; N_{min} is the minimum estimate of stock abundance.

[4] These values, found in NMFS's SARs, represent annual levels of human-caused mortality plus serious injury from all sources combined (*e.g.,* commercial fisheries, vessel strike). Annual M/SI often cannot be determined precisely and is in some cases presented as a minimum value or range. A CV associated with estimated mortality due to commercial fisheries is presented in some cases.

[5] NMFS uses "credible interval" to characterize the uncertainty as opposed to CV for North Atlantic right whales (Hayes *et al.,* 2024).

[6] Photo-ID catalog count of 402 recognizable blue whale individuals from the Gulf of St. Lawrence is considered a minimum population estimate for the western North Atlantic stock (Waring *et al.,* 2010). An additional 39 (0.64) were documented in the summer of 2016 for Central Virginia to Bay of Fundy (Waring *et al.,* 2010).

[7] The West Greenland stock of fin whales is not managed by NMFS and, therefore, does not have an associated Stock Assessment Report. Abundance and a 95% confidence interval were presented in Heide-Jorgensen *et al.* (2010a).

[8] The Gulf of St. Lawrence stock of fin whales is not managed by NMFS and, therefore, does not have an associated Stock Assessment Report. Abundance and 95% confidence interval were presented in Ramp *et al.* (2014).

[9] The West Greenland stock of minke whales is not managed by NMFS and, therefore, does not have an associated Stock Assessment Report. Abundance and 95% confidence interval were presented in Heide-Jorgensen *et al.* (2010b).

[10] Total M/SI is a minimum estimate and does not include Fisheries M/SI.

[11] The Labrador Sea stock of sei whales is not managed by NMFS and, therefore, does not have an associated Stock Assessment Report. Information was obtained in Prieto *et al.* (2014).

[12] Because *Kogia sima* and *K. breviceps* are difficult to differentiate at sea, the reported abundance estimates for the Western North Atlantic stock are for both species of *Kogia* combined.
[13] Because *Kogia sima* and *K. breviceps* are difficult to differentiate at sea, the reported abundance estimates for the Northern Gulf of America stock are for both species of *Kogia* combined.
[14] Estimate includes undifferentiated *Mesoplodon* species.
[15] Estimate includes Gervais' and Blainville's beaked whales.
[16] There are 32 stocks within the bottlenose dolphin Gulf of America Bay, Sound, and Estuaries strategic stock and there are no stock-specific SARs available at this time.
[17] Estimate may include sightings of the coastal form.
[18] Harbor porpoises in the Gulf of St. Lawrence are not managed by NMFS and have no associated Stock Assessment Report.
[19] Harbor porpoises in Newfoundland are not managed by NMFS and have no associated Stock Assessment Report.
[20] Harbor porpoises in Greenland are not managed by NMFS and have no associated Stock Assessment Report.

Species Not Included in the Analysis

The species carried forward for analysis (and described in table 14) are those likely to be found in the AFTT Study Area based on the most recent data available and do not include species that may have once inhabited or transited the area but have not been sighted in recent years (*e.g.,* species which were extirpated from factors such as 19th and 20th century commercial exploitation). Several species that may be present in the northwestern Atlantic Ocean have an extremely low probability of presence in the AFTT Study Area. These species are considered extralimital (not anticipated to occur in the Study Area) or rare (occur in the Study Area sporadically, but sightings are rare). These extralimital species include the bowhead whale (*Balaena mysticetus*), beluga whale (*Delphinapterus leucas*), narwhal (*Monodon monoceros*), ringed seal (*Pusa hispida*), and bearded seal (*Erignathus barbatus*). Bowhead whales are likely to be found only in the Labrador Current open ocean area but, in 2012 and 2014, the same bowhead whale was observed in Cape Cod Bay, which represents the southernmost record of this species in the western North Atlantic. In June 2014, a beluga whale was observed in several bays and inlets of Rhode Island and Massachusetts (Swaintek, 2014). This sighting likely represents an extralimital beluga whale occurrence in the Northeast United States Continental Shelf Large Marine Ecosystem. Narwhals prefer cold Arctic waters, and there is no stock of narwhal that occurs in the U.S. EEZ in the Atlantic Ocean; however, populations from Hudson Strait and Davis Strait may extend into the AFTT Study Area at its northwest extreme and those that winter in Hudson Strait likely occur in smaller numbers.

In addition to the species listed above, several stocks that did not overlap areas in or near modeled activities in the AFTT Study Area were not analyzed. These stocks include the West Greenland and Gulf of St. Lawrence stocks of fin whale; the West Greenland stock of minke whale; the Labrador Sea stock of sei whale; and the Gulf of St. Lawrence, Newfoundland, and Greenland stocks of harbor porpoise. NMFS agrees with the Action Proponents' assessment that these species are unlikely to occur in the AFTT Study Area, and they are not discussed further. Further, neither NMFS nor Navy anticipates take of the Puerto Rico/U.S. Virgin Islands stock of sperm whale, as U.S. Navy training activities in the Vieques Naval Training Range ceased in 2003.

Three species of marine mammals, walrus (*Odobenus rosmarus*), West Indian manatee (*Trichechus manatus*), and polar bear (*Ursus maritimus*), occur in the AFTT Study Area, but are managed by the U.S. Fish and Wildlife Service (U.S. FWS), and thus are not considered further in this document.

Below, we consider additional information about the marine mammals in the area of the specified activities that informs our analysis, such as identifying known areas of important habitat or behaviors, or where Unusual Mortality Events (UME) have been designated.

Critical Habitat

Currently, only the NARW has ESA-designated critical habitat in the AFTT Study Area. However, NMFS has recently published a proposed rule proposing new ESA-designated critical habitat for the Rice's whale (88 FR 47453, July 24, 2023).

North Atlantic Right Whale

On February 26, 2016, NMFS issued a final rule (81 FR 4838) to replace the critical habitat for NARW with two new areas. The areas now designated as critical habitat contain approximately 29,763 nmi^2 (102,084 km^2) of marine habitat in the Gulf of Maine and Georges Bank region (Unit 1), essential for NARW foraging and off the Southeast U.S. coast (Unit 2), including the coast of North Carolina, South Carolina, Georgia, and Florida, which are key areas essential for calving. These two ESA-designated critical habitats were established to replace three smaller previously ESA-designated critical habitats (Cape Cod Bay/Massachusetts Bay/Stellwagen Bank, Great South Channel, and the coastal waters of Georgia and Florida in the southeastern United States) that had been designated by NMFS in 1994 (59 FR 28805, June 3, 1994). Two additional areas in Canadian waters, Grand Manan Basin and Roseway Basin, were identified and designated as critical habitat under Canada's endangered species law (section 58 (5) of the Species at Risk Act (SARA), S. C. 2002, c. 29) and identified in Final Recovery Strategy for the NARW, posted June 2009 on the SARA Public Registry.

Unit 1 encompasses the Gulf of Maine and Georges Bank region including the large embayments of Cape Cod Bay and Massachusetts Bay and deep underwater basins, as well as state waters, except for inshore areas, bays, harbors, and inlets, from Maine through Massachusetts in addition to Federal waters, all of which are key areas (see figure 4.1–1 of the application). It also does not include waters landward of the 72 COLREGS lines (33 CFR part 80). The essential physical and biological features of foraging habitat for NARW are: (1) The physical oceanographic conditions and structures of the Gulf of Maine and Georges Bank region that combine to distribute and aggregate *Calanus finmarchicus* for right whale foraging, namely prevailing currents and circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, and temperature regimes; (2) low flow velocities in Jordan, Wilkinson, and Georges Basins that allow diapausing *C. finmarchicus* to aggregate passively below the convective layer so that the copepods are retained in the basins; (3) late stage *C. finmarchicus* in dense aggregations in the Gulf of Maine and Georges Bank region; and (4) diapausing *C. finmarchicus* in aggregations in the Gulf of Maine and Georges Bank region.

Unit 2 consists of all marine waters from Cape Fear, North Carolina, southward to approximately 27 nmi below Cape Canaveral, Florida, within the area bounded on the west by the shoreline and the 72 COLREGS lines, and on the east by rhumb lines connecting the specific points described below (see figure 4.1–2 of the application). The essential physical and biological features correlated with the distribution of NARW in the southern critical habitat area provide an optimum environment for calving. These are: (1) Calm sea surface conditions of Force 4 or less on the Beaufort Wind Scale; (2) sea surface temperatures from a minimum of 44.6 °F (7 °C), and never more than 62.6 °F (17 °C); and (3) water depths of 19.7 to 91.9 ft (6 to 28 m), where these features simultaneously co-occur over contiguous areas of at least 231 nmi^2 (792.3 km^2) of ocean waters during the months of November through April. For example, the bathymetry of the inner and nearshore middle shelf area minimizes the effect of strong winds and offshore waves, limiting the formation of large waves and rough water. The average temperature of critical habitat waters is cooler during the time right whales are present due to a lack of influence by the Gulf Stream and cool freshwater runoff from coastal areas. The water temperatures may provide an optimal balance between offshore waters that are too warm for nursing mothers to tolerate, yet not too cool for calves that may only have minimal fatty insulation. Reproductive females and calves are expected to be concentrated in the critical habitat from December through April.

Rice's Whale

On August 23, 2021, NMFS published a final rule that revised the listing of Rice's whales under the ESA to reflect the change in the scientifically accepted taxonomy and nomenclature of this species (86 FR 47022). Prior to this revision, the Rice's whale was listed in 2019 under the ESA as an endangered subspecies of the Bryde's whale (Gulf of America subspecies (referred to as the Gulf of Mexico subspecies in 86 FR 47022)). The 2019 listing rule indicated that, with a total abundance of approximately 100 individuals, small population size and restricted range are the most serious threats to this species (84 FR 15446, April 15, 2019). However, other threats such as energy exploration, development, and production; oil spills and oil spill responses; vessel collision; fishing gear entanglement; and anthropogenic noise were also identified as threats that contribute to the risk of extinction.

The specific occupied areas proposed for designation as critical habitat for the Rice's whale contain approximately 28,270.65 mi^2 (73,220.65 km^2) of continental shelf and slope associated waters between 100 m and 400 m (328 ft and 1,312 ft) isobaths within the Gulf of America spanning from the U.S. EEZ boundary off the southwestern coast of Texas, to the boundary between the South Atlantic Fishery Management Council and the Gulf Fishery Management Council off the southeastern coast of Florida.

In the final listing rule, NMFS stated that critical habitat was not determinable at the time of the listing, because sufficient information was not currently available on the geographical area occupied by the species (84 FR 15446, April 15, 2019). On July 24, 2023, NMFS published a proposed rule describing the proposed critical habitat designation, including supporting information on Rice's whale biology, distribution, and habitat use, and the methods used to develop the proposed designation (88 FR 47453). The physical and biological features essential to the conservation of the species identified in the proposed rule are:

(i) Sufficient density, quality, abundance, and accessibility of small demersal and vertically migrating prey species, including scombriformes, stomiiformes, myctophiformes, and myopsida;

(ii) Marine water with:

A. Elevated productivity,

B. Bottom temperatures of 50–66.2 °F (10–19 °C), and

C. Levels of pollutants that do not preclude or inhibit any demographic function; and

(iii) Sufficiently quiet conditions for normal use and occupancy, including intraspecific communication, navigation, and detection of prey, predators, and other threats.

Biologically Important Areas

LaBrecque *et al.* (2015) identified Biologically Important Areas (BIAs) within U.S. waters of the East Coast and Gulf of America, which represent areas and times in which cetaceans are known to concentrate in areas of known importance for activities related to reproduction, feeding, and migration, or areas where small and resident populations are known to occur. Unlike ESA critical habitat, these areas are not formally designated pursuant to any statute or law, but are a compilation of the best available science intended to inform impact and mitigation analyses. An interactive map of the BIAs is available here: *https://oceannoise.noaa.gov/biologically-important-areas.* In some cases, additional, or newer, information regarding known feeding, breeding, or migratory areas may be available, and is included below.

On the East Coast, 19 of the 24 identified BIAs fall within or overlap with the AFTT Study Area: 10 feeding (2 for minke whale, 1 for sei whale, 3 for fin whale, 3 for NARW, and 1 for humpback), 1 migration (NARW), 2 reproduction (NARW), and 6 small and resident population (1 for harbor porpoise and 5 for bottlenose dolphin). Figures 4.1–1 through 4.1–14 of the application illustrate how these BIAs overlap with OPAREAs on the East Coast. In the Gulf of America, 4 of the 12 identified BIAs for small and resident populations overlap the AFTT Study Area (1 for Rice's (Bryde's) whale and 3 for bottlenose dolphin). Figures 4.1–9 through 4.1–13 of the application illustrates how these BIAs overlap with OPAREAs in the Gulf of America.

Large Whales Feeding BIAs—East Coast

Two minke whale feeding BIAs are located in the northeast Atlantic from March through November in waters less than 200 m (656 ft) in the southern and southwestern section of the Gulf of Maine including Georges Bank, the Great South Channel, Cape Cod Bay and Massachusetts Bay, Stellwagen Bank, Cape Anne, and Jeffreys Ledge (LaBrecque *et al.,* 2015a; LaBrecque *et al.,* 2015b). LaBrecque *et al.* (2015b) delineated a feeding area for sei whales in the northeast Atlantic between the 25-m (82-ft) contour off coastal Maine and Massachusetts to the 200-m (656-ft) contour in central Gulf of Maine, including the northern shelf break area of Georges Bank. The feeding area also includes the southern shelf break area of Georges Bank from 100–2,000 m (328–6,562 ft) and the Great South Channel. Feeding activity is concentrated from May through November with a peak in July and August. LaBrecque *et al.* (2015b) identified three feeding areas for fin whales in the North Atlantic within the AFTT Study Area: (1) June to October in the northern Gulf of Maine, (2) year-round in the southern Gulf of Maine, and (3) March to October east of Montauk Point. LaBrecque *et al.* (2015b) delineated a humpback whale feeding area in the Gulf of Maine, Stellwagen Bank, and Great South Channel.

North Atlantic Right Whale BIAs—East Coast and Additional Information

LaBrecque *et al.* (2015b) identified three seasonal NARW feeding areas BIAs located in or near the AFTT Study Area (1) February to April on Cape Cod Bay and Massachusetts Bay, (2) April to June in the Great South Channel and on the northern edge of Georges Bank, and (3) June to July and October to December on Jeffreys Ledge in the western Gulf of Maine. A mating BIA was identified in the central Gulf of Maine (from November through January), a calving BIA in the southeast Atlantic (from mid-November to late April), and the migratory corridor area BIA along the U.S. East Coast between the NARW southern calving grounds and northern feeding areas (see figures 4.1–1 through 4.1–14 of the application for how these BIAs overlap with Navy OPAREAs).

In addition to the BIAs described above, an area south of Martha's Vineyard and Nantucket, primarily along the western side of Nantucket Shoals, was recently described as an important feeding area (Kraus *et al.,* 2016; O'Brien *et al.,* 2022, Quintano-Rizzo *et al.,* 2021). Its importance as a foraging habitat is well established (Leiter *et al.,* 2017; Estabrook *et al.,* 2022; O'Brien *et al.,* 2022). Nantucket Shoals' unique oceanographic and bathymetric features, including a persistent tidal front, help sustain year-round elevated phytoplankton biomass and aggregate zooplankton prey for NARW (White *et al.,* 2020; Quintana-Rizzo *et al.,* 2021). O'Brien *et al.* (2022) hypothesize that NARW southern New England habitat use has increased in recent years (*i.e.,* over the last decade) as a result of either, or a combination of, a northward shift in prey distribution (thus increasing local prey availability) or a decline in prey in other abandoned feeding areas (*e.g.,* Gulf of Maine), both induced by climate change. Pendleton *et al.* (2022) characterize southern New

England as a ''waiting room'' for NARW in the spring, providing sufficient, although sub-optimal, prey choices while NARW wait for *C. finmarchicus* supplies in Cape Cod Bay (and other primary foraging grounds like the Great South Channel) to optimize as seasonal primary and secondary production progresses. Throughout the year, southern New England provides opportunities for NARW to capitalize on *C. finmarchicus* blooms or alternative prey (*e.g., Pseudocalanus elongatus* and *Centropages* species, found in greater concentrations than *C. finmarchicus* in winter), although likely not to the extent provided seasonally in more well-understood feeding habitats like Cape Cod Bay in late spring or the Great South Channel (O'Brien *et al.,* 2022). Although extensive data gaps, highlighted in a recent report by the National Academy of Sciences (NAS) (2023), have prevented development of a thorough understanding of NARW foraging ecology in the Nantucket Shoals region, it is clear that the habitat was historically valuable to the species based on historical whaling records, and observations over the last decade confirm the area's importance as a feeding habitat.

Harbor Porpoise BIA—East Coast

LaBrecque *et al.* (2015b) identified a small and resident population BIA for harbor porpoise in the Gulf of Maine (see figure 4.1–14 of the application). From July to September, harbor porpoises are concentrated in waters less than 150 m (492 ft) deep in the northern Gulf of Maine and southern Bay of Fundy. During fall (October to December) and spring (April to June), harbor porpoises are widely dispersed from New Jersey to Maine, with lower densities farther north and south (LaBrecque *et al.,* 2015b).

Bottlenose Dolphin BIA—East Coast

LaBrecque *et al.* (2015b) identified nine small and resident bottlenose dolphin population areas within estuarine areas along the east coast of the U.S. (see figure 4.1–11 of the application). These areas include estuarine and nearshore areas extending from Pamlico Sound, North Carolina down to Florida Bay, Florida (LaBrecque *et al.,* 2015b). The Northern North Carolina Estuarine System, Southern North Carolina Estuarine System, and Charleston Estuarine System populations partially overlap with nearshore portions of the Navy Cherry Point Range Complex and Jacksonville Estuarine System Populations partially overlaps with nearshore portions of the Jacksonville Range Complex. The Southern Georgia Estuarine System Population area also overlaps with the Jacksonville Range Complex, specifically within Naval Submarine Base Kings Bay, Kings Bay, Georgia and includes estuarine and intercoastal waterways from Altamaha Sound, to the Cumberland River (LaBrecque *et al.,* 2015b). The remaining four BIAs are outside but adjacent to the AFTT Study Area boundaries.

Bottlenose Dolphin BIA—Gulf of America

LaBrecque *et al.* (2015) also described 11 year-round BIAs for small and resident estuarine stocks of bottlenose dolphin that primarily inhabit inshore waters of bays, sounds, and estuaries (BSE) in the Gulf of America (see figures 4.1–12 and 4.1–13 in the application). Of the 11 BIAs identified for the BSE bottlenose dolphins in the Gulf of America, three overlap with the Gulf Range Complex (Aransas Pass Area, Texas; Mississippi Sound Area, Mississippi; and St. Joseph Bay Area, Florida), while eight are located adjacent to the AFTT Study Area boundaries.

Rice's (Previously Bryde's) Whale BIA—Gulf of America

The Rice's (previously Bryde's) whale is a very small population that is genetically distinct from Bryde's whales and not genetically diverse within the Gulf of America (Rosel and Wilcox, 2014; Rosel *et al.,* 2021). Further, the species is typically observed only within a narrowly circumscribed area within the eastern Gulf of America. Therefore, this area is described as a year-round BIA by LaBrecque *et al.* (2015). Previous survey effort covered all oceanic waters of the U.S. Gulf of America, and whales were observed only between approximately the 100- and 300-m (328- and 984-ft) isobaths in the eastern Gulf of America from the head of the De Soto Canyon (south of Pensacola, Florida) to northwest of Tampa Bay, Florida (Maze-Foley and Mullin, 2006; Waring *et al.,* 2016; Rosel and Wilcox, 2014; Rosel *et al.,* 2016). Rosel *et al.* (2016) expanded this description by stating that, due to the depth of some sightings, the area is more appropriately defined to the 400-m (1,312-ft) isobath and westward to Mobile Bay, Alabama, in order to provide some buffer around the deeper sightings and to include all sightings in the northeastern Gulf of America. Since then, passive acoustic detections of Rice's whale have occurred in the north central and western Gulf of America (Soldevilla *et al.,* 2022; Soldevilla *et al.,* 2024), although the highest densities of Rice's whales have been confined to the northeastern Gulf of America core habitat. The number of individuals that occur in the central and western Gulf of America and nature of their use of this area is poorly understood. Soldevilla *et al.* (2022) suggest that more than one individual was present on at least one occasion, as overlapping calls of different call subtypes were recorded in that instance, but also state that call detection rates suggest that either multiple individuals are typically calling or that individual whales are producing calls at higher rates in the central and western Gulf of America. Soldevilla *et al.* (2024) provide further evidence that Rice's whale habitat encompasses all 100–400 m (328–1,312 ft) depth waters encircling the entire Gulf of America, including Mexican waters (as described in the proposed critical habitat designation (88 FR 47453, July 24, 2023)), but they also note that further research is needed to understand the density of whales in these areas, seasonal changes in whale density, and other aspects of habitat usage.

National Marine Sanctuaries

Under Title III of the Marine Protection, Research, and Sanctuaries Act of 1972 (also known as the National Marine Sanctuaries Act (NMSA)), NOAA can establish as national marine sanctuaries (NMS) areas of the marine environment with special conservation, recreational, ecological, historical, cultural, archaeological, scientific, educational, or aesthetic qualities. Sanctuary regulations prohibit destroying, causing the loss of, or injuring any sanctuary resource managed under the law or regulations for that sanctuary (15 CFR part 922). NMS are managed on a site-specific basis, and each sanctuary has site-specific regulations. Most, but not all sanctuaries have site-specific regulatory exemptions from the prohibitions for certain military activities. Separately, section 304(d) of the NMSA requires Federal agencies to consult with the Office of National Marine Sanctuaries whenever their Proposed Activities are likely to destroy, cause the loss of, or injure a sanctuary resource. There are five designated NMSs and one proposed NMS within the AFTT Study Area (see section 6.1.3 of the 2024 AFTT Draft Supplemental EIS/OEIS). Two of these sanctuaries, Flower Garden Banks NMS in the Gulf of America and Monitor NMS off of North Carolina, do not inform our assessment of impacts to marine mammals and their habitat.

Three NMSs and one proposed NMS within the AFTT Study Area are associated with features that inform our assessment of impacts to marine mammals and their habitat: Gerry E. Studds Stellwagen Bank NMS, Gray's Reef NMS, Florida Keys NMS, and Hudson Canyon Proposed NMS. Stellwagen Bank NMS sits at the mouth of Massachusetts Bay, 3 miles (mi; 4.8 km) south of Cape Ann, 3 mi (4.8 km) north of Cape Cod and 25 mi (40.2 km) due east of Boston and provides feeding and nursery grounds for marine mammals including NARW, humpback, sei, and fin whales. The Stellwagen Bank NMS is within critical habitat for the NARW for foraging (Unit 1). Gray's Reef NMS is 19 mi (30.6 km) east of Sapelo Island Georgia, in the South Atlantic Bight (the offshore area between Cape Hatteras, North Carolina and Cape Canaveral, Florida) and is within the designated critical habitat for NARW calving in the southeast (Unit 2). Florida Keys NMS protects 2,900 nmi^2 (9,947 km^2) of waters surrounding the Florida Keys, from south of Miami westward to encompass the Dry Tortugas, excluding Dry Tortugas National Park and supports a resident group of bottlenose dolphin (Florida Bay Population BIA). The Office of National Marine Sanctuaries is in the process of designating the Hudson Canyon NMS off the coast of New York and New Jersey. Hudson Canyon is the largest submarine canyon along the U.S. Atlantic coast and is one of the largest in the world. Beginning approximately 100 mi (160.9 km) southeast of New York City, the canyon extends about 350 mi (563.3 km) seaward, reaches depths of 2–2.5 mi (3.2–4.0 km), and is up to 7.5 mi (12.1 km) wide. Hudson Canyon is considered an ecological hotspot due to its size and diversity of structures, including steep slopes, firm outcrops for invertebrates, diverse sediments, flux of nutrients, and areas of upwelling that support marine mammals and provides habitat for a range of endangered and protected species, including sperm whales.

Unusual Mortality Events

An Unusual Mortality Event (UME) is defined under section 410(6) of the MMPA as a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response. Three UMEs with ongoing investigations in the AFTT Study Area that inform our analysis are discussed below. The 2022 Maine Pinniped UME has closed, and the 2018 Northeast Pinniped UME is non-active and pending closure.

North Atlantic Right Whale (2017–Present)

Beginning in 2017, elevated mortalities in NARW were documented in Canada and the United States and necessitated an UME be declared. The whales impacted by the UME include dead, injured, and sick individuals, who represent more than 20 percent of the population, which is a significant impact on an endangered species where deaths are outpacing births. Additionally, research demonstrates that only about one third of right whale deaths are documented. The preliminary cause of mortality, serious injury, and morbidity (sublethal injury and illness) in most of these whales is from entanglements or vessel strikes. Endangered NARW are approaching extinction. There are approximately 372 individuals remaining, including fewer than 70 reproductively active females. Human impacts continue to threaten the survival of this species. The many individual whales involved in the UME are a significant setback to the recovery of this endangered species.

Since 2017, dead, seriously injured, sublethally injured, or ill NARW along the United States and Canadian coasts have been documented, necessitating a UME declaration and investigation. The leading category for the cause of death for this ongoing UME is ''human interaction,'' specifically from entanglements or vessel strikes. As of January 2, 2025, there have been 41 confirmed mortalities (dead, stranded, or floating) and 39 seriously injured free-swimming whales for a total of 80 whales. The UME also considers animals with sublethal injury or illness (*i.e.,* ''morbidity''; $n = 71$) bringing the total number of whales in the UME to 151. More information about the NARW UME is available online at *https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2025-north-atlantic-right-whale-unusual-mortality-event.*

Humpback Whale (2017–Present)

Since January 2016, elevated humpback whale mortalities have occurred along the Atlantic coast from Maine to Florida. This event was declared a UME in April 2017. Partial or full necropsy examinations have been conducted on approximately half of the 244 known cases (as of February 6, 2025). Of the whales examined (approximately 90), about 40 percent had evidence of human interaction either from vessel strike or entanglement. While a portion of the whales have shown evidence of pre-mortem vessel strike, this finding is not consistent across all whales examined, and more research is needed. NOAA is consulting with researchers that are conducting studies on the humpback whale populations, and these efforts may provide information on changes in whale distribution and habitat use that could provide additional insight into how these vessel interactions occurred. More information is available at: *https://www.fisheries.noaa.gov/national/marine-life-distress/2016-2025-humpback-whale-unusual-mortality-event-along-atlantic-coast*.

Minke Whale (2017–Present)

Elevated minke whale mortalities detected along the Atlantic coast from Maine through South Carolina resulted in the declaration of an on-going UME in 2017. As of February 10, 2025, a total of 198 minke whales have stranded during this UME. Full or partial necropsy examinations were conducted on more than 60 percent of the whales. Preliminary findings show evidence of human interactions or infectious disease, but these findings are not consistent across all of the minke whales examined, so more research is needed. More information is available at: *https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2025-minke-whale-unusual-mortality-event-along-atlantic-coast*.

Phocid Seals (2018–2020, 2022)

Harbor and gray seals have experienced two UMEs since 2018, although one was recently closed (2022 Pinniped UME in Maine) and closure of the other, described here, is pending. Beginning in July 2018, elevated numbers of harbor seal and gray seal mortalities occurred across Maine, New Hampshire, and Massachusetts. Additionally, stranded seals have shown clinical signs as far south as Virginia, although not in elevated numbers, therefore the UME investigation encompassed all seal strandings from Maine to Virginia. A total of 3,152 reported strandings (of all species) occurred from July 1, 2018, through March 13, 2020. Full or partial necropsy examinations were conducted on some of the seals and samples were collected for testing. Based on tests conducted thus far, the main pathogen found in the seals is phocine distemper virus. NMFS is performing additional testing to identify any other factors that may be involved in this UME, which is pending closure. Information on this UME is available online at: *https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-life-distress/2018-2020-pinniped-unusual-mortality-event-along*.

Deepwater Horizon Oil Spill

In 2010, the BP-operated *Macondo* well blowout and explosion aboard the *Deepwater Horizon* drilling rig (also known as the *Deepwater Horizon* explosion, oil spill, and response; hereafter referred to as the DWH oil spill) caused oil, natural gas, and other substances to flow into the Gulf of America for 87 days before the well was sealed. Total oil discharge was estimated at 3.19 million barrels (134 million gallons), resulting in the largest marine oil spill in history (DWH Natural Resource Damage Assessment (NRDA) Trustees, 2016). In addition, the response effort involved extensive application of dispersants at the seafloor and at the surface, and controlled burning of oil at the surface was also used extensively as a response technique. The oil, dispersant, and burn residue compounds present ecological challenges in the region.

At its maximum extent, oil covered over 15,444 mi^2 (40,000 km^2) of ocean. Cumulatively, over the course of the spill, oil was detected on over 43,243 mi^2 (112,000 km^2) of ocean. Currents, winds, and tides carried these surface oil slicks to shore, fouling more than 1,304.9 mi (2,100 km) of shoreline, including beaches, bays, estuaries, and marshes from eastern Texas to the Florida Panhandle. In addition, some lighter oil compounds evaporated from the slicks, exposing air-breathing organisms like marine mammals to noxious fumes at the sea surface.

DWH oil was found to cause problems with the regulation of stress hormone secretion from adrenal cells and kidney cells, which will affect an animal's ability to regulate body functions and respond appropriately to stressful situations, thus leading to reduced fitness. Bottlenose dolphins living in habitats contaminated with DWH oil showed signs of adrenal dysfunction, and dead, stranded dolphins from areas contaminated with DWH oil had smaller adrenal glands (Schwacke *et al.,* 2014a; Venn-Watson *et al.,* 2015b). Other factors were ruled out as a primary cause for the high prevalence of adverse health effects, reproductive failures, and disease in stranded animals. When all of the data were considered together, the DWH oil spill was determined to be the only reasonable cause for the full suite of observed adverse health effects.

Due to the difficulty of investigating marine mammals in pelagic environments and across the entire region impacted by the event, the injury assessment focused on health assessments conducted on bottlenose dolphins in nearshore habitats and used these populations as case studies for extrapolating to coastal and oceanic populations that received similar or worse exposure to DWH oil, with appropriate adjustments made for differences in behavior, anatomy, physiology, life histories, and population dynamics among species. Investigators then used a population modeling approach to capture the overlapping and synergistic relationships among the metrics for injury, and to quantify the entire scope of DWH marine mammal injury to populations into the future, expressed as ''lost cetacean years'' due to the DWH oil spill (which represents years lost due to premature mortality as well as the resultant loss of reproductive output). This approach allowed for consideration of long-term impacts resulting from immediate losses and reproductive failures in the few years following the spill, as well as expected persistent impacts on survival and reproduction for exposed animals well into the future (Takeshita *et al.,* 2017; Smith *et al.,* 2022). For a more detailed overview of the injury quantification for these stocks and their post-DWH population trajectory, please see Schwacke *et al.* (2017) and Marques *et al.* (2023), and for full details of the overall injury quantification, see DWH Marine Mammal Injury Quantification Team (MMIQT) (2015).

The results of the quantification exercise for each affected shelf and oceanic stock, and for northern and western coastal stocks of bottlenose dolphin, are presented in table 15. This is likely a conservative estimate of impacts, because: (1) Shelf and oceanic species experienced long exposures (up to 90 days) to very high concentrations of fresh oil and a diverse suite of response activities, while estuarine dolphins were not exposed until later in the spill period and to weathered oil products at lower water concentrations; (2) oceanic cetaceans dive longer and to deeper depths, and it is possible that the types of lung injuries observed in estuarine dolphins may be more severe for oceanic cetaceans; and (3) cetaceans in deeper waters were exposed to very high concentrations of volatile gas compounds at the water's surface near the wellhead. No analysis was performed for Fraser's dolphins or killer whales; although they are present in the Gulf of America, sightings are rare and there were no historical sightings in the oil spill footprint during the surveys used in the quantification process. These stocks were likely injured, but no information was available on which to base a quantification effort at that time.

TABLE 15—SUMMARY OF MODELED EFFECTS OF THE DEEPWATER HORIZON OIL SPILL

[DWH NRDA Trustees, 2016]

Common name	Stock	Percent of population exposed to oil (95 percent CI)	Percent of population killed (95 percent CI)	Percent of females with reproductive failure (95 percent CI)	Percent of population with adverse health effects (95 percent CI)	Percent of maximum population reduction (95 percent CI)	Years to recovery (95 percent CI) *
Rice's whale (formerly Bryde's whale).	Northern Gulf of America.	48 (23–100)	17 (7–24)	22 (10–31)	18 (7–28)	−22	69
Sperm whale	Northern Gulf of America.	16 (11–23)	6 (2–8)	7 (3–10)	6 (2–9)	−7	21
Kogia spp	Multiple	15 (8–29)	5 (2–7)	7 (3–10)	6 (2–9)	−6	11
Beaked whales	Multiple	12 (7–22)	4 (2–6)	5 (3–8)	4 (2–7)	−6	10
Bottlenose dolphin	Northern Gulf of America, Oceanic.	10 (5–10)	3 (1–5)	5 (2–6)	4 (1–6)	−4	N/A
Bottlenose dolphin	Gulf of America, Northern Coastal.	82 (55–100)	38 (26–58)	37 (17–53)	30 (11–47)	−50 (32–73)	39 (23–76)

TABLE 15—SUMMARY OF MODELED EFFECTS OF THE DEEPWATER HORIZON OIL SPILL—Continued

[DWH NRDA Trustees, 2016]

Common name	Stock	Percent of population exposed to oil (95 percent CI)	Percent of population killed (95 percent CI)	Percent of females with reproductive failure (95 percent CI)	Percent of population with adverse health effects (95 percent CI)	Percent of maximum population reduction (95 percent CI)	Years to recovery (95 percent CI) *
Bottlenose dolphin	Gulf of America, Western Coastal.	23 (16–32)	1 (1–2)	10 (5–15)	8 (3–13)	−5 (3–9)	N/A
Shelf dolphins **	Multiple	13 (9–19)	4 (2–6)	6 (3–8)	5 (2–7)	−3	N/A
Clymene dolphin	Northern Gulf of America.	7 (3–15)	2 (1–4)	3 (2–5)	3 (1–4)	−3	N/A
False killer whale	Northern Gulf of America.	18 (7–48)	6 (3–9)	8 (4–12)	7 (3–11)	−9	42
Melon-headed whale.	Northern Gulf of America.	15 (6–36)	5 (2–7)	7 (3–10)	6 (2–9)	−7	29
Pantropical spotted dolphin.	Northern Gulf of America.	20 (15–26)	7 (3–10)	9 (4–13)	7 (3–11)	−9	39
Pygmy killer whale	Northern Gulf of America.	15 (7–33)	5 (2–8)	7 (3–10)	6 (2–9)	−7	29
Risso's dolphin	Northern Gulf of America.	8 (5–13)	3 (1–4)	3 (2–5)	3 (1–4)	−3	N/A
Rough-toothed dolphin.	Northern Gulf of America.	41 (16–100)	14 (6–20)	19 (9–26)	15 (6–23)	−17	54
Short-finned pilot whale.	Northern Gulf of America.	6 (4–9)	2 (1–3)	3 (1–40)	2 (1–3)	−3	N/A
Spinner dolphin	Northern Gulf of America.	47 (24–91)	16 (7–23)	21 (10–30)	17 (6–27)	−23	105
Striped dolphin	Northern Gulf of America.	13 (8–22)	5 (2–7)	6 (3–9)	5 (2–8)	−6	14

Note: Table modified from the DWH NRDA Trustees (2016). CI = confidence interval, No CI was calculated for population reduction or years to recovery for shelf or oceanic stocks. Marine mammals in the Gulf of America are named in DWH NRDA Trustees (2016) with reference to the formerly named "Gulf of Mexico." This Notice refers to these marine mammal stocks as Northern Gulf of America stocks. The geographical location of the stocks remains the same.

* It is not possible to calculate years to recovery for stocks with maximum population reductions of less than or equal to 5 percent.

** Shelf dolphins includes Atlantic spotted dolphins and the shelf stock of bottlenose dolphins (20–200 m water depth). These two species were combined because the abundance estimate used in population modeling was derived from aerial surveys and the species could not generally be distinguished from the air.

However, a recent study by Frasier *et al.* (2024), using a widely-spaced passive acoustic monitoring array, found that of eight groups monitored from 2010–2020, seven groups experienced long-term density declines, including beaked whales (up to 83 percent), small delphinids (up to 43 percent), and sperm whales (up to 31 percent). These measured density declines exceed model-predicted changes and do not suggest recovery trends for affected species to date (Frasier *et al.,* 2024). Population consequences of 15 cetacean taxonomic units in pelagic and continental shelf waters (not including killer whales, false killer whales, and Fraser's dolphins) were assessed by Marques *et al.* (2023), who found that the DWH oil spill had the greatest population impacts on spinner dolphins, striped dolphins, sperm whales, oceanic bottlenose dolphins, and *Kogia* species. The number of lost cetacean years was highest for the shelf bottlenose dolphin population (32,584 years) and pantropical spotted dolphin population (31,372 years) (Marques *et al.,* 2023).

Marine Mammal Hearing

Hearing is the most important sensory modality for marine mammals underwater, and exposure to anthropogenic sound can have deleterious effects. To appropriately assess the potential effects of exposure to sound, it is necessary to understand the frequency ranges marine mammals are able to hear. Not all marine mammal species have equal hearing capabilities (*e.g.,* Richardson *et al.,* 1995, Wartzok and Ketten, 1999, Au and Hastings, 2008). To reflect this, Southall *et al.* (2007), Southall *et al.* (2019) recommended that marine mammals be divided into hearing groups based on directly measured (behavioral or auditory evoked potential techniques) or estimated hearing ranges (*e.g.,* behavioral response data, anatomical modeling). NMFS (2024) generalized hearing ranges were chosen based on the approximately 65-dB threshold from the composite audiograms, previous analysis in NMFS (2018), and/or data from Southall *et al.* (2007) and Southall *et al.* (2019). We note that the names of two hearing groups and the generalized hearing ranges of all marine mammal hearing groups have been recently updated (NMFS, 2024) as reflected below in table 16.

TABLE 16—MARINE MAMMAL HEARING GROUPS

[NMFS, 2024]

Hearing group	Generalized hearing range *
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 36 ** kHz.

TABLE 16—MARINE MAMMAL HEARING GROUPS—Continued

[NMFS, 2024]

Hearing group	Generalized hearing range *
High-frequency (HF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz.
Very High-frequency (VHF) cetaceans (true porpoises, *Kogia,* river dolphins, Cephalorhynchid, *Lagenorhynchus cruciger* & *L. australis*).	200 Hz to 165 kHz.
Phocid pinnipeds (PW) (underwater) (true seals)	40 Hz to 90 kHz.
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 68 kHz.

* Represents the generalized hearing range for the entire group as a composite (*i.e.,* all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on the ~65-dB threshold from composite audiogram, previous analysis in NMFS (2018), and/or data from Southall *et al.* (2007) and Southall *et al.* (2019). Additionally, animals are able to detect very loud sounds above and below that ''generalized'' hearing range.

** The Action Proponents split the LF functional hearing group into LF and VLF based on Houser *et al.,* (2024) while NMFS Updated Technical Guidance (NMFS, 2024) does not include these data. NMFS is aware these data and data collected during a final field season by Houser *et al.* (in prep) have implications for the generalized hearing range for low-frequency cetaceans and their weighting function, however, as described in the 2024 Updated Technical Guidance, it is premature for us to propose any changes to our current Updated Technical Guidance. Mysticete hearing data is identified as a special circumstance that could merit reevaluating the acoustic criteria for low-frequency cetaceans in the 2024 Updated Technical Guidance once the data from the final field season is published. Therefore, we anticipate that once the data are published, it will likely necessitate updating this document (*i.e.,* likely after the data gathered in the summer 2024 field season and associated analysis are published).

For more detail concerning these groups and associated frequency ranges, please see NMFS (2024) for a review of available information.

The Navy adjusted these hearing groups using data from recent hearing measurements in minke whales (Houser *et al.,* 2024). These data support separating mysticetes (the LF cetacean marine mammal hearing group in table 16) into two hearing groups, which the Navy designates as ''very low-frequency (VLF) cetaceans'' and ''low-frequency (LF) cetaceans,'' which follows the recommendations of Southall *et al.* (2019a). Within the Navy's adjusted hearing groups, the VLF cetacean group contains the larger mysticetes (blue, fin, right, and bowhead whales) and the LF cetacean group contains the mysticete species not included in the VLF group (*e.g.,* minke, humpback, gray, pygmy right whales). Although there have been no direct measurements of hearing sensitivity in the larger mysticetes included in Navy's VLF hearing group, an audible frequency range of approximately 10 Hz to 30 kHz has been estimated from measured vocalization frequencies, observed responses to playback of sounds, and anatomical analyses of the auditory system. The upper frequency limit of hearing in Navy's LF hearing group has been estimated in a minke whale from direct measurements of auditory evoked potentials (Houser *et al.,* 2024).

Potential Effects of Specified Activities on Marine Mammals and Their Habitat

This section provides a discussion of the ways in which components of the specified activity may impact marine mammals and their habitat. The *Estimated Take of Marine Mammals* section later in this document includes a quantitative analysis of the number of individuals that are expected to be taken by this activity. The *Preliminary Analysis and Negligible Impact Determination* section considers the content of this section, the *Estimated Take of Marine Mammals* section, and the *Proposed Mitigation Measures* section, to draw conclusions regarding the likely impacts of these activities on the reproductive success or survivorship of individuals and whether those impacts on individuals are likely to adversely affect the species through effects on annual rates of recruitment or survival.

The Action Proponents have requested authorization for the take of marine mammals that may occur incidental to training and testing activities in the AFTT Study Area. The Action Proponents analyzed potential impacts to marine mammals from acoustic and explosive sources and from vessel use in the application. NMFS carefully reviewed the information provided by the Action Proponents and concurs with their synthesis of science, along with independently reviewing applicable scientific research and literature and other information to evaluate the potential effects of the Action Proponents' activities on marine mammals, which are presented in this section (see appendix D in the 2024 AFTT Draft Supplemental EIS/OEIS for additional information).

Other potential impacts to marine mammals from training and testing activities in the AFTT Study Area were analyzed in the 2024 AFTT Draft Supplemental EIS/OEIS, in consultation with NMFS as a cooperating agency, and determined to be unlikely to result in marine mammal take. Therefore, the Action Proponents have not requested authorization for take of marine mammals incidental to other components of their proposed Specified Activities, and we agree that incidental take is unlikely to occur from those components. In this proposed rule, NMFS analyzes the potential effects on marine mammals from the activity components that may cause the take of marine mammals: exposure to acoustic or explosive stressors including non-impulsive (sonar and other transducers, and vibratory pile driving) and impulsive (explosives, impact pile driving, and air guns) stressors and vessel movement.

For the purpose of MMPA incidental take authorizations, NMFS' effects assessments serve four primary purposes: (1) to determine whether the specified activities would have a negligible impact on the affected species or stocks of marine mammals (based on whether it is likely that the activities would adversely affect the species or stocks through effects on annual rates of recruitment or survival); (2) to determine whether the specified activities would have an unmitigable adverse impact on the availability of the species or stocks for subsistence uses; (3) to prescribe the permissible methods of taking (*i.e.,* Level B harassment (behavioral harassment and temporary threshold shift (TTS)), Level A harassment (auditory (AUD INJ) and non-auditory injury), serious injury, or mortality), including identification of the number and types of take that could occur by harassment, serious injury, or mortality, and to prescribe other means of effecting the least practicable adverse impact on the species or stocks and their habitat (*i.e.,* mitigation measures); and (4) to prescribe requirements pertaining to monitoring and reporting.

In this section, NMFS provides a description of the ways marine mammals may be generally affected by these activities in the form of mortality, physical injury, sensory impairment (permanent and temporary threshold shifts and acoustic masking), physiological responses (particular stress responses), behavioral disturbance, or habitat effects. Explosives and vessel strikes, which have the potential to result in incidental take by serious injury and/or mortality, will be discussed in more detail in the *Estimated Take of Marine Mammals* section. The *Estimated Take of Marine Mammals* section also discusses how the potential effects on marine mammals from non-impulsive and impulsive sources relate to the MMPA definitions of Level A Harassment and Level B Harassment, and quantifies those effects that rise to the level of a take. The *Preliminary Analysis and Negligible Impact Determination* section assesses whether the proposed authorized take would have a negligible impact on the affected species and stocks.

Potential Effects of Underwater Sound on Marine Mammals

The marine soundscape is comprised of both ambient and anthropogenic sounds. Ambient sound is defined as the all-encompassing sound in a given place and is usually a composite of sound from many sources both near and far (ANSI, 1995). The sound level of an area is defined by the total acoustical energy being generated by known and unknown sources, which may include physical (*e.g.,* waves, wind, precipitation, earthquakes, ice, atmospheric sound), biological (*e.g.,* sounds produced by marine mammals, fish, and invertebrates), and anthropogenic sound (*e.g.,* vessels, dredging, aircraft, construction).

The sum of the various natural and anthropogenic sound sources at any given location and time—which comprise ''ambient'' or ''background'' sound—depends not only on the source levels (as determined by current weather conditions and levels of biological and shipping activity) but also on the ability of sound to propagate through the environment. In turn, sound propagation is dependent on the spatially and temporally varying properties of the water column and sea floor and is frequency-dependent. As a result of the dependence on a large number of varying factors, ambient sound levels can be expected to vary widely over both coarse and fine spatial and temporal scales. Sound levels at a given frequency and location can vary by 10–20 dB from day to day (Richardson *et al.,* 1995). The result is that, depending on the source type and its intensity, sound from the specified activities may be a negligible addition to the local environment or could form a distinctive signal that may affect marine mammals.

Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of highly variable impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and various other factors. The potential effects of underwater sound from active acoustic sources can possibly result in one or more of the following: temporary or permanent hearing impairment, other auditory injury, non-auditory physical or physiological effects, behavioral disturbance, stress, and masking (Richardson *et al.,* 1995; Gordon *et al.,* 2004; Nowacek *et al.,* 2007; Southall *et al.,* 2007; Götz *et al.,* 2009, Southall *et al.,* 2019a). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high-level sounds can cause auditory injury, as can longer exposures to lower level sounds. Temporary or permanent loss of hearing can occur after exposure to noise, and occurs almost exclusively for noise within an animal's hearing range.

Richardson *et al.* (1995) described zones of increasing intensity of effect that might be expected to occur, in relation to distance from a source and assuming that the signal is within an animal's hearing range. First is the area within which the acoustic signal would be audible (potentially perceived) to the animal, but not strong enough to elicit any overt behavioral or physiological response. The next zone corresponds with the area where the signal is audible to the animal and of sufficient intensity to elicit behavioral or physiological responsiveness. Third is a zone within which, for signals of high intensity, the received level is sufficient to potentially cause discomfort or non-auditory injury to auditory systems. Overlaying these zones to a certain extent is the area within which masking (*i.e.,* when a sound interferes with or masks the ability of an animal to detect a signal of interest that is above the absolute hearing threshold) may occur; the masking zone may be highly variable in size.

We also describe more severe potential effects (*i.e.,* certain non-auditory physical or physiological effects). Potential effects from impulsive sound sources can range in severity from effects such as behavioral disturbance or tactile perception to physical discomfort, slight injury of the internal organs and the auditory system, or, in the case of explosives, more severe injuries or mortality (Yelverton *et al.,* 1973). Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to high levels of underwater sound or as a secondary effect of extreme behavioral responses (*e.g.,* change in dive profile as a result of an avoidance response) caused by exposure to sound include neurological effects, bubble formation, resonance effects, and other types of organ or non-auditory injury (Cox *et al.,* 2006; Southall *et al.,* 2007; Zimmer and Tyack, 2007; Tal *et al.,* 2015).

Hearing

Marine mammals have adapted hearing based on their biology and habitat: amphibious marine mammals (*e.g.,* pinnipeds that spend time on land and underwater) have modified ears that allow them to hear both in-air and in-water, while fully aquatic marine mammals (*e.g.,* cetaceans that are always underwater) have specialized ear adaptations for in-water hearing (Wartzok and Ketten, 1999). These adaptations explain the variation in hearing ability and sensitivity among marine mammals and have led to the characterization of marine mammal functional hearing groups based on those sensitivities: very low-frequency cetaceans (VLF group: blue, fin, right, and bowhead whales), low-frequency cetaceans (LF group: minke, sei, Bryde's, Rice's, humpback, gray, and pygmy right whales), high-frequency cetaceans (HF group: sperm whales, beaked whales, killer whale, melon-headed whale, false/pygmy killer whale, pilot whales, and some dolphin species), very high-frequency cetaceans (VHF group: some dolphin species, porpoises, Amazon River dolphin, *Kogia* species, Baiji, and La Plata dolphin), sirenians (SI group: manatees, dugongs), otariids and other non-phocid marine carnivores in water and in air (OCW and OCA groups: sea lion, fur seal, walrus, otter), and phocids in water and in air (PCW and PCA groups: true seals) (Southall *et al.,* 2019c). In Phase III, VLF and LF cetaceans were part of one, combined LF cetacean hearing group. However, as described in the Navy's report ''Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase 4)'' (U.S. Department of the Navy, 2024), Houser *et al.* (2024) recently reported hearing measurements for minke whales. The Action

Proponents incorporated these measurements, as well as Southall *et al.* (2019c), into their analysis. They determined that the data support dividing mysticetes into two separate hearing groups: VLF and LF cetacean, and NMFS concurs (as described further in the Estimated Take of Marine Mammals section), that this approach is appropriate for this action.

The hearing sensitivity of marine mammals is also directional, meaning the angle between an animal's position and the location of a sound source impacts the animal's hearing threshold, thereby impacting an animal's ability to perceive the sound emanating from that source. This directionality is likely useful for determining the general location of a sound, whether for detection of prey, predators, or members of the same species, and can be dependent upon the frequency of the sound (Accomando *et al.,* 2020; Au and Moore, 1984; Byl *et al.,* 2016; Byl *et al.* 2019; Kastelein *et al.,* 2005; Kastelein *et al.,* 2019; Popov and Supin, 2009).

Acoustic Signaling

An acoustic signal refers to the sound waves used to communicate underwater, and marine mammals use a variety of acoustic signals for socially important functions, such as communicating, as well as biologically important functions, such as echolocating (Richardson *et al.,* 1995; Wartzok and Ketten, 1999). Acoustic signals used for communication are lower frequency (*i.e.,* 20 Hz to 30 kHz) than those signals used for echolocation, which are high-frequency (approximately 10–200 kHz peak frequency) signals used by odontocetes to sense their underwater environment. Lower frequency vocalizations used for communication may have a specific, prominent fundamental frequency (Brady *et al.,* 2021) or have a wide frequency range, depending on the functional hearing group and whether the marine mammal is vocalizing in-water or in-air. Acoustic signals used for echolocation are high-frequency, high-energy sounds with patterns and peak frequencies that are often species-specific (Baumann-Pickering *et al.,* 2013).

Marine mammal species typically produce sounds at frequencies within their own hearing range, though auditory and vocal ranges do not perfectly align (*e.g.,* odontocetes may only hear a portion of the frequencies of an echolocation click). Because determining a species vocal range is easier than determining a species' hearing range, vocal ranges are often used to infer a species' hearing range when species-specific hearing data are not available (*e.g.,* large whale species).

Hearing Loss and Auditory Injury

Marine mammals, like all mammals, lose their ability to hear over time due to age-related degeneration of auditory pathways and sensory cells of the inner ear. This natural, age-related hearing loss is distinct from acute noise-induced hearing loss (Møller, 2013). Noise-induced hearing loss can be temporary (*i.e.,* TTS) or permanent (permanent threshold shift, PTS), and higher-level sound exposures are more likely to cause PTS or other AUD INJ. For marine mammals, AUD INJ is considered to be possible when sound exposures are sufficient to produce 40 dB of TTS measured approximately 4 minutes after exposure (U.S. Department of the Navy, 2024). Numerous studies have directly examined noise-induced hearing loss in marine mammals by measuring an animal's hearing threshold before and after exposure to intense sounds. The difference between the post-exposure and pre-exposure hearing thresholds is then used to determine the amount of TTS (in dB) that was produced as a result of the sound exposure (see appendix D of the 2024 AFTT Draft Supplemental EIS/OEIS for additional details). The Navy used these studies to generate exposure functions, which are predictions of the onset of TTS or PTS based on sound frequency, level, and type (continuous or impulsive), for each marine mammal functional hearing group (U.S. Department of the Navy, 2024).

TTS can last from minutes or hours to days (*i.e.,* there is recovery back to baseline/pre-exposure hearing threshold), can occur within a specific frequency range (*i.e.,* an animal might only have a temporary loss of hearing sensitivity within a limited frequency band of its auditory range), and can be of varying amounts (*e.g.,* an animal's hearing sensitivity might be reduced by only 6 dB or reduced by 30 dB). While there is no simple functional relationship between TTS and PTS or other AUD INJ (*e.g.,* neural degeneration), as TTS increases, the likelihood that additional exposure to increased sound pressure level (SPL) or duration will result in PTS or other injury also increases (see the 2024 AFTT Draft Supplemental EIS/OEIS for additional discussion). Exposure thresholds for the occurrence of AUD INJ, which include the potential for PTS, as well as situations when AUD INJ occurs without PTS, can therefore be defined based on a specific amount of TTS; that is, although an exposure has been shown to produce only TTS, we assume that any additional exposure may result in some AUD INJ. The specific upper limit of TTS is based on experimental data showing amounts of TTS that have not resulted in AUD INJ. In other words, we do not need to know the exact functional relationship between TTS and AUD INJ, we only need to know the upper limit for TTS before some AUD INJ is possible. In severe cases of AUD INJ, there can be total or partial deafness, while in most cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter, 1985).

The following physiological mechanisms are thought to play a role in inducing auditory threshold shift: effects to sensory hair cells in the inner ear that reduce their sensitivity; modification of the chemical environment within the sensory cells; residual muscular activity in the middle ear; displacement of certain inner ear membranes; increased blood flow; and post-stimulatory reduction in both efferent and sensory neural output (Southall *et al.,* 2007). The amplitude, duration, frequency, temporal pattern, and energy distribution of sound exposure all can affect the amount of associated threshold shift and the frequency range in which it occurs. Generally, the amount of threshold shift, and the time needed to recover from the effect, increase as amplitude and duration of sound exposure increases. Human non-impulsive noise exposure guidelines are based on the assumption that exposures of equal energy (the same SEL) produce equal amounts of hearing impairment regardless of how the sound energy is distributed in time (NIOSH, 1998). Previous marine mammal TTS studies have also generally supported this equal energy relationship (Southall *et al.,* 2007). SEL is used to predict TTS in marine mammals and is considered a good predictor of TTS for shorter duration exposures than longer duration exposures. The amount of TTS increases with exposure SPL and duration, and is correlated with SEL, but duration of the exposure has a more significant effect on TTS than would be predicted based on SEL alone (*e.g.,* Finneran *et al.,* 2010b; Kastak *et al.,* 2007; Kastak *et al.,* 2005; Kastelein *et al.,* 2014a; Mooney *et al.,* 2009a; Popov *et al.,* 2014; Gransier and Kastelein, 2024). These studies highlight the inherent complexity of predicting TTS onset in marine mammals, as well as the importance of considering exposure duration when assessing potential impacts.

Generally, TTS increases with SEL in a non-linear fashion, where lower SEL exposures will elicit a steady rate of TTS increase while higher SEL exposures will either increase TTS more rapidly or plateau (Finneran, 2015; U.S. Department of the Navy, 2024). Additionally, with sound exposures of equal energy, those that had lower SPL with longer duration were found to induce TTS onset at lower levels than those of higher SPL and shorter duration. Less threshold shift will occur from intermittent sounds than from a continuous exposure with the same energy (some recovery can occur between intermittent exposures) (Kryter *et al.,* 1966; Ward, 1997; Mooney *et al.,* 2009a, 2009b; Finneran *et al.,* 2010; Kastelein *et al.,* 2014; Kastelein *et al.,* 2015). For example, one short higher SPL sound exposure may induce the same impairment as one longer lower SPL sound, which in turn may cause more impairment than a series of several intermittent softer sounds with the same total energy (Ward, 1997). Additionally, though TTS is temporary, very prolonged or repeated exposure to sound strong enough to elicit TTS, or shorter-term exposure to sound levels well above the TTS threshold, can cause AUD INJ, at least in terrestrial mammals (Kryter, 1985; Lonsbury-Martin *et al.,* 1987).

Although TTS increases non-linearly in marine mammals, recovery from TTS typically occurs in a linear fashion with the logarithm of time (Finneran, 2015; Finneran *et al.,* 2010a; Finneran *et al.,* 2010b; Finneran and Schlundt, 2013; Kastelein *et al.,* 2012a; Kastelein *et al.,* 2012b; Kastelein *et al.,* 2013a; Kastelein *et al.,* 2014a; Kastelein *et al.,* 2014b; Kastelein *et al.,* 2014c; Popov *et al.,* 2014; Popov *et al.,* 2013; Popov *et al.,* 2011; Muslow *et al.,* 2023; Finneran *et al.,* 2023). Considerable variation has been measured in individuals of the same species in both the amount of TTS incurred from similar SELs (Kastelein *et al.,* 2012a; Popov *et al.,* 2013) and the time-to-recovery from TTS (Finneran, 2015; Kastelein *et al.,* 2019e). Many of these studies relied on continuous sound exposures, but intermittent, impulsive sound exposures have also been tested. The sound resulting from an explosive detonation is considered an impulsive sound, but no direct measurements of hearing loss from exposure to explosive sources have been made. Few studies (Finneran *et al.,* 2002; Lucke *et al.,* 2009; Sills *et al.,* 2020; Muslow *et al.,* 2023) using impulsive sounds have produced enough TTS to make predictions about hearing loss due to this source type (see U.S. Department of the Navy, 2024a). In general, predictions of TTS based on SEL for this type of sound exposure are likely to overestimate TTS because some recovery from TTS may occur in the quiet periods between impulsive sounds—especially when the duty cycle is low. Peak SPL (unweighted) is also used to predict TTS due to impulsive sounds (Southall *et al.,* 2007; Southall *et al.,* 2019c; U.S. Department of the Navy, 2024a).

In some cases, intense noise exposures have caused AUD INJ (*e.g.,* loss of cochlear neuron synapses), despite thresholds eventually returning to normal; *i.e.,* it is possible to have AUD INJ without a resulting PTS (*e.g.,* Kujawa and Liberman, 2006, 2009; Kujawa, 2010; Fernandez *et al.,* 2015; Ryan *et al.,* 2016; Houser, 2021). In these situations, however, threshold shifts were 30–50 dB measured 24 hours after the exposure; *i.e.,* there is no evidence that an exposure resulting in less than 40 dB TTS measured a few minutes after exposure can produce AUD INJ. Therefore, an exposure producing 40 dB of TTS, measured a few minutes after exposure, can also be used as an upper limit to prevent AUD INJ; *i.e.,* it is assumed that exposures beyond those capable of causing 40 dB of TTS have the potential to result in INJ (which may or may not result in PTS).

Irreparable damage to the inner or outer cochlear hair cells may cause PTS; however, other mechanisms are also involved, such as exceeding the elastic limits of certain tissues and membranes in the middle and inner ears and resultant changes in the chemical composition of the inner ear fluids (Southall *et al.,* 2007). When AUD INJ occurs, there is physical damage to the sound receptors in the ear, whereas TTS represents primarily tissue fatigue and is reversible (Southall *et al.,* 2007). AUD INJ is permanent (*i.e.,* there is incomplete recovery back to baseline/pre-exposure levels) but also can occur in a specific frequency range and amount as mentioned above for TTS. In addition, other investigators have suggested that TTS is within the normal bounds of physiological variability and tolerance and does not represent physical injury (*e.g.,* Ward, 1997). Therefore, NMFS does not consider less than 40 dB of TTS to constitute AUD INJ. The NMFS Acoustic Updated Technical Guidance (NMFS, 2024), which was used in the assessment of effects for this rule, compiled, interpreted, and synthesized the best available scientific information for noise-induced hearing effects for marine mammals to derive updated thresholds for assessing the impacts of noise on marine mammal hearing.

While many studies have examined noise-induced hearing loss in marine mammals (see Finneran (2015) and Southall *et al.* (2019a) for summaries), published data on the onset of TTS for cetaceans are limited to the captive bottlenose dolphin, beluga, harbor porpoise, and Yangtze finless porpoise, and for pinnipeds in water, measurements of TTS are limited to harbor seals, elephant seals, California sea lions, and bearded seals. These studies examine hearing thresholds measured in marine mammals before and after exposure to intense sounds, which can then be used to determine the amount of threshold shift at various post-exposure times. NMFS has reviewed the available studies, which are summarized below (see also the 2024 AFTT Draft Supplemental EIS/OEIS which includes additional discussion on TTS studies related to sonar and other transducers).

- The method used to test hearing may affect the resulting amount of measured TTS, with neurophysiological measures producing larger amounts of TTS compared to psychophysical measures (Finneran *et al.,* 2007; Finneran, 2015; Finneran *et al.,* 2023).
- The amount of TTS varies with the hearing test frequency. As the exposure SPL increases, the frequency at which the maximum TTS occurs also increases (Kastelein *et al.,* 2014b). For high-level exposures, the maximum TTS typically occurs one-half to one octave above the exposure frequency (Finneran *et al.,* 2007; Mooney *et al.,* 2009a; Nachtigall *et al.,* 2004; Popov *et al.,* 2011; Popov *et al.,* 2013; Schlundt *et al.,* 2000). The overall spread of TTS from tonal exposures can therefore extend over a large frequency range (*i.e.,* narrowband exposures can produce broadband (greater than one octave) TTS).
- The amount of TTS increases with exposure SPL and duration and is correlated with SEL, especially if the range of exposure durations is relatively small (Kastak *et al.,* 2007; Kastelein *et al.,* 2014b; Popov *et al.,* 2014). As the exposure duration increases, however, the relationship between TTS and SEL begins to break down. Specifically, duration has a more significant effect on TTS than would be predicted on the basis of SEL alone (Finneran *et al.,* 2010a; Kastak *et al.,* 2005; Mooney *et al.,* 2009a). This means if two exposures have the same SEL but different durations, the exposure with the longer duration (thus lower SPL) will tend to produce more TTS than the exposure with the higher SPL and shorter duration. In most acoustic impact assessments, the scenarios of interest involve shorter duration exposures than the marine mammal experimental data from which impact thresholds are derived; therefore, use of SEL tends to

over-estimate the amount of TTS. Despite this, SEL continues to be used in many situations because it is relatively simple, more accurate than SPL alone, and lends itself easily to scenarios involving multiple exposures with different SPL (Finneran, 2015).

• Gradual increases of TTS may not be directly observable with increasing exposure levels, before the onset of PTS (Reichmuth *et al.,* 2019). Similarly, PTS can occur without measurable behavioral modifications (Reichmuth *et al.,* 2019).

• The amount of TTS depends on the exposure frequency. Sounds at low frequencies, well below the region of best sensitivity, are less hazardous than those at higher frequencies, near the region of best sensitivity (Finneran and Schlundt, 2013). The onset of TTS—defined as the exposure level necessary to produce 6 dB of TTS (*i.e.,* clearly above the typical variation in threshold measurements)—also varies with exposure frequency. At the low frequency end of a species' hearing curve, onset-TTS exposure levels are higher compared to those in the region of best sensitivity.

• TTS can accumulate across multiple exposures, but the resulting TTS will be less than the TTS from a single, continuous exposure with the same SEL (Finneran *et al.,* 2010a; Kastelein *et al.,* 2014b; Kastelein *et al.,* 2015b; Mooney *et al.,* 2009b). This means that TTS predictions based on the total, cumulative SEL will overestimate the amount of TTS from intermittent exposures such as sonars and impulsive sources.

• The amount of observed TTS tends to decrease with increasing time following the exposure; however, the relationship is not monotonic (*i.e.,* increasing exposure does not always increase TTS). The time required for complete recovery of hearing depends on the magnitude of the initial shift; for relatively small shifts recovery may be complete in a few minutes, while large shifts (*e.g.,* approximately 40 dB) may require several days for recovery. Under many circumstances TTS recovers linearly with the logarithm of time (Finneran *et al.,* 2010a, 2010b; Finneran and Schlundt, 2013; Kastelein *et al.,* 2012a; Kastelein *et al.,* 2012b; Kastelein *et al.,* 2013a; Kastelein *et al.,* 2014b; Kastelein *et al.,* 2014c; Popov *et al.,* 2011; Popov *et al.,* 2013; Popov *et al.,* 2014). This means that for each doubling of recovery time, the amount of TTS will decrease by the same amount (*e.g.,* 6 dB recovery per doubling of time).

Nachtigall *et al.* (2018) and Finneran (2018) describe the measurements of hearing sensitivity of multiple odontocete species (bottlenose dolphin, harbor porpoise, beluga, and false killer whale) when a relatively loud sound was preceded by a warning sound. These captive animals were shown to reduce hearing sensitivity when warned of an impending intense sound. Based on these experimental observations of captive animals, the authors suggest that wild animals may dampen their hearing during prolonged exposures or if conditioned to anticipate intense sounds. Finneran (2018) recommends further investigation of the mechanisms of hearing sensitivity reduction in order to understand the implications for interpretation of existing TTS data obtained from captive animals, notably for considering TTS due to short duration, unpredictable exposures.

Marine mammal hearing plays a critical role in communication with conspecifics and in interpretation of environmental cues for purposes such as predator avoidance and prey capture. Depending on the degree (elevation of threshold in dB), duration (*i.e.,* recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious similar to those discussed in auditory masking, below. For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that takes place during a time where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during a time when communication is critical for successful mother/calf interactions could have more serious impacts if it were in the same frequency band as the necessary vocalizations and of a severity that impeded communication. The fact that animals exposed to high levels of sound that would be expected to result in this physiological response would also be expected to have behavioral responses of a comparatively more severe or sustained nature is potentially more significant than the simple existence of a TTS. However, it is important to note that TTS could occur due to longer exposures to sound at lower levels so that a behavioral response may not be elicited.

Depending on the degree and frequency range, the effects of AUD INJ on an animal could also range in severity, although it is considered generally more serious than TTS because it is a permanent condition (Reichmuth *et al.,* 2019). Of note, reduced hearing sensitivity as a simple function of aging has been observed in marine mammals, as well as humans and other taxa (Southall *et al.,* 2007), so we can infer that strategies exist for coping with this condition to some degree, though likely not without some cost to the animal.

As the amount of research on hearing sensitivity has grown, so, too, has the understanding that marine mammals may be able to self-mitigate, or protect, against noise-induced hearing loss. An animal may learn to reduce or suppress their hearing sensitivity when warned of an impending intense sound exposure, or if the duty cycle of the sound source is predictable (Finneran, 2018; Finneran *et al.,* 2024; Nachtigall and Supin, 2013, 2014, 2015; Nachtigall *et al.,* 2015; Nachtigall *et al.,* 2016a, 2018; Nachtigall *et al.,* 2016b). This has been shown with several species, including the false killer whale (Nachtigall and Supin, 2013), bottlenose dolphin (Finneran, 2018; Nachtigall and Supin, 2014, 2015; Nachtigall *et al.,* 2016b), beluga whale (Nachtigall *et al.,* 2015), and harbor porpoise (Nachtigall *et al.,* 2016a). Additionally, Finneran *et al.* (2023) and Finneran *et al.* (2024) found that odontocetes that had participated in TTS experiments in the past could have learned from that experience and subsequently protected their hearing during new sound exposure experiments.

Behavioral Responses

Behavioral responses to sound are highly variable and context-specific (Nowacek *et al.,* 2007; Southall *et al.,* 2007; Southall *et al.,* 2019). Many different variables can influence an animal's perception of and response to (nature and magnitude) an acoustic event. An animal's prior experience with a sound or sound source affects whether it is less likely (habituation, self-mitigation) or more likely (sensitization) to respond to certain sounds in the future (animals can also be innately predisposed to respond to certain sounds in certain ways) (Southall *et al.,* 2007; Southall *et al.,* 2016; Finneran, 2018; Finneran *et al.,* 2024; Nachtigall & Supin, 2013, 2014, 2015; Nachtigall *et al.,* 2015; Nachtigall *et al.,* 2016a, 2018; Nachtigall *et al.,* 2016b). Related to the sound itself, the perceived proximity of the sound, bearing of the sound (approaching vs. retreating), the similarity of a sound to biologically relevant sounds in the animal's environment (*i.e.,* calls of predators, prey, or conspecifics), familiarity of the sound, and navigational constraints may affect the way an animal responds to the sound (Ellison *et al.,* 2011; Southall *et al.,* 2007, DeRuiter *et al.,* 2013, Southall *et al.,* 2021; Wartzok *et al.,* 2003). Individuals (of different age, gender, reproductive status, *etc.*) among most populations will have variable hearing capabilities, and differing behavioral sensitivities to sounds that will be affected by prior conditioning, experience, and current activities of those individuals. Southall *et al.* (2007) and Southall *et al.* (2021) have developed and subsequently refined methods developed to categorize and assess the severity of acute behavioral responses, considering impacts to individuals that may consequently impact populations. Often, specific acoustic features of the sound and contextual variables (*i.e.,* proximity, duration, or recurrence of the sound or the current behavior that the marine mammal is engaged in or its prior experience), as well as entirely separate factors such as the physical presence of a nearby vessel, may be more relevant to the animal's response than the received level alone.

Studies by DeRuiter *et al.* (2012) indicate that variability of responses to acoustic stimuli depends not only on the species receiving the sound and the sound source, but also on the social, behavioral, or environmental contexts of exposure. Another study by DeRuiter *et al.* (2013) examined behavioral responses of goose-beaked whales to MF sonar and found that whales responded strongly at low received levels (89–127 dB re 1 μPa) by ceasing normal fluking and echolocation, swimming rapidly away, and extending both dive duration and subsequent non-foraging intervals when the sound source was 2.1–5.9 mi (3.4–9.5 km) away. Importantly, this study also showed that whales exposed to a similar range of received levels (78–106 dB re 1 μPa) from distant sonar exercises 73.3 mi (118 km away) did not elicit such responses, suggesting that context may moderate responses.

Ellison *et al.* (2012) outlined an approach to assessing the effects of sound on marine mammals that incorporates contextual-based factors. The authors recommend considering not just the received level of sound, but also the activity the animal is engaged in at the time the sound is received, the nature and novelty of the sound (*i.e.,* is this a new sound from the animal's perspective), and the distance between the sound source and the animal. They submit that this ''exposure context,'' as described, greatly influences the type of behavioral response exhibited by the animal. Forney *et al.* (2017) also point out that an apparent lack of response (*e.g.,* no displacement or avoidance of a sound source) may not necessarily mean there is no cost to the individual or population, as some resources or habitats may be of such high value that animals may choose to stay, even when experiencing stress or hearing loss. Forney *et al.* (2017) recommend considering both the costs of remaining in an area of noise exposure such as TTS, PTS, or masking, which could lead to an increased risk of predation or other threats or a decreased capability to forage, and the costs of displacement, including potential increased risk of vessel strike, increased risks of predation or competition for resources, or decreased habitat suitable for foraging, resting, or socializing. This sort of contextual information is challenging to predict with accuracy for ongoing activities that occur over large spatial and temporal expanses. However, distance is one contextual factor for which data exist to quantitatively inform a take estimate, and the method for predicting Level B harassment in this rule does consider distance to the source. Other factors are often considered qualitatively in the analysis of the likely consequences of sound exposure, where supporting information is available.

Friedlaender *et al.* (2016) provided the first integration of direct measures of prey distribution and density variables incorporated into across-individual analyses of behavior responses of blue whales to sonar, and demonstrated a five-fold increase in the ability to quantify variability in blue whale diving behavior. These results illustrate that responses evaluated without such measurements for foraging animals may be misleading, which again illustrates the context-dependent nature of the probability of response.

Exposure of marine mammals to sound sources can result in, but is not limited to, no response or any of the following observable responses: increased alertness; orientation or attraction to a sound source; vocal modifications; cessation of feeding; cessation of social interaction; alteration of movement or diving behavior; habitat abandonment (temporary or permanent); and, in severe cases, panic, flight, stampede, or stranding, potentially resulting in death (Southall *et al.,* 2007). A review of marine mammal responses to anthropogenic sound was first conducted by Richardson (1995). More recent reviews (Nowacek *et al.,* 2007; DeRuiter *et al.,* 2012 and 2013; Ellison *et al.,* 2012; Gomez *et al.,* 2016) address studies conducted since 1995 and focused on observations where the received sound level of the exposed marine mammal(s) was known or could be estimated. Gomez *et al.* (2016) conducted a review of the literature considering the contextual information of exposure in addition to received level and found that higher received levels were not always associated with more severe behavioral responses and vice versa. Southall *et al.* (2016) state that results demonstrate that some individuals of different species display clear yet varied responses, some of which have negative implications, while others appear to tolerate high levels, and that responses may not be fully predictable with simple acoustic exposure metrics (*e.g.,* received sound level). Rather, the authors state that differences among species and individuals along with contextual aspects of exposure (*e.g.,* behavioral state) appear to affect response probability (Southall *et al.,* 2019). The following subsections provide examples of behavioral responses to stressors that provide an idea of the variability in responses that would be expected given the differential sensitivities of marine mammal species to sound and the wide range of potential acoustic sources to which a marine mammal may be exposed. Behavioral responses that could occur for a given sound exposure should be determined from the literature that is available for each species (see section D.6.5 (Behavioral Reactions) of the 2024 AFTT Draft Supplemental EIS/OEIS for a comprehensive list of behavioral studies and species-specific findings), or extrapolated from closely related species when no information exists, along with contextual factors.

Responses Due to Sonar and Other Transducers—

Mysticetes responses to sonar and other duty-cycled tonal sounds are dependent upon the characteristics of the signal, behavioral state of the animal, sensitivity and previous experience of an individual, and other contextual factors including distance of the source, movement of the source, physical presence of vessels, time of year, and geographic location (Goldbogen *et al.,* 2013; Harris *et al.,* 2019a; Harris *et al.,* 2015; Martin *et al.,* 2015; Sivle *et al.,* 2015b). For example, a behavioral response study (BRS) in Southern California demonstrated that individual behavioral state was critically important in determining response of blue whales to Navy sonar. In this BRS, some blue whales engaged in deep (greater than 164 ft (50 m)) feeding behavior had greater dive responses than those in shallow feeding or non-feeding conditions, while some blue whales that were engaged in shallow feeding behavior demonstrated no clear changes in diving or movement even when received levels were high (approximately 160 dB re 1 μPa) from exposures to 3–4 kHz sonar signals, while others showed a clear response at exposures at lower received level of sonar and pseudorandom noise (Goldbogen *et al.,* 2013). Generally, behavioral responses were brief and of low to moderate severity, and the whales returned to baseline behavior shortly after the end of the acoustic exposure (DeRuiter *et al.,* 2017; Goldbogen *et al.,* 2013; Southall *et al.,* 2019c). To better understand the context to these behavioral responses, Friedlaender *et al.* (2016) mapped the prey field of the deep-diving blue whales and found that the response to sound was more apparent for individuals engaged in feeding than those that were not. The probability of a moderate behavioral response increased when the source was closer for these foraging blue whales, although there was a high degree of uncertainty in that relationship (Southall *et al.,* 2019b). In the same BRS, none of the tagged fin whales demonstrated more than a brief or minor response regardless of their behavioral state (Harris *et al.,* 2019a). The fin whales were exposed to both mid-frequency simulated sonar and pseudorandom noise of similar frequency, duration, and source level. They were less sensitive to disturbance than blue whales, with no significant differences in response between behavioral states or signal types. The authors rated responses as low-to-moderate severity with no negative impact to foraging success (Southall *et al.,* 2023).

Similarly, while the rates of foraging lunges decrease in humpback whales due to sonar exposure, there was variability in the response across individuals, with one animal ceasing to forage completely and another animal starting to forage during the exposure (Sivle *et al.,* 2016). In addition, almost half of the animals that exhibited avoidance behavior were foraging before the exposure, but the others were not; the animals that exhibited avoidance behavior while not feeding responded at a slightly lower received level and greater distance than those that were feeding (Wensveen *et al.,* 2017). These findings indicate that the behavioral state of the animal plays a role in the type and severity of a behavioral response. Henderson *et al.* (2019) examined tagged humpback whale dive and movement behavior, including individuals incidentally exposed to Navy sonar during training activities, at the Pacific Missile Range Facility off Kaua'i, Hawaii. Tracking data showed that, regardless of exposure to sonar, individual humpbacks spent limited time, no more than a few days, in the vicinity of Kaua'i. Potential behavioral responses due to sonar exposure were limited and may have been influenced by breeding and social behaviors. Martin *et al.* (2015) found that the density of calling minke whales was reduced during periods of Navy training involving sonar relative to the periods before training began and increased again in the days following the completion of training activities. The responses of individual whales could not be assessed, so in this case it is unknown whether the decrease in calling animals indicated that the animals left the range or simply ceased calling. Harris *et al.* (2019b) utilized acoustically generated minke whale tracks to statistically demonstrate changes in the spatial distribution of minke whale acoustic presence before, during, and after surface ship MFAS training. The spatial distribution of probability of acoustic presence was different in the ''during'' phase compared to the ''before'' phase, and the probability of presence at the center of ship activity during MFAS training was close to zero for both years. The ''after'' phases for both years retained lower probabilities of presence suggesting the return to baseline conditions may take more than five days. The results show a clear spatial redistribution of calling minke whales during surface ship MFAS training, however a limitation of passive acoustic monitoring is that one cannot conclude if the whales moved away, went silent, or a combination of the two.

Building on this work, Durbach *et al.* (2021) used the same data and determined that individual minke whales tended to be in either a fast or slow movement behavior state while on the missile range, where whales tended to be in the slow state in baseline or before periods but transitioned into the fast state with more directed movement during sonar exposures. They also moved away from the area of sonar activity on the range, either to the north or east depending on where the activity was located; this explains the spatial redistribution found by Harris *et al.* (2019b). Minke whales were also more likely to stop calling when in the fast state, regardless of sonar activity, or when in the slow state during sonar activity (Durbach *et al.,* 2021). Similarly, minke whale detections were reduced or ceased altogether during periods of sonar use off Jacksonville, Florida, (Norris *et al.,* 2012; Simeone *et al.,* 2015; U.S. Department of the Navy, 2013), especially with an increased ping rate (Charif *et al.,* 2015).

Odontocetes have varied, context-dependent behavioral responses to sonar and other transducers. Much of the research on odontocetes has been focused on understanding the impacts of sonar and other transducers on beaked whales because they were hypothesized to be more susceptible to behavioral disturbance after several strandings of beaked whales in which military MFAS was identified as a contributing factor (see *Stranding and Mortality* section). Subsequent BRSs have shown beaked whales are likely more sensitive to disturbance than most other cetaceans. Many species of odontocetes have been studied during BRSs, including Blainville's beaked whale, goose-beaked whale, Baird's beaked whale, northern bottlenose whale, harbor porpoise, pilot whale, killer whale, sperm whale, false killer whale, melon-headed whale, bottlenose dolphin, rough-toothed dolphin, Risso's dolphin, Pacific white-sided dolphin, and Commerson's dolphin. Observed responses by Blainville's beaked whales, goose-beaked whales, Baird's beaked whales, and northern bottlenose whales (the largest of the beaked whales), to mid-frequency sonar sounds include cessation of clicking, decline in group vocal periods, termination of foraging dives, changes in direction to avoid the sound source, slower ascent rates to the surface, longer deep and shallow dive durations, and other unusual dive behaviors (DeRuiter *et al.,* 2013b; Hewitt *et al.,* 2022; Jacobson *et al.,* 2022; McCarthy *et al.,* 2011; Miller *et al.,* 2015; Moretti *et al.,* 2014; Southall *et al.,* 2011; Stimpert *et al.,* 2014; Tyack *et al.,* 2011).

During a BRS in Southern California, a tagged Baird's beaked whale exposed to simulated MFA sonar within 3 km increased swim speed and modified its dive behavior (Stimpert *et al.,* 2014). One goose-beaked whale was also incidentally exposed to real Navy sonar located over 62.1 mi (100 km) away in addition to the source used in the controlled exposure study, and the authors did not detect similar responses at comparable received levels. Received levels from the MFA sonar signals from the controlled (2.1 to 5.9 mi (3.4 to 9.5 km)) exposures were calculated as 84–144 dB re 1 μPa, and incidental (73.3 mi (118 km)) exposures were calculated as 78–106 dB re 1 μPa, indicating that context of the exposures (*e.g.,* source proximity, controlled source ramp-up) may have been a significant factor in the responses to the simulated sonars (DeRuiter *et al.,* 2013b).

Long-term tagging work during the same BRS demonstrated that the longer duration dives considered a behavioral response by DeRuiter *et al.* (2013b) fell within the normal range of dive durations found for eight tagged goose-beaked whales on the Southern California Offshore Range (Schorr *et al.,* 2014). However, the longer inter-deep dive intervals found by DeRuiter *et al.* (2013b), which were among the longest found by Schorr *et al.* (2014) and Falcone *et al.* (2017), may indicate a response to sonar. Williams *et al.* (2017) note that during normal deep dives or during fast swim speeds, beaked whales and other marine mammals use strategies to reduce their stroke rates (*e.g.,* leaping, wave surfing when swimming, interspersing glides between bouts of stroking when diving). The authors determined that in the post-exposure dives by the tagged goose-beaked whales described in DeRuiter *et al.* (2013b), the whales ceased gliding and swam with almost continuous strokes. This change in swim behavior was calculated to increase metabolic costs about 30.5 percent and increase the amount of energy expending on fast swim speeds from 27–59 percent of their overall energy budget. This repartitioning of energy was detected in the model up to 1.7 hours after the single sonar exposure. Therefore, while the overall post-exposure dive durations were similar, the metabolic energy calculated by Williams *et al.* (2017) was higher. However, Southall *et al.* (2019a) found that prey availability was higher in the western area of the Southern California Offshore Range where goose-beaked whales preferentially occurred, while prey resources were lower in the eastern area and moderate in the area just north of the Range. This high prey availability may indicate that goose-beaked whales need fewer foraging dives to meet energy requirements than would be needed in another area with fewer resources.

During a BRS in Norway, northern bottlenose whales avoided a sonar sound source over a wide range of distances (0.5 to 17.4 mi (0.8 to 28 km)) and estimated avoidance thresholds ranging from received SPLs of 117 to 126 dB re 1 µPa. The behavioral response characteristics and avoidance thresholds were comparable to those previously observed in beaked whale studies; however, researchers did not observe an effect of distance on behavioral response and found that onset and intensity of behavioral response were better predicted by received SPL. There was one instance where an individual northern bottlenose whale approached the vessel, circled the sound source (source level was only 122 dB re 1 µPa), and resumed foraging after the exposure. Conversely, one northern bottlenose whale exposed to a sonar source was documented performing the longest and deepest dive on record for the species, and continued swimming away from the source for more than 7 hours (Miller *et al.,* 2015; Siegal *et al.,* 2022; Wensveen *et al.,* 2019).

Research on Blainville's beaked whales at the Atlantic Undersea Test and Evaluation Center (AUTEC) range has shown that individuals move off-range during sonar use, only returning after the cessation of sonar transmission (Boyd *et al.,* 2009; Henderson *et al.,* 2015; Jones-Todd *et al.,* 2021; Manzano-Roth *et al.,* 2022; Manzano-Roth *et al.,* 2016; McCarthy *et al.,* 2011; Tyack *et al.,* 2011). Five Blainville's beaked whales estimated to be within 1.2 to 18 mi (2 to 29 km) of the AUTEC range at the onset of active sonar were displaced a maximum of 17.4 to 42.3 mi (28 to 68 km) after moving away from the range, although one individual did approach the range during active sonar use. Researchers found a decline in deep dives at the onset of the training and an increase in time spent on foraging dives as whales moved away from the range. Predicted received levels at which presumed responses were observed were comparable to those previously observed in beaked whale studies. Acoustic data indicated that vocal periods were detected on the range within 72 hours after training ended (Joyce *et al.,* 2019). However, Blainville's beaked whales have been documented to remain on-range to forage throughout the year (Henderson *et al.,* 2016), indicating the AUTEC range may be a preferred foraging habitat regardless of the effects of active sonar noise, or it could be that there are no long-term consequences of the sonar activity. In the SOCAL Range Complex, researchers conducting photo-identification studies have identified approximately 100 individual goose-beaked whales, with 40 percent having been seen in one or more prior years, with re-sightings up to 7 years apart, indicating a possible on-range resident population (Falcone & Schorr, 2014; Falcone *et al.,* 2009).

The probability of Blainville's beaked whale group vocal periods on the Pacific Missile Range Facility were modeled during periods of (1) no naval activity, (2) naval activity without hull-mounted MFA sonar, and (3) naval activity with hull-mounted MFA sonar (Jacobson *et al.,* 2022). At a received level of 150 dB re 1 µPa RMS, the probability of detecting a group vocal period during MFA sonar use decreased by 77 percent compared to periods when general training activity was ongoing, and by 87 percent compared to baseline (no naval activity) conditions. Jacobsen et al (2022) found a greater reduction in probability of a group vocal period with MFA sonar than observed in a prior study of the same species at the AUTEC range (Moretti *et al.,* 2014), which may be due to the baseline period in the AUTEC study including naval activity without MFA sonar, potentially lowering the baseline group vocal period activity in that study, or due to differences in the residency of the populations at each range.

Stanistreet *et al.* (2022) used passive acoustic recordings during a multinational navy activity to assess marine mammal acoustic presence and behavioral response to especially long bouts of sonar lasting up to 13 consecutive hours, occurring repeatedly over 8 days (median and maximum SPL = 120 dB and 164 dB). Goose-beaked whales and sperm whales substantially reduced how often they produced clicks during sonar, indicating a decrease or cessation in foraging behavior. Few previous studies have shown sustained changes in foraging or displacement of sperm whales, but there was an absence of sperm whale clicks for 6 consecutive days of sonar activity. Sperm whales returned to baseline levels of clicks within days after the activity, but beaked whale detection rates remained low even 7 days after the exercise. In addition, there were no detections from a *Mesoplodon* beaked whale species within the area during, and at least 7 days after, the sonar activity. Clicks from northern bottlenose whales and Sowerby's beaked whales were also detected but were not frequent enough at the recording site used to compare clicks between baseline and sonar conditions.

Goose-beaked whale behavioral responses (*i.e.,* deep and shallow dive durations, surface interval durations, inter-deep dive intervals) on the Southern California Anti-Submarine Warfare Range were modeled against predictor values that included helicopter dipping sonar, mid-power MFA sonar and hull-mounted, high-power MFA sonar along with other non-MFA sonar predictors (Falcone *et al.,* 2017). They found both shallow and deep dive durations increased as the proximity to both mid- and high-powered sources decreased, and found that surface intervals and inter-deep dive intervals increased in the presence of both types of sonars (helicopter dipping and hull-mounted), although surface intervals shortened during periods without MFA sonar. Proximity of source and receiver were important considerations, as the responses to the mid-power MFA sonar at closer ranges were comparable to the responses to the higher source level vessel sonar, as was the context of the exposure. Helicopter dipping sonars are shorter duration and randomly located, therefore more difficult to predict or track by beaked whales and potentially more likely to elicit a response, especially at closer distances (3.7 to 15.5 mi (6 to 25 km))(Falcone *et al.,* 2017). Sea floor depths and quantity of light (*i.e.,* lunar cycle) are also important variables to consider in BRSs, as goose-beaked whale foraging dive depth increased with sea floor depth (maximum 6,561.7 ft (2,000 m)) and the amount of time spent at foraging depths (and likely foraging) was greater at night (likely avoiding predation by staying deeper during periods of bright lunar illumination), although they spent more time near the surface during the night, as well, particularly on dark nights with little moonlight, (Barlow *et al.,* 2020). Sonar occurred during 10 percent of the dives studied and had little effect on the resulting dive metrics. Watwood *et al.* (2017) found that the longer the duration of a sonar event, the greater reduction in detected goose-beaked whale group dives and, as helicopter dipping events occurred more frequently but with shorter durations than periods of hull-mounted sonar, when looking at the number of detected group dives there was a greater reduction during periods of hull-mounted sonar than during helicopter dipping sonar. DiMarzio *et al.* (2019) also found that group vocal periods (*i.e.,* clusters of foraging pulses), on average, decreased during sonar events on the Southern California Anti-Submarine Warfare Range, though the decline from before the event to during the event was significantly less for helicopter dipping events than hull-mounted events, and there was no difference in the magnitude of the decline between vessel-only events and events with both vessels and helicopters. Manzano-Roth *et al.* (2022) analyzed long-term passive acoustic monitoring data from the Pacific Missile Range Facility in Kaua'i, Hawaii, and found beaked whales reduced group vocal periods during submarine command course events and remained low for a minimum of 3 days after the MFA sonar activity.

Harbor porpoise behavioral responses have been researched extensively using acoustic deterrent and acoustic harassment devices; however, BRSs using sonar are limited. Kastelein *et al.* (2018b) found harbor porpoises did not respond to low-duty cycle mid-frequency sonar tones (3.5–4.1 kHz at 2.7 percent duty cycle; *e.g.,* one tone per minute) at any received level, but one individual did respond (*i.e.,* increased jumping, increased respiration rates) to high-duty cycle sonar tones (3.5–4.1 kHz at 96 percent duty cycle; *e.g.,* continuous tone for almost a minute).

Behavioral responses by odontocetes (other than beaked whales and harbor porpoises) to sonar and other transducers include horizontal avoidance, reduced breathing rates, changes in behavioral state, changes in dive behavior (Antunes *et al.,* 2014; Isojunno *et al.,* 2018; Isojunno *et al.,* 2017; Isojunno *et al.,* 2020; Miller, 2012; Miller *et al.,* 2011; Miller *et al.,* 2014), and, in one study, separation of a killer whale calf from its group (Miller *et al.,* 2011). Some species of dolphin (*e.g.,* bottlenose, spotted, spinner, Clymene, Pacific white-sided, rough-toothed) are frequently documented bowriding with vessels and the drive to engage in bowriding, whether for pleasure or energetic savings (Fiori *et al.,* 2024) may supersede the impact of associated sonar noise (Würsig *et al.,* 1998).

In controlled exposure experiments on captive odontocetes, Houser *et al.,* (2013a) recorded behavioral responses from bottlenose dolphins with 3 kHz sonar-like tones between 115–185 dB re 1 μPa, and individuals across 10 trials demonstrated a 50 percent probability of response at 172 dB re 1 μPa. Multiple studies have been conducted on bottlenose dolphins and beluga whales to measure TTS (Finneran *et al.,* 2003a; Finneran *et al.,* 2001; Finneran *et al.,* 2005; Finneran & Schlundt, 2004; Schlundt *et al.,* 2000). During these studies, when individuals were presented with 1-second tones up to 203 dB re 1 μPa, responses included changes in respiration rate, fluke slaps, and a refusal to participate or return to the location of the sound stimulus, including what appeared to be deliberate attempts by animals to avoid a sound exposure or to avoid the location of the exposure site during subsequent tests (Finneran *et al.,* 2002; Schlundt *et al.,* 2000). Bottlenose dolphins exposed to more intense 1-second tones exhibited short-term changes in behavior above received levels of 178–193 dB re 1 μPa, and beluga whales did so at received levels of 180–196 dB re 1 μPa and above.

While several opportunistic observations of odontocete (other than beaked whales and harbor porpoises) responses have been recorded during previous Navy activities and BRSs that employed sonar and sonar-like sources, it is difficult to definitively attribute responses of non-focal species to sonar exposure. Responses range from no response to potential highlight-impactful responses, such as the separation of a killer whale calf from its group (Miller *et al.,* 2011). This may be due, in part, to the variety of species and sensitivities of the odontocete taxonomic group, as well as the breadth of study types conducted and field observations, leading to the assessment of both contextually driven and dose-based responses. The available data indicate exposures to sonar in close proximity and with multiple vessels approaching an animal likely lead to higher-level responses by most odontocete species, regardless of received level or behavioral state. However, when sources are further away and moving in variable directions, behavioral responses are likely driven by behavioral state, individual experience, or species-level sensitivities, as well as exposure duration and received level, with the likelihood of response increasing with increased received levels. As such, it is expected odontocete behavioral responses to sonar and other transducers will vary by species, populations, and individuals, and long-term consequences or population-level effects are likely dependent upon the frequency and duration of the exposure and resulting behavioral response.

Pinniped behavioral response to sonar and other transducers is context-dependent (*e.g.,* Hastie *et al.,* 2014; Southall *et al.,* 2019). All studies on pinniped response to sonar thus far have been limited to captive animals, though, based on exposures of wild pinnipeds to vessel noise and impulsive sounds (see Responses Due to Vessel Noise section and Responses Due to Impulsive Noise section below), pinnipeds may only respond strongly to military sonar that is in close proximity or approaching an animal. Kvadsheim *et al.* (2010b) found that captive hooded seals exhibited avoidance response to sonar signals between 1–7 kHz (160 to 170 dB re 1 μPa rms) by reducing diving activity, rapid surface swimming away from the source, and eventually moving to areas of least SPL. However, the authors noted a rapid adaptation in behavior (passive surface floating) during the second and subsequent exposures, indicating a level of habituation within a short amount of time. Kastelein *et al.* (2015c) exposed captive harbor seals to three different sonar signals at 25 kHz with variable waveform characteristics and duty cycles and found individuals responded to a frequency modulated signal at received levels over 137 dB re 1 μPa by hauling out more, swimming faster, and raising their heads or jumping out of the water. However, seals did not respond to a continuous wave or combination signals at any received level (up to 156 dB re 1 μPa). Houser *et al.* (2013a) conducted a study to determine behavioral responses of captive California sea lions to MFA sonar at various received levels (125 to 185 dB re 1 μPa). They found younger animals (less than 2 years old) were more likely to respond than older animals and responses included increased respiration rate, increased time spent submerged, refusal to participate in a repetitive task, and hauling out. Most responses below 155 dB re 1 μPa were changes in respiration, while more severe responses (*i.e.,* refusing to participate, hauling out) began to occur over 170 dB re 1 μPa, and many of the most severe responses came from the young sea lions.

Responses Due to Impulsive Noise—

Impulsive signals have a rapid rise time and higher instantaneous peak pressure than other signal types, particularly at close range, which means they are more likely to cause startle or avoidance responses. At long distances, however, the rise time increases as the signal duration lengthens (similar to a ''ringing'' sound), making the impulsive signal more similar to a non-impulsive signal (Hastie *et al.,* 2019; Martin *et al.,* 2020). Behavioral responses from explosive sounds are likely to be similar to responses studied for other impulsive noise, such as those produced by air guns and impact pile driving. Data on behavioral responses to impulsive sound sources are limited across all marine mammal groups, with only a few studies available for mysticetes and odontocetes.

Mysticetes have varied responses to impulsive sound sources, including avoidance, aggressive directed movement towards the source, reduced surface intervals, altered swimming behavior, and changes in vocalization rates (Gordon *et al.,* 2003; McCauley *et al.,* 2000a; Richardson *et al.,* 1985; Southall *et al.,* 2007). Studies have been conducted on many baleen whale species, including gray, humpback, blue, fin and bowhead whales; it is assumed that these responses are representative of all baleen whale species. The behavioral state of the whale seems to be an integral part of whether the animal responds and how they respond, as does the location and movement of the sound source, more than the received level of the sound.

If an individual is engaged in migratory behavior, it may be more likely to respond to impulsive noise, and some species may be more sensitive than others. Migrating gray whales showed avoidance responses to seismic vessels at received levels between 164 and 190 dB re 1 μPa (Malme *et al.,* 1986, Malme *et al.,* 1988). In one study, McCauley *et al.* (1998) found that migrating humpback whales in Australia showed avoidance behavior at ranges of 3.1–5 mi (5–8 km) from a seismic array during observational studies and controlled exposure experiments, and another study found humpback whales in Australia decreased their dive times and reduced their swimming speeds (Dunlop *et al.,* 2015). However, when comparing received levels and behavioral responses between air gun ramp-up versus constant noise level of air guns, humpback whales did not change their dive behavior but did deviate from their predicted heading and decreased their swim speeds, deviating more during the constant noise source trials but reducing swim speeds more during ramp-up trials (Dunlop *et al.,* 2016). In both cases, there was no dose-response relationship with the received level of the air gun noise, and similar responses were observed in control trials without air guns (vessel movement remained constant across trials), so some responses may have been due to vessel presence and not received level from the air guns. Social interactions between males and mother-calf pairs were reduced in the presence of vessels towing seismic air gun arrays, regardless of whether the air guns were active or not; which indicates that it was likely the presence of vessels (rather than the impulsive noise generated from active air guns) that affected humpback whale behavior (Dunlop *et al.,* 2020).

Proximity of the impulsive source is another important factor to consider when assessing the potential for behavioral responses in marine mammals. Dunlop *et al.* (2017) found that groups of humpback whales were more likely to avoid a smaller air gun array at closer proximity than a larger air gun array, despite the same received level, showing the difference in response between arrays has more to do with the combined effects of received level and source proximity. In this study, responses were varied and generally small, with short-term course deviations of about 1,640 ft (500 m). Studies on bowhead whales have shown they may be more sensitive than other species to impulsive noise, as individuals have shown clear changes in diving and breathing patterns up to 45.4 mi (73 km) from seismic vessels with received levels as low as 125 dB re 1 μPa (Malme *et al.* 1988). Richardson *et al.* (1995b) documented bowhead whales exhibiting avoidance behaviors at a distance of more than 12.4 mi (20 km) from seismic vessels when received levels were as low as 120 dB re 1 μPa, although most did not show active avoidance until 5 mi (8 km) from the source. Although bowhead whales may avoid the area around seismic surveys, from 3.7 to 5 mi (6 to 8 km) (Koski and Johnson 1987, as cited in Gordon *et al.,* 2003) out to 12.4 or 18.6 mi (20 or 30 km) (Richardson *et al.,* 1999), a study by Robertson *et al.* (2013) supports the idea that behavioral responses are contextually dependent, and that during seismic operations, bowhead whales may be less ''available'' for counting due to alterations in dive behavior but that they may not have completely vacated the area.

In contrast, noise from seismic surveys was not found to impact feeding behavior or exhalation rates in western gray whales while resting or diving off the coast of Russia (Gailey *et al.,* 2007; Yazvenko *et al.,* 2007); however, the increase in vessel traffic associated with surveys and the proximity of the vessels to the whales did affect the orientation of the whales relative to the vessels and shortened their dive-surface intervals (Gailey *et al.,* 2016). They also increased their speed and distance from the noise source and have been documented in one case study swimming towards shore to avoid an approaching seismic vessel (Gailey *et al.,* 2022). Todd *et al.* (1996) found no clear short-term behavioral responses by foraging humpbacks to explosions associated with construction operations in Newfoundland but did see a trend of increased rates of net entanglement closer to the noise source, possibly indicating a reduction in net detection associated with the noise through masking or TTS. Distributions of fin and minke whales were modeled with multiple environmental variables and with the occurrence or absence of seismic surveys, and no evidence of a decrease in sighting rates relative to seismic activity was found for either species (Vilela *et al.,* 2016). Their distributions were driven entirely by environmental variables, particularly those linked to prey, including warmer sea surface temperatures, higher chlorophyll-a values, and higher photosynthetically available radiation (a measure of primary productivity). Sighting rates based on over 8,000 hours of baleen and toothed whale survey data were compared on regular vessel surveys versus both active and passive periods of seismic surveys (Kavanagh *et al.,* 2019). Models of sighting numbers were developed, and it was determined that baleen whale sightings were reduced by 88 percent during active and 87 percent during inactive phases of seismic surveys compared to regular surveys. These results seemed to occur regardless of geographic location of the survey; however, when only comparing active versus inactive periods of seismic surveys the geographic location did seem to affect the change in sighting rates.

Mysticetes seem to be the most behaviorally sensitive taxonomic group of marine mammals to impulsive sound sources, with possible avoidance responses occurring out to 18.6 mi (30 km) and vocal changes occurring in response to sounds over 62.1 mi (100 km) away. However, they are also the most studied taxonomic group, yielding a larger sample size and greater chance of finding behavioral responses to impulsive noise. Also, their responses appear to be behavior-dependent, with most avoidance responses occurring during migration behavior and little observed response during feeding behavior. These response patterns are likely to hold true for impulsive sources used by the Action Proponents; however, their impulsive sources would largely be stationary (*e.g.,* explosives fired at a fixed target, small air guns), and short term (hours rather than days or weeks) versus those in the aforementioned studies, so responses would likely occur in closer proximity to animals or not at all.

Odontocete responses to impulsive noise are not well studied and the majority of data have come from seismic (*i.e.,* air gun) surveys, pile driving, and construction activities, while only a few studies have been done to understand how explosive sounds impact odontocetes. What data are available show they may be less sensitive than mysticetes to impulsive sound and that responses occur at closer distances. This may be due to the predominance of low-frequency sound associated with impulsive sources that propagates across long distances and overlaps with the range of best hearing for mysticetes but is below that range for odontocetes. Even harbor porpoises—shown to be highly sensitive to most sound sources, avoiding both stationary (*e.g.,* pile driving) and moving (*e.g.,* seismic survey vessels) impulsive sound sources out to approximately 12.4 mi (20 km) (*e.g.,* Haelters *et al.,* 2014; Pirotta *et al.,* 2014)—have short-term responses, returning to an area within hours upon cessation of the impulsive noise.

Although odontocetes are generally considered less sensitive, impulsive noise does impact toothed whales in a variety of ways. In one study, dolphin detections were compared during 30 second periods before, during, and after underwater detonations near naval mine neutralization exercises in VACAPES. Lammers *et al.* (2017) found that within 30 seconds after an explosion, the immediate response was an increase in whistles compared to the 30 seconds before an explosion, and that there was a reduction in dolphin acoustic activity during the day of and day after the exercise within 3.7 mi (6 km). This held true only during daytime, as nighttime activity did not appear different than before the exercise, and two days after the explosion there seemed to be an increase in daytime acoustic activity, indicating dolphins may have returned to the area or resumed vocalizations (Lammers *et al.,* 2017). Weaver (2015) documented potential sex-based differences in behavioral responses to impulsive noise during construction (including blasting) of a bridge over a waterway commonly used by bottlenose dolphins, where females decreased area use and males continued using the area, perhaps indicating differential habitat uses.

When exposed to multiple impulses from a seismic air gun, Finneran *et al.* (2015) noted some captive dolphins turned their heads away from the source just before the impulse, indicating they could anticipate the timing of the impulses and may be able to behaviorally mediate the exposure to reduce their received level. Kavanagh *et al.* (2019) found sightings of odontocete whales decreased by 53 percent during active phases of seismic air gun surveys and 29 percent during inactive phases compared to control surveys. Heide-Jorgensen *et al.* (2021) found that narwhals exposed to air gun noise in an Arctic fjord were sensitive to seismic vessels over 6.8 mi (11 km) away, even though the small air gun source reached ambient noise levels around 1.9 mi (3 km) (source level of 231 dB re 1 µPa at 1 m) and large air gun source reached ambient noise levels around 6.2 mi (10 km) (source level 241 dB re 1 µPa at 1 m). Behavioral responses included changes in swimming speed and swimming direction away from the impulsive sound source and towards the shoreline. Changes in narwhal swimming speed was context-dependent and usually increased in the presence of vessels but decreased (a ''freeze'' response) in response to closely approaching air gun pulses (Heide-Jorgensen *et al.,* 2021). A cessation of feeding was also documented, when the impulsive noise was less than 6.2 mi (10 km) away, although received SELs were less than 130 dB re 1 µPa^{2}s for either air gun at this distance. However, because of this study's research methods and criteria, the long-distance responses of narwhals may be conservatively estimating narwhals' range to behavioral response.

Similarly, harbor porpoises seem to have an avoidance response to seismic surveys by leaving the area and decreasing foraging activity within 3.1–6.2 mi (5–10 km) of the survey, as evidenced by both a decrease in vocalizations near the survey and an increase in vocalizations at a distance (Pirotta *et al.,* 2014; Thompson *et al.,* 2013a). The response was short-term, as the porpoises returned to the area within 1 day upon cessation of the air gun operation. Sarnocińska *et al.* (2020) placed autonomous recording devices near oil and gas platforms and control sites to measure harbor porpoise acoustic activity during seismic air gun surveys. They noted a dose-response effect, with the lowest amount of porpoise activity closest to the seismic vessel ($SEL_{single\ shot}$ = 155 dB re 1 µPa^{2}s) and increasing porpoise activity out to 5 to 7.5 mi (8 to 12 km), and that distance to the seismic vessel, rather than sound level, was a better model predictor of porpoise activity. Overall porpoise activity in the seismic survey area was similar to the control sites (approximately 9.3 mi (15 km) apart), which may indicate the harbor porpoises were moving around the area to avoid the seismic vessel without leaving the area entirely.

Pile driving, another activity that produces impulsive sound, elicited a similar response in harbor porpoises. Benhemma-Le Gall *et al.,* 2021 examined changes in porpoise presence and foraging at two offshore windfarms between control (102–104 dB) and construction periods (155–161 dB), and found decreased presence (8–17 percent) and decreased foraging activity (41–62 percent) during construction periods. Porpoises were displaced up to 7.5 mi (12 km) away from pile driving and 2.5 mi (4 km) from construction vessels. Multiple studies have documented strong avoidance responses by harbor porpoises out to 12.4 mi (20 km) during pile driving activity, however, animals returned to the area after the activity stopped (Brandt *et al.,* 2011; Dähne *et al.,* 2014; Haelters *et al.,* 2014; Thompson *et al.,* 2010; Tougaard *et al.,* 2005; Tougaard *et al.,* 2009). When bubble curtains were deployed around pile driving, the avoidance distance appeared to be reduced by half to 7.5 mi (12 km), and the animals returned to the area after approximately 5 hours rather than 1 day later (Dähne *et al.,* 2017). Further, Bergström *et al.* (2014) found that although there was a high likelihood of acoustic disturbance during wind farm construction (including pile driving), the impact was short-term, and Graham *et al.* (2019) found that the distance at which behavioral responses of harbor porpoises were likely decreased over the course of a construction project, suggesting habituation to impulsive pile-driving noise. Kastelein *et al.* (2013b) exposed captive harbor porpoises to impact pile driving noise, and found that respiration rates increased above 136 dB re 1 μPa (zero-to-peak), and at higher sound levels individuals jumped more frequently. When a single harbor porpoise was exposed to playbacks of impact pile driving noise with different bandwidths, Kastelein *et al.* (2022) found the animal's behavioral response (*i.e.,* swim speed, respiration rate, jumping) decreased with bandwidth.

Overall, odontocete behavioral responses to impulsive sound sources are likely species- and context-dependent. Responses might be expected close to a noise source, under specific behavioral conditions such as females with offspring, or for sensitive species such as harbor porpoises, while many other species demonstrate little to no behavioral response.

Pinnipeds seem to be the least sensitive marine mammal group to impulsive noise (Richardson *et al.,* 1995b; Southall *et al.,* 2007), and some may even experience hearing effects before exhibiting a behavioral response (Southall *et al.,* 2007). Some species may be more sensitive and are only likely to respond (*e.g.,* startling, entering the water, ceasing foraging) to loud impulsive noises in close proximity, but only for brief periods of time before returning to their previous behavior. Demarchi *et al.* (2012) exposed Steller sea lions to in-air explosive blasts, which resulted in increased activity levels and often caused re-entry into the water from a hauled out state. These responses were brief (lasting only minutes) and the animals returned to haul outs and there were no documented lasting behavioral impacts in the days following the explosions.

Ringed seals exhibited little or no response to pile driving noise with mean underwater levels of 157 dB re 1 μPa and in-air levels of 112 dB re 20 μPa (Blackwell *et al.,* 2004) while harbor seals vacated the area surrounding an active pile driving site at estimated received levels between 166–178 dB re 1 μPa SPL (peak to peak), returning within 2 hours of the completion of piling activities (Russell *et al.,* 2016). Wild-captured gray seals exposed to a startling treatment (sound with a rapid rise time and a 93 dB sensation level (the level above the animal's hearing threshold at that frequency) avoided a known food source, whereas animals exposed to a non-startling treatment (sound with a slower rise time but peaking at the same level) did not react or habituated during the exposure period (Götz and Janik, 2011). These results underscore the importance of the characteristics of an acoustic signal in predicting an animal's response of habituation.

Hastie *et al.* (2021) studied how the number and severity of avoidance events may be an outcome of marine mammal cognition and risk assessment using captive grey seals. Five individuals were given the option to forage in a high- or low-density prey patch while continuously exposed to silence or anthropogenic noise (pile driving or tidal turbine operation) playbacks (148 dB re 1 μPa at 1 m). For each trial, one prey patch was closer to the source, therefore having a higher received level in experimental exposures than the other prey patch. The authors found that foraging success was highest during silent periods and that the seals avoided both anthropogenic noises with higher received levels when the prey density was limited (low-density prey patch). The authors concluded the seals made foraging decisions within the trials based on both the energetic value of the prey patch (low-density corresponding to low energetic value, high-density corresponding to high energetic value), and the nature and location of the acoustic signal relative to the prey patches of different value.

Responses Due to Vessel Noise—

Mysticetes have varied responses to vessel noise and presence, from having no response to approaching vessels to exhibiting an avoidance response by both horizontal (swimming away) and vertical (increased diving) movement (Baker *et al.,* 1983; Fiori *et al.,* 2019; Gende *et al.,* 2011; Watkins, 1981). Avoidance responses include changing swim patterns, speed, or direction (Jahoda *et al.,* 2003), remaining submerged for longer periods of time (Au & Green, 2000), and performing shallower dives with more frequent surfacing. Behavioral responses to vessels range from smaller-scale changes, such as altered breathing patterns (*e.g.,* Baker *et al.,* 1983; Jahoda *et al.,* 2003), to larger-scale changes such as a decrease in apparent presence (Anderwald *et al.,* 2013). Other common behavioral responses include changes in vocalizations, surface time, feeding and social behaviors (Au & Green, 2000; Dunlop, 2019; Fournet *et al.,* 2018; Machernis *et al.,* 2018; Richter *et al.,* 2003; Williams *et al.,* 2002a). For example, NARWs have been reported to increase the amplitude or frequency of their vocalizations or call at a lower rate in the presence of increased vessel noise (Parks *et al.,* 2007; Parks *et al.,* 2011), but generally demonstrate little to no response to vessels or sounds from approaching vessels and often continue to use habitats in high vessel traffic areas (Nowacek *et al.* 2004a). This lack of response may be due to habituation to the presence and associated noise of vessels in NARW habitat or may be due to propagation effects that may attenuate vessel noise near the surface (Nowacek *et al.,* 2004a; Terhune & Verboom, 1999).

Similarly, sei whales have been observed ignoring the presence of vessels entirely and even pass close to vessels (Reeves *et al.,* 1998). Historically, fin whales tend to ignore vessels at a distance (Watkins, 1981) or habituate to vessels over time (Watkins, 1986) but still demonstrate vocal modifications (*e.g.,* decreased frequency parameters of calls) during vessel traffic. Ramesh *et al.* (2021) found that fin whale calls in Ireland were less likely to be detected for every 1 dB re 1 μPa/minute increase in shipping noise levels. In the presence of tour boats in Chile, fin whales were changing their direction of movement more frequently, with less linear movement than occurred before the boats arrived; this behavior may represent evasion or avoidance of the boats (Santos-Carvallo *et al.,* 2021). The increase in travel swim speeds after the vessels departed may be related to the rapid speeds at which the vessels traveled, sometimes in front of fin whales, leading to additional avoidance behavior post-exposure.

Mysticete behavioral responses to vessels may also be affected by vessel behavior (Di Clemente *et al.,* 2018; Fiori *et al.,* 2019). Avoidance responses occurred most often after ''J'' type vessel approaches (*i.e.,* traveling parallel to the whales' direction of travel, then overtaking the whales by turning in front of the group) compared to parallel or direct approaches. Mother humpbacks were particularly sensitive to direct and J type approaches and spent significantly more time diving in response (Fiori *et al.,* 2019). The presence of a passing vessel did not change the behavior of resting humpback whale mother-calf pairs, but fast vessels with louder low-frequency weighted source levels (173 dB re 1 μPa, equating to weighted received levels of 133 dB re 1 μPa) at an average distance of 328 ft (100 m) resulted in a decreased resting behavior and increases in dives, swim speeds, and respiration rates (Sprogis *et al.,* 2020). Humpback whale responses to vessel disturbance were dependent on their behavioral state. Di Clemente *et al.* (2018) found that when vessels passed within 1,640 ft (500 m) of humpback whales, individuals would continue to feed if already engaged in feeding behavior but were more likely to start swimming if they were surface active when approached. In response to an approaching large commercial vessel in an area of high ambient noise levels (125–130 dB re 1 μPa), a tagged female blue whale turned around mid-ascent and descended perpendicular to the vessel's path (Szesciorka *et al.,* 2019). The whale did not respond until the vessel's closest point of approach (328 ft (100 m) distance, 135 dB re 1 μPa), which was 10 dB above the ambient noise levels. After the vessel passed, the whale ascended to the surface again with a three-minute delay.

Overall, mysticete responses to vessel noise and traffic are varied, and habituation or changes to vocalization are predominant long-term responses. When baleen whales do avoid vessels, they seem to do so by altering their swim and dive patterns to move away from the vessel. Although a lack of response in the presence of a vessel may minimize potential disturbance from passing vessels, it does increase the whales' vulnerability to vessel strike, which may be of greater concern for mysticetes than vessel noise.

Odontocete responses due to vessel noise are varied and context-dependent, and it is difficult to separate the impacts of vessel noise from the impacts of vessel presence. Vessel presence has been shown to interrupt feeding behavior in delphinids in some studies (Meissner *et al.,* 2015; Pirotta *et al.,* 2015b) while a recent study by Mills *et al.* (2023) found that, in an important foraging area, bottlenose dolphins may continue to forage and socialize even while constantly exposed to high vessel traffic. Ng and Leung (2003) found that the type of vessel, approach, and speed of approach can all affect the probability of a negative behavioral response and, similarly, Guerra *et al.* (2014) documented varied responses in group structure and vocal behavior.

While most odontocetes have documented neutral responses to vessels, avoidance (Bejder *et al.,* 2006a; Würsig *et al.,* 1998) and attraction (Norris & Prescott, 1961; Ritter, 2002; Shane *et al.,* 1986; Westdal *et al.,* 2023; Würsig *et al.,* 1998) behaviors have also been observed (Hewitt, 1985). Archer *et al.* (2010) compared the responses of dolphin populations far offshore that were often targeted by tuna fisheries to populations closer (less than 100 nmi (185.2 km)) to shore and found the fisheries-associated populations (spotted, spinner, and common dolphins) showed evasive behavior when approached by vessels while those nearshore species not associated with offshore fisheries (coastal spotted and bottlenose dolphins) tended to be attracted to vessels.

Arranz *et al.* (2021) used different engine types to determine whether behavioral responses of short-finned pilot whales were attributable to vessel noise, vessel presence, or both. Mother-calf pairs were approached by the same vessel outfitted with either ''quiet'' electric engines or ''noisy'' traditional combustion engines, controlling for approach speed and distance. Arranz *et al.* (2021) found mother pilot whales rested less and calves nursed less in response to both types of engines compared to control conditions, but only the ''noisy'' engine caused significant impacts (29 percent and 81 percent, respectively).

Smaller vessels tend to generate more noise in higher frequency bands, are more likely to approach odontocetes directly, and spend more time near an animal. Carrera *et al.* (2008) found tour boat activity can cause short-term displacement of dolphins, and Haviland-Howell *et al.* (2007) documented longer term or repetitive displacement of dolphins due to chronic vessel noise. Delphinid behavioral states also change in the presence of small tour vessels that often approach animals: travel and resting increases, foraging and social behavior decreases, and animals move closer together (Cecchetti *et al.,* 2017; Clarkson *et al.,* 2020; Kassamali-Fox *et al.,* 2020; Meissner *et al.,* 2015). Most studies on behavioral responses of bottlenose dolphin to vessel traffic show at least short-term changes in behavior, activities, or vocalization patterns when vessels are nearby (Acevedo, 1991; Arcangeli & Crosti, 2009; Berrow & Holmes, 1999; Fumagalli *et al.,* 2018; Gregory & Rowden, 2001; Janik & Thompson, 1996; Lusseau, 2004; Marega *et al.,* 2018; Mattson *et al.,* 2005; Perez-Ortega *et al.,* 2021; Puszka *et al.,* 2021; Scarpaci *et al.,* 2000).

Information is limited on beaked whale responses to vessel noise, but Würsig *et al.* (1998) noted that most beaked whales seem to exhibit avoidance behaviors when exposed to vessels and beaked whales may respond to all anthropogenic noise (*i.e.,* sonar, vessel) at similar sound levels (Aguilar de Soto *et al.,* 2006; Tyack *et al.,* 2011; Tyack, 2009). The information available includes a disruption of foraging by a vocalizing goose-beaked whale in the presence of a passing vessel (Aguilar de Soto *et al.,* 2006) and restriction of group movement, or possibly reduction in the number of individuals clicking within the group, after exposure to broadband (received level of 135 dB re 1 μPa) vessel noise up to at least 3.2 mi (5.2 km) away from the source, though no change in duration of Blainville's beaked whale foraging dives was observed (Pirotta *et al.,* 2012).

Porpoises and small delphinids are known to be sensitive to vessel noise, as well. Frankish *et al.* (2023) found harbor porpoises more likely to avoid large commercial vessels via horizontal movement during the day and vertical movement at night, which supports previous research that the species routinely avoids large motorized vessels (Polacheck and Thorpe, 1990). Harbor porpoises have also been documented responding to vessels with increased changes in behavioral state and significantly decreased feeding (Akkaya Bas *et al.,* 2017), fewer clicks (Sairanen, 2014), and fewer prey capture attempts and have disrupted foraging when vessels pass closely and noise levels are higher (Wisniewska *et al.,* 2018). Habituation to vessel noise and presence was observed for a resident population of harbor porpoises that was in regular proximity to vessel traffic (32.8 ft to 0.6 mi (10 m to 1 km) away); the population had no response in 74 percent of interactions and an avoidance response in 26 percent of interactions. It should be noted that fewer responses in populations of odontocetes regularly subjected to high levels of vessel traffic could be a sign of habituation, or it could be that the more sensitive individuals in the population have abandoned that area of higher human activity. Most avoidance responses were the result of fast-moving or steady plane-hulling motorized vessels and the vessel type and speed were considered to be more relevant than vessel presence, as few responses were observed to non-motorized or stationary vessels (Oakley *et al.,* 2017). Similarly, Akkaya Bas *et al.* (2017) found that when fast moving vessels were within 164 ft (50 m) of harbor porpoises, there was an 80 percent probability of change in swimming direction but only a 40 percent probability of change when vessels were beyond 1,312.3 ft (400 m). Frankish *et al.* (2023) found that harbor porpoises were most likely to avoid vessels less than 984.3 ft (300 m) away but, 5–10 percent of the time, they would also respond to vessels more than 1.2 mi (2 km) away, signifying that were not just attuning to vessel presence but vessel noise, as well. Although most vessel noise is constrained to frequencies below 1 kHz, at close ranges vessel noise can extend into mid- and high frequencies (into the tens of kHz) (Hermannsen *et al.,* 2014; Li *et al.,* 2015) and it is these frequencies that harbor porpoises are likely responding to; the mean M-weighted received SPL threshold for a response at these frequencies is 123 dB re 1 µPa (Dyndo *et al.,* 2015). M-weighting functions are generalized frequency weightings for various groups of marine mammals that were defined by Southall *et al.* (2007) based on known or estimated auditory sensitivity at different frequencies, and are used to characterize auditory effects of strong sounds. Hermannsen *et al.* (2019) estimated that noise in the 16 kHz frequency band resulting from small recreational vessels could cause behavioral directions in harbor porpoises, and could be elevated up to 124 dB re 1 µPa and raise ambient noise levels by a maximum of 51 dB. The higher noise levels were associated with vessel speed and range, which exceeded the threshold levels found by Dyndo *et al.* (2015) and Wisniewska *et al.* (2018) by 49–85 percent of events with high levels of vessel noise.

Lusseau and Bejder (2007) have reported some long-term consequences of vessel noise on odontocetes but, overall, there is little information on the long-term and cumulative impacts of vessel noise (National Academies of Sciences Engineering and Medicine, 2017; National Marine Fisheries Service, 2007). Many researchers speculate that long-term impacts may occur on odontocete populations that experience repeated interruption of foraging behaviors (Stockin *et al.,* 2008), and Southall *et al.* (2021) indicates that, in many contexts, the localized and coastal home ranges typical of many species make them less resilient to this chronic stressor than mysticetes.

Context and experience likely play a role in pinnipeds response to vessel noise, which vary from negative responses including increased vigilance and alerting to avoidance to reduced time spent doing biologically important activities (*e.g.,* resting, feeding, and nursing) (Martin *et al.,* 2023a; Martin *et al.,* 2022; Mikkelsen *et al.,* 2019; Richardson *et al.,* 1995b) to attraction or lack of observable response (Richardson *et al.,* 1995b). More severe responses, like flushing, could be more detrimental to individuals during biologically important activities and times, such as during pupping season. Blundell and Pendleton (2015) found that vessel presence reduces haul out time of Alaskan harbor seals during pupping season and larger vessels elicit stronger responses. Cates and Acevedo-Gutiérrez (2017) modeled harbor seal responses to passing vessels at haul out sites in less trafficked areas and found the model best predicting flushing behavior included number of boats, type of boats, and distance of seals to boats. The authors noted flushing occurred more in response to non-motorized vessels (*e.g.,* kayaks), likely because they tended to pass closer (82 to 603.7 ft (25 to 184 m)) to haul out sites than motorized vessels (180.4 to 1,939 ft (55 to 591 m)) and tended to occur in groups rather than as a single vessel. Cape fur seals were also more responsive to vessel noise at sites with a large breeding colony than at sites with lower abundances of conspecifics (Martin *et al.,* 2023a). A field study of harbor and gray seals showed that seal responses to vessels included interruption of resting and foraging during times when vessel noise was increasing or at its peak (Mikkelsen *et al.,* 2019). And, although no behavioral differences were observed in hauled out wild cape fur seals exposed to low (60–64 dB re 20 µPa RMS SPL), medium (64–70 dB) and high-level (70–80 dB) vessel noise playbacks, mother-pup pairs spent less time nursing (15–31 percent) and more time awake (13–26 percent), vigilant (7–31 percent), and mobile (2–4 percent) during vessel noise conditions compared to control conditions (Martin *et al.,* 2022).

Masking

Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, interpret, or discriminate between acoustic signals of interest (*e.g.,* those used for intraspecific communication and social interactions, prey detection, predator avoidance, or navigation) (Clark *et al.,* 2009; Richardson *et al.,* 1995; Erbe and Farmer, 2000; Tyack, 2000; Erbe *et al.,* 2016; Branstetter and Sills, 2022). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity and may occur whether the coincident sound is natural (*e.g.,* snapping shrimp, wind, waves, precipitation) or anthropogenic (*e.g.,* shipping, sonar, seismic exploration) in origin. As described in detail in appendix D, section D.6.4 (Masking), of the 2024 AFTT Draft Supplemental EIS/OEIS, the ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (*e.g.,* signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (*e.g.,* sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age, or TTS hearing loss), and existing ambient noise and propagation conditions. Masking these acoustic signals can disturb the behavior of individual animals, groups of animals, or entire populations. Masking can lead to behavioral changes including vocal changes (*e.g.,* Lombard effect, increasing amplitude, or changing frequency), cessation of foraging, and leaving an area, to both signalers and receivers, in an attempt to compensate for noise levels (Erbe *et al.,* 2016).

Most research on auditory masking is focused on energetic masking, or the ability of the receiver (*i.e.,* listener) to detect a signal in noise. However, from a fitness perspective, both signal detection and signal interpretation are necessary for success. This type of masking is called informational masking and occurs when a signal is detected by an animal but the meaning of that signal has been lost. Few data exist on informational masking in marine mammals but studies have shown that some recognition of predator cues might be missed by species that are preyed upon by killer whales if killer whale vocalizations are masked (Curé *et al.,* 2016; Curé *et al.,* 2015; Deecke *et al.,* 2002; Isojunno *et al.,* 2016; Visser *et al.,* 2016). von Benda-Beckman *et al.* (2021) modeled the effect of pulsed and continuous active sonars (CAS) on sperm whale echolocation and found that sonar sounds could reduce the ability of sperm whales to find prey under certain conditions.

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is man-made, it may be considered harassment when disrupting natural behavioral patterns to the point where the behavior is abandoned or significantly altered. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which only occurs during the sound exposure. Because masking (without resulting in threshold shift) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

Richardson *et al.* (1995) argued that the maximum radius of influence of an industrial noise (including broadband low-frequency sound transmission) on a marine mammal is the distance from the source to the point at which the noise can barely be heard. This range is determined by either the hearing sensitivity (including critical ratios, or the lowest signal-to-noise ratio in which animals can detect a signal) of the animal (Finneran and Branstetter, 2013; Johnson *et al.,* 1989; Southall *et al.,* 2000) or the background noise level present. Industrial masking is most likely to affect some species' ability to detect communication calls and natural sounds (*i.e.,* surf noise, prey noise, *etc.*) (Richardson *et al.,* 1995).

The frequency range of the potentially masking sound is important in determining any potential behavioral impacts. For example, low-frequency signals may have less effect on high-frequency echolocation sounds produced by odontocetes but are more likely to affect detection of mysticete communication calls and other potentially important natural sounds such as those produced by surf and some prey species. The masking of communication signals by anthropogenic noise may be considered as a reduction in the communication space of animals (*e.g.,* Clark *et al.,* 2009; Matthews *et al.,* 2016) and may result in energetic or other costs as animals change their vocalization behavior (*e.g.,* Miller *et al.,* 2000; Foote *et al.,* 2004; Parks *et al.,* 2007; Di Iorio and Clark, 2009; Holt *et al.,* 2009). Masking can be reduced in situations where the signal and noise come from different directions (Richardson *et al.,* 1995), through amplitude modulation of the signal, or through other compensatory behaviors (Houser and Moore, 2014). Masking can be tested directly in captive species, but in wild populations it must be either modeled or inferred from evidence of masking compensation. There are few studies addressing real-world masking sounds likely to be experienced by marine mammals in the wild (*e.g.,* Cholewiak *et al.,* 2018; Branstetter and Sills, 2023; Branstetter *et al.,* 2024).

High-frequency sounds may mask the echolocation calls of toothed whales. Human data indicate low-frequency sound can mask high-frequency sounds (*i.e.,* upward masking). Studies on captive odontocetes by Au *et al.* (1974, 1985, 1993) indicate that some species may use various processes to reduce masking effects (*e.g.,* adjustments in echolocation call intensity or frequency as a function of background noise conditions). There is also evidence that the directional hearing abilities of odontocetes are useful in reducing masking at the high-frequencies these cetaceans use to echolocate, but not at the low-to-moderate frequencies they use to communicate (Zaitseva *et al.,* 1980). A study by Nachtigall and Supin (2018) showed that false killer whales adjust their hearing to compensate for ambient sounds and the intensity of returning echolocation signals.

Impacts on signal detection, measured by masked detection thresholds, are not the only important factors to address when considering the potential effects of masking. As marine mammals use sound to recognize conspecifics, prey, predators, or other biologically significant sources (Branstetter *et al.,* 2016), it is also important to understand the impacts of masked recognition thresholds (informational masking). Branstetter *et al.* (2016) measured masked recognition thresholds for whistle-like sounds of bottlenose dolphins and observed that they are approximately 4 dB above detection thresholds (energetic masking) for the same signals. Reduced ability to recognize a conspecific call or the acoustic signature of a predator could have severe negative impacts. Branstetter *et al.* (2016) observed that if ''quality communication'' is set at 90 percent recognition the output of communication space models (which are based on 50 percent detection) would likely result in a significant decrease in communication range.

As marine mammals use sound to recognize predators (Allen *et al.,* 2014; Cummings and Thompson, 1971; Cure, *et al.,* 2015; Fish and Vania, 1971), the presence of masking noise may also prevent marine mammals from responding to acoustic cues produced by their predators, particularly if it occurs in the same frequency band. For example, harbor seals that reside in the coastal waters of British Columbia are frequently targeted by mammal-eating killer whales. The seals acoustically discriminate between the calls of mammal-eating and fish-eating killer whales (Deecke *et al.,* 2002), a capability that should increase survivorship while reducing the energy required to identify all killer whale calls. Similarly, sperm whales (Cure, *et al.,* 2016; Isojunno *et al.,* 2016), long-finned pilot whales (Visser *et al.,* 2016), and humpback whales (Cure, *et al.,* 2015) changed their behavior in response to killer whale vocalization playbacks. The potential effects of masked predator acoustic cues depends on the duration of the masking noise and the likelihood of a marine mammal encountering a predator during the time that detection and recognition of predator cues are impeded.

Redundancy and context can also facilitate detection of weak signals. These phenomena may help marine mammals detect weak sounds in the presence of natural or anthropogenic noise. Most masking studies in marine mammals present the test signal and the masking noise from the same direction. The dominant background noise may be highly directional if it comes from a particular anthropogenic source such as a vessel or industrial site. Directional hearing may significantly reduce the masking effects of these sounds by improving the effective signal-to-noise ratio.

Masking affects both senders and receivers of acoustic signals and can potentially have long-term chronic effects on marine mammals at the population level as well as at the individual level. Low-frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, with most of the increase from distant commercial shipping (Hildebrand, 2009; Cholewiak *et al.,* 2018). All anthropogenic sound sources, but especially chronic and lower-frequency signals (*e.g.,* from commercial vessel traffic), contribute to elevated ambient sound levels, thus intensifying masking for marine mammals.

Masking Due to Sonar and Other Transducers—

The functional hearing ranges of mysticetes, odontocetes, and pinnipeds underwater overlap the frequencies of the sonar sources used in the Action Proponents' LFAS/MFAS/high-frequency active sonar (HFAS) training and the Navy's testing exercises. Additionally, almost all affected species' vocal repertoires span across the frequencies of these sonar sources used by the Action Proponents. The closer the characteristics of the masking signal to the signal of interest, the more likely masking is to occur. Masking by LFAS or MFAS with relatively low-duty cycles is not anticipated (or would be of very short duration) for most cetaceans as sonar signals occur over a relatively short duration and narrow bandwidth (overlapping with only a small portion of the hearing range). LFAS could overlap in frequency with mysticete vocalizations, however LFAS does not overlap with vocalizations for most marine mammal species. For example, in the presence of LFAS, humpback whales were observed to increase the length of their songs (Fristrup *et al.,* 2003; Miller *et al.,* 2000), potentially due to the overlap in frequencies between the whale song and the LFAS. While dolphin whistles and MFAS are similar in frequency, masking is not anticipated (or would be of very short duration) due to the low-duty cycle and short durations of most sonars.

As described in additional detail in the 2024 AFTT Draft Supplemental EIS/OEIS, high duty-cycle or CAS have more potential to mask vocalizations. These sonars transmit more frequently (greater than 80 percent duty cycle) than traditional sonars, but typically at lower source levels. HFAS, such as pingers that operate at higher repetition rates, also operate at lower source levels and have faster attenuation rates due to the higher frequencies used. These lower source levels limit the range of impacts, however, compared to traditional sonar systems, individuals close to the source are likely to experience masking at longer time scales. The frequency range at which high-duty cycle systems operate overlaps the vocalization frequency of many mid-frequency cetaceans. Continuous noise at the same frequency of communicative vocalizations may cause disruptions to communication, social interactions, and acoustically mediated cooperative behaviors (Sørensen *et al.,* 2023) such as foraging and mating. Similarly, because the high-duty cycle or CAS includes mid-frequency sources, there is also the potential for the mid-frequency sonar signals to mask important environmental cues (*e.g.,* predator or conspecific acoustic cues), possibly affecting survivorship for targeted animals. Spatial release from masking may occur with higher duty cycle or CAS.

While there are currently few studies of the impacts of high-duty cycle sonars on marine mammals, masking due to these systems is likely analogous to masking produced by other continuous sources (*e.g.,* vessel noise and low-frequency cetaceans), and would likely have similar short-term consequences, though longer in duration due to the duration of the masking noise. These may include changes to vocalization amplitude and frequency (Brumm and Slabbekoorn, 2005; Hotchkin and Parks, 2013) and behavioral impacts such as avoidance of the area and interruptions to foraging or other essential behaviors (Gordon *et al.,* 2003). Long-term consequences could include changes to vocal behavior and vocalization structure (Foote *et al.,* 2004; Parks *et al.,* 2007), abandonment of habitat if masking occurs frequently enough to significantly impair communication (Brumm and Slabbekoorn, 2005), a potential decrease in survivorship if predator vocalizations are masked (Brumm and Slabbekoorn, 2005), and a potential decrease in recruitment if masking interferes with reproductive activities or mother-calf communication (Gordon *et al.,* 2003).

von Benda-Beckmann *et al.* (2021) modeled the effect of pulsed and continuous 1 to 2 kHz active sonar on sperm whale echolocation clicks and found that the presence of upper harmonics in the sonar signal increased masking of clicks produced in the search phase of foraging compared to buzz clicks produced during prey capture. Different levels of sonar caused intermittent to continuous masking (120 to 160 dB re 1 μPa^2, respectively), but varied based on click level, whale orientation, and prey target strength. CAS resulted in a greater percentage of time that echolocation clicks were masked compared to pulsed active sonar. This means that sonar sounds could reduce the ability of sperm whales to find prey under certain conditions. However, echoes from prey are most likely spatially separated from the sonar source, and so spatial release from masking would be expected.

Masking Due to Impulsive Noise—

Impulsive sound sources, including explosions, are intense and short in duration. Since impulsive noise is intermittent, the length of the gap between sounds (duty-cycle) and received level are relevant when considering the potential for masking. Impulsive sounds with lower duty cycles or lower received levels are less likely to result in masking than higher duty cycles or received levels. There are no direct observations of masking in marine mammals due to exposure to explosive sources. Potential masking from explosive sounds or weapon noise is likely similar to masking studied for other impulsive sounds, such as air guns or pile-driving.

Masking of mysticete calls could occur due to the overlap between their low-frequency vocalizations and the dominant frequencies of impulsive sources (Castellote *et al.,* 2012; Nieukirk *et al.,* 2012). For example, blue whale feeding/social calls increased when seismic exploration was underway (Di Lorio & Clark, 2010), indicative of a possible compensatory response to masking effects of the increased noise level. However, mysticetes that call at higher rates are less likely to be masked by impulsive noise with lower duty cycles (Clark *et al.,* 2009) because of the decreased likelihood that the noise would overlap with the calls, and because of dip listening. Field observations of masking effects such as vocal modifications are difficult to interpret because when recordings indicate that call rates decline, this could be caused by (1) animals calling less frequently (actual noise-induced vocal modifications), (2) the calls being masked from the recording hydrophone due to the noise (*e.g.,* animals are not calling less frequently but are being detected less frequently), or (3) the animals moving away from the noise, or any combination of these causes (Blackwell *et al.,* 2013; Cerchio *et al.,* 2014).

Masking of pinniped communication sounds at 100 Hz center frequency is possible when vocalizations occur at the same time as an air gun pulse (Sills *et al.,* 2017). This might result in some percentage of vocalizations being masked if an activity such as a seismic survey is being conducted in the vicinity, even when the sender and receiver are near one another. Release from masking due to ''dip listening'' is likely in this scenario.

While a masking effect of impulsive noise can depend on the received level (Blackwell *et al.,* 2015) and other characteristics of the noise, the vocal response of the affected animal to masking noise is an equally important consideration for inferring overall impacts to an animal. It is possible that the receiver would increase the rate and/or level of calls to compensate for masking; or, conversely, cease calling.

In general, impulsive noise has the potential to mask sounds that are biologically important for marine mammals, reducing communication space or resulting in noise-induced vocal modifications that might impact marine mammals. Masking by close-range impulsive sound sources is most likely to impact marine mammal communication.

Masking Due to Vessel Noise—

Masking is more likely to occur in the presence of broadband, relatively continuous noise sources such as vessels. Several studies have shown decreases in marine mammal communication space and changes in behavior as a result of the presence of vessel noise. For example, NARW were observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks *et al.,* 2007) as well as increasing the amplitude (intensity) of their calls (Parks, 2009; Parks *et al.,* 2011). Fournet *et al.* (2018) observed that humpback whales in Alaska responded to increasing ambient sound levels (natural and anthropogenic) by increasing the source levels of their calls (non-song vocalizations). Clark *et al.* (2009) also observed that right whales communication space decreased by up to 84 percent in the presence of vessels (Clark *et al.,* 2009). Cholewiak *et al.* (2018) also observed loss in communication space in Stellwagen National Marine Sanctuary for NARW, fin whales, and humpback whales with increased ambient noise and shipping noise. Gabriele *et al.* (2018) modeled the effects of vessel traffic sound on communication space in Glacier Bay National Park in Alaska and found that typical summer vessel traffic in the Park causes losses of communication space to singing whales (reduced by 13–28 percent), calling whales (18–51 percent), and roaring seals (32–61 percent), particularly during daylight hours and even in the absence of cruise ships. Dunlop (2019) observed that an increase in vessel noise reduced modeled communication space and resulted in significant reduction in group social interactions in Australian humpback whales. However, communication signal masking did not fully explain this change in social behavior in the model, indicating there may also be an additional effect of the physical presence of the vessel on social behavior (Dunlop, 2019). Although humpback whales off Australia did not change the frequency or duration of their vocalizations in the presence of ship noise, their source levels were lower than expected based on source level changes to wind noise, potentially indicating some signal masking (Dunlop, 2016). Multiple delphinid species have also been shown to increase the minimum or maximum frequencies of their whistles in the presence of anthropogenic noise and reduced communication space (*e.g.,* Holt *et al.,* 2009; Holt *et al.,* 2011; Gervaise *et al.,* 2012; Williams *et al.,* 2013; Hermannsen *et al.,* 2014; Papale *et al.,* 2015; Liu *et al.,* 2017).

Other Physiological Response

Physiological stress is a natural and adaptive process that helps an animal survive changing conditions. When an animal perceives a potential threat, whether or not the stimulus actually poses a threat, a stress response is triggered (Seyle, 1950; Moberg, 2000; Sapolsky *et al.,* 2005). Once an animal's central nervous system perceives a threat, it mounts a biological response or defense that consists of a combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses.

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and distress is the biotic cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other biotic functions. For example, when a stress response diverts energy away from growth in young animals, those animals may experience stunted growth. When a stress response diverts energy from a fetus, an animal's reproductive success and its fitness will suffer. In these cases, the animals will have entered a pre-pathological or pathological state which is called ''distress'' (Seyle, 1950) or ''allostatic loading'' (McEwen and Wingfield, 2003). This pathological state of distress will last until the animal replenishes its energetic reserves sufficiently to restore normal function.

According to Moberg (2000), in the case of many stressors, an animal's first and sometimes most economical (in terms of biotic costs) response is behavioral avoidance of the potential stressor or avoidance of continued exposure to a stressor. An animal's second line of defense to stressors involves the sympathetic part of the autonomic nervous system and the classical ''fight or flight'' response which includes the cardiovascular system, the gastrointestinal system, the exocrine glands, and the adrenal medulla to produce changes in heart rate, blood pressure, and gastrointestinal activity that humans commonly associate with ''stress.'' These responses have a relatively short duration and may or may not have significant long-term effect on an animal's welfare.

An animal's third line of defense to stressors involves its neuroendocrine systems or sympathetic nervous systems; the system that has received the most study has been the hypothalamus-pituitary-adrenal system (also known as the HPA axis in mammals or the hypothalamus-pituitary-interrenal axis in fish and some reptiles). Unlike stress responses associated with the autonomic nervous system, virtually all neuro-endocrine functions that are affected by stress, including immune competence, reproduction, metabolism, and behavior, are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction (Moberg, 1987; Rivier and Rivest, 1991), altered metabolism (Elasser *et al.,* 2000), reduced immune competence (Blecha, 2000), and behavioral disturbance (Moberg, 1987; Blecha, 2000). Increases in the circulation of glucocorticosteroids (cortisol, corticosterone, and aldosterone in marine mammals; see Romano *et al.,* 2004) have been equated with stress for many years.

Marine mammals naturally experience stressors within their environment and as part of their life histories. Changing weather and ocean conditions, exposure to disease and naturally occurring toxins, lack of prey availability, and interactions with predators all contribute to the stress a marine mammal experiences (Atkinson *et al.,* 2015). Breeding cycles, periods of fasting, social interactions with members of the same species, and molting (for pinnipeds) are also stressors, although they are natural components of an animal's life history. Anthropogenic activities have the potential to provide additional stressors beyond those that occur naturally (*e.g.,* fishery interactions, pollution, tourism, ocean noise) (Fair *et al.,* 2014; Meissner *et al.,* 2015; Rolland *et al.,* 2012).

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well-studied through controlled experiments for both laboratory and free-ranging animals (*e.g.,* Holberton *et al.,* 1996; Hood *et al.,* 1998; Jessop *et al.,* 2003; Krausman *et al.,* 2004; Lankford *et al.,* 2005; Reneerkens *et al.,* 2002; Thompson and Hamer, 2000). However, it should be noted (and as is described in additional detail in the 2024 AFTT Draft Supplemental EIS/OEIS) that our understanding of the functions of various stress hormones (*e.g.,* cortisol), is based largely upon observations of the stress response in terrestrial mammals. Atkinson *et al.,* (2015) note that the endocrine response of marine mammals to stress may not be the same as that of terrestrial mammals because of the selective pressures marine mammals faced during their evolution in an ocean environment. For example, due to the necessity of breath-holding while diving and foraging at depth, the physiological role of epinephrine and norepinephrine (the catecholamines) in marine mammals might be different than in other mammals. Relatively little information exists on the linkage between anthropogenic sound exposure and stress in marine mammals, and even less information exists on the ultimate consequences of sound-induced stress responses (either acute or chronic). Most studies to date have focused on acute responses to sound either by measuring neurohormones (*i.e.,* catecholamines) or heart rate as a proxy for an acute stress response.

The ability to make predictions from stress hormones about impacts on individuals and populations exposed to various forms of natural and anthropogenic stressors relies on understanding the linkages between changes in stress hormones and resulting physiological impacts. Currently, the sound characteristics that correlate with specific stress responses in marine mammals are poorly understood, as are the ultimate consequences of these changes. Several research efforts have improved the understanding of, and the ability to predict, how stressors ultimately affect marine mammal populations (*e.g.,* King *et al.,* 2015; New *et al.,* 2013a; Pirotta *et al.,* 2015a; Pirotta *et al.,* 2022b). This includes determining how and to what degree various types of anthropogenic sound cause stress in marine mammals and understanding what factors may mitigate those physiological stress responses. Factors potentially affecting an animal's response to a stressor include life history, sex, age, reproductive status, overall physiological and behavioral adaptability, and whether they are naïve or experienced with the sound (*e.g.,* prior experience with a stressor may result in a reduced response due to habituation)(Finneran and Branstetter, 2013; St. Aubin and Dierauf, 2001). Because there are many unknowns regarding the occurrence of acoustically induced stress responses in marine mammals, any physiological response (*e.g.,* hearing loss or injury) or significant behavioral response is assumed to be associated with a stress response.

Non-impulsive sources of sound can cause direct physiological effects including noise-induced loss of hearing sensitivity (or ''threshold shift'') or other auditory injury, nitrogen decompression, acoustically-induced bubble growth, and injury due to sound-induced acoustic resonance. Separately, an animal's behavioral response to an acoustic exposure might lead to physiological effects that might ultimately lead to injury or death, which is discussed later in the *Stranding and Mortality* section.

Heart Rate Response—

Several experimental studies have measured the heart rate response of a variety of marine mammals. For example, Miksis *et al.* (2001) observed increases in heart rates of captive bottlenose dolphins to which known calls of other dolphins were played, although no increase in heart rate was observed when background tank noise was played back. However, it cannot be determined whether the increase in heart rate was due to stress or social factors, such as expectation of an encounter with a known conspecific. Similarly, a young captive beluga's heart rate increased during exposure to noise, with increases dependent upon the frequency band of noise and duration of exposure, and with a sharp decrease to normal or below normal levels upon cessation of the exposure (Lyamin *et al.,* 2011). Spectral analysis of heart rate variability corroborated direct measures of heart rate (Bakhchina *et al.,* 2017). This response might have been in part due to the conditions during testing, the young age of the animal, and the novelty of the exposure; a year later the exposure was repeated at a slightly higher received level and there was no heart rate response, indicating the beluga whale had potentially habituated to the noise exposure.

Kvadsheim *et al.* (2010a) measured the heart rate of captive hooded seals during exposure to sonar signals and found an increase in the heart rate of the seals during exposure periods versus control periods when the animals were at the surface. When the animals dove, the normal dive-related heart rate decrease was not impacted by the sonar exposure. Similarly, Thompson *et al.* (1998) observed a rapid, short-lived decrease in heart rates in wild harbor and grey seals exposed to seismic air guns (cited in Gordon *et al.,* 2003).

Two captive harbor porpoises showed significant bradycardia (reduced heart rate), below that which occurs with diving, when they were exposed to pinger-like sounds with frequencies between 100–140 kHz (Teilmann *et al.,* 2006). The bradycardia was found only in the early noise exposures and the porpoises acclimated quickly across successive noise exposures. Elmegaard *et al.* (2021) also found that initial exposures to sonar sweeps produced bradycardia but did not elicit a startle response in captive harbor porpoises. As with Teilmann *et al.* (2006), the cardiac response disappeared over several repeat exposures suggesting rapid acclimation to the noise. In the same animals, 40-kHz noise pulses induced startle responses but without a change in heart rate. Bakkeren *et al.* (2023) found no change in the heart rate of a harbor porpoise during exposure to masking noise (⅓ octave band noise, centered frequency of 125 kHz, maximum received level of 125 dB re 1 μPa) during an echolocation task but showed significant bradycardia while blindfolded for the same task. The authors attributed the change in heart rate to sensory deprivation, although no strong conclusions about acoustic masking could be made since the animal was still able to perform the echolocation task in the presence of the masking noise. Williams *et al.* (2022) observed periods of increased heart rate variability in narwhals during seismic air gun impulse exposure, but profound bradycardia was not noted. Conversely, Williams *et al.* (2017) found that a profound bradycardia persisted in narwhals, even though exercise effort increased dramatically as part of their escape response following release from capture and handling.

Limited evidence across several different species suggests that increased heart rate might occur as part of the acute stress response of marine mammals that are at the surface. However, the decreased heart rate typical of diving marine mammals can be enhanced in response to an acute stressor, suggesting that the context of the exposure is critical to understanding the cardiac response. Furthermore, in instances where a cardiac response was noted, there appears to be rapid habituation when repeat exposures occur. Additional research is required to understand the interaction of dive bradycardia, noise-induced cardiac responses, and the role of habituation in marine mammals.

Stress Hormone and Immune Response—

What is known about the function of the various stress hormones is based largely upon observations of the stress response in terrestrial mammals. The endocrine response of marine mammals to stress may not be the same as that of terrestrial mammals because of the selective pressures marine mammals faced during their evolution in an ocean environment (Atkinson *et al.,* 2015). For example, due to the necessity of breath-holding while diving and foraging at depth, the physiological role of epinephrine and norepinephrine (the catecholamines) might be different in marine versus other mammals.

Catecholamines increase during breath-hold diving in seals, co-occurring with a reduction in heart rate, peripheral vasoconstriction (constriction of blood vessels), and an increased reliance on anaerobic metabolism during extended dives (Hance *et al.,* 1982; Hochachka *et al.,* 1995; Hurford *et al.,* 1996); the catecholamine increase is not associated with increased heart rate, glycemic release, and increased oxygen consumption typical of terrestrial mammals. Captive belugas demonstrated no catecholamine response to the playback of oil drilling sounds (Thomas *et al.,* 1990b) but showed a small but statistically significant increase in catecholamines following exposure to impulsive sounds produced from a seismic water gun (Romano *et al.,* 2004). A captive bottlenose dolphin exposed to the same sounds did not demonstrate a catecholamine response but did demonstrate a statistically significant elevation in aldosterone (Romano *et al.,* 2004); however, the increase was within the normal daily variation observed in this species (St. Aubin *et al.,* 1996) and was likely of little biological significance. Aldosterone has been speculated to not only contribute to electrolyte balance, but possibly also the maintenance of blood pressure during periods of vasoconstriction (Houser *et al.,* 2011). In marine mammals, aldosterone is thought to play a role in mediating stress (St. Aubin & Dierauf, 2001; St. Aubin & Geraci, 1989).

Yang *et al.* (2021) measured cortisol concentrations in two captive bottlenose dolphins and found significantly higher concentrations after exposure to 140 dB re 1 µPa impulsive noise playbacks. Two out of six tested indicators of immune system function underwent acoustic dose-dependent changes, suggesting that repeated exposures or sustained stress response to impulsive sounds may increase an affected individual's susceptibility to pathogens. Unfortunately, absolute values of cortisol were not provided, and it is not possible from the study to tell if cortisol rose to problematic levels (*e.g.,* see normal variation and changes due to handling in Houser *et al.* (2021) and Champagne *et al.* (2018)). Exposing dolphins to a different acoustic stressor yielded contrasting results. Houser *et al.* (2020) measured cortisol and epinephrine obtained from 30 captive bottlenose dolphins exposed to simulated Navy MFAS and found no correlation between SPL and stress hormone levels, even though sound exposures were as high as 185 dB re 1 µPa. In the same experiment (Houser *et al.,* 2013b), behavioral responses were shown to increase in severity with increasing received SPLs. These results suggest that behavioral responses to sonar signals are not necessarily indicative of a hormonal stress response.

Whereas a limited amount of work has addressed the potential for acute sound exposures to produce a stress response, almost nothing is known about how chronic exposure to acoustic stressors affects stress hormones in marine mammals, particularly as it relates to survival or reproduction. In what is probably the only study of chronic noise exposure in marine mammals associating changes in a stress hormone with changes in anthropogenic noise, Rolland *et al.* (2012) compared the levels of cortisol metabolites in NARW feces collected before and after September 11, 2001. Following the events of September 11, 2001, shipping was significantly reduced in the region where fecal collections were made, and regional ocean background noise declined. Fecal cortisol metabolites significantly decreased during the period of reduced ship traffic and ocean noise (Rolland *et al.,* 2012). Rolland *et al.* (2017) also compared acute (death by vessel strike) to chronic (entanglement or live stranding) stressors in NARW and found that whales subject to chronic stressors had higher levels of glucocorticoid stress hormones (cortisol and corticosterone) than either healthy whales or those killed by ships. It was presumed that whales subjected to acute stress may have died too quickly for increases in fecal glucocorticoids to be detected.

Considerably more work has been conducted in an attempt to determine the potential effect of vessel disturbance on smaller cetaceans, particularly killer whales (Bain, 2002; Erbe, 2002; Lusseau, 2006; Noren *et al.,* 2009; Pirotta *et al.,* 2015b; Read *et al.,* 2014; Rolland *et al.,* 2012; Williams *et al.,* 2009; Williams *et al.,* 2014a; Williams *et al.,* 2014b; Williams *et al.,* 2006b). Most of these efforts focused primarily on estimates of metabolic costs associated with altered behavior or inferred consequences of boat presence and noise but did not directly measure stress hormones. However, Ayres *et al.* (2012) investigated Southern Resident killer whale fecal thyroid hormone and cortisol metabolites to assess two potential threats to the species' recovery: lack of prey (salmon) and impacts from exposure to the physical presence of vessel traffic (but without measuring vessel traffic noise). Ayres *et al.* (2012) concluded from these stress hormone measures that the lack of prey overshadowed any population-level physiological impacts on Southern Resident killer whales due to vessel traffic. Lemos *et al.* (2022) investigated the potential for vessel traffic to affect gray whales. By assessing gray whale fecal cortisol metabolites across years in which vessel traffic was variable, Lemos *et al.* (2022) found a direct relationship between the presence/density of vessel traffic and fecal cortisol metabolite levels. Unfortunately, no direct noise exposure measurements were made on any individual making it impossible to tell if other natural and anthropogenic factors could also be related to the results. Collectively, these studies indicate the difficulty in determining which factors are primarily influence the secretion of stress hormones, including the separate and additive effects of vessel presence and vessel noise. While vessel presence could contribute to the variation in fecal cortisol metabolites in NARW and gray whales, there are other potential influences on fecal hormone metabolites, so it is difficult to establish a direct link between ocean noise and fecal hormone metabolites.

Non-Auditory Injury

Non-auditory injury, or direct injury, is considered less likely to occur in the context of the Action Proponents' activities than auditory injury and the primary anticipated source of non-auditory injury for these activities is exposure to the pressure generated by explosive detonations, which is discussed in the *Potential Effects of Explosive Sources on Marine Mammals* section below. Here, we discuss less direct non-auditory injury impacts, including acoustically induced bubble formation, injury from sonar-induced acoustic resonance, and behaviorally mediated injury.

One theoretical cause of injury to marine mammals is rectified diffusion (Crum and Mao, 1996), the process of increasing the size of a bubble by exposing it to a sound field. This process could be facilitated if the environment in which the ensonified bubbles exist is supersaturated with gas. Repetitive diving by marine mammals can cause the blood and some tissues to accumulate gas to a greater degree than is supported by the surrounding environmental pressure (Ridgway and Howard, 1979). The deeper and longer dives of some marine mammals (for example, beaked whales) are theoretically predicted to induce greater supersaturation (Houser *et al.,* 2001b). If rectified diffusion were possible in marine mammals exposed to high-level sound, conditions of tissue supersaturation could theoretically speed the rate and increase the size of bubble growth. Subsequent effects due to tissue trauma and emboli would presumably mirror those observed in humans suffering from decompression sickness. Acoustically-induced (or mediated) bubble growth and other pressure-related physiological impacts are addressed below but are not expected to result from the Action Proponents' proposed activities.

It is unlikely that the short duration (in combination with the source levels) of sonar pings would be long enough to drive bubble growth to any substantial size, if such a phenomenon occurs. However, an alternative but related hypothesis has also been suggested: stable bubbles could be destabilized by high-level sound exposures such that bubble growth then occurs through static diffusion of gas out of the tissues. In such a scenario the marine mammal would need to be in a gas-supersaturated state for a long enough period of time for bubbles to become of a problematic size. Recent research with *ex vivo* supersaturated bovine tissues suggested that, for a 37 kHz signal, a sound exposure of approximately 215 dB referenced to (re) 1 μPa would be required before microbubbles became destabilized and grew (Crum *et al.,* 2005). Assuming spherical spreading loss and a nominal sonar source level of 235 dB re 1 μPa at 1 m, a whale would need to be within 33 ft (10 m) of the sonar dome to be exposed to such sound levels. Furthermore, tissues in the study were supersaturated by exposing them to pressures of 400–700 kilopascals for periods of hours and then releasing them to ambient pressures. Assuming the equilibration of gases with the tissues occurred when the tissues were exposed to the high pressures, levels of supersaturation in the tissues could have been as high as 400–700 percent. These levels of tissue supersaturation are substantially higher than model predictions for marine mammals (Fahlman *et al.,* 2009; Fahlman *et al.,* 2014; Houser *et al.,* 2001; Saunders *et al.,* 2008). It is improbable that this mechanism is responsible for stranding events or traumas associated with beaked whale strandings because both the degree of supersaturation and exposure levels observed to cause microbubble destabilization are unlikely to occur, either alone or in concert.

Yet another hypothesis (decompression sickness) has speculated that rapid ascent to the surface following exposure to a startling sound might produce tissue gas saturation sufficient for the evolution of nitrogen bubbles (Jepson *et al.,* 2003; Fernandez *et al.,* 2005; Fernández *et al.,* 2012). In this scenario, the rate of ascent would need to be sufficiently rapid to compromise behavioral or physiological protections against nitrogen bubble formation. Alternatively, Tyack *et al.* (2006) studied the deep diving behavior of beaked whales and concluded that: ‘‘Using current models of breath-hold diving, we infer that their natural diving behavior is inconsistent with known problems of acute nitrogen supersaturation and embolism.’’ Collectively, these hypotheses can be referred to as ‘‘hypotheses of acoustically mediated bubble growth.’’

Although theoretical predictions suggest the possibility for acoustically mediated bubble growth, there is considerable disagreement among scientists as to its likelihood (Piantadosi and Thalmann, 2004; Evans and Miller, 2003; Cox *et al.,* 2006; Rommel *et al.,* 2006). Crum and Mao (1996) hypothesized that received levels would have to exceed 190 dB in order for there to be the possibility of significant bubble growth due to supersaturation of gases in the blood (*i.e.,* rectified diffusion). Work conducted by Crum *et al.* (2005) demonstrated the possibility of rectified diffusion for short duration signals, but at SELs and tissue saturation levels that are highly improbable to occur in diving marine mammals. To date, energy levels predicted to cause *in vivo* bubble formation within diving cetaceans have not been evaluated (NOAA, 2002b). Jepson *et al.* (2003, 2005) and Fernandez *et al.* (2004, 2005, 2012) concluded that in vivo bubble formation, which may be exacerbated by deep, long-duration, repetitive dives may explain why beaked whales appear to be relatively vulnerable to MFAS/HFAS exposures. It has also been argued that traumas from some beaked whale strandings are consistent with gas emboli and bubble-induced tissue separations (Jepson *et al.,* 2003); however, there is no conclusive evidence of this (Rommel *et al.,* 2006). Based on examination of sonar-associated strandings, Bernaldo de Quiros *et al.* (2019) list diagnostic features, the presence of all of which suggest gas and fat embolic syndrome for beaked whales stranded in association with sonar exposure.

As described in additional detail in the Behaviorally Mediated Injury section of appendix D the 2024 AFTT Draft Supplemental EIS/OEIS, marine mammals generally are thought to deal with nitrogen loads in their blood and other tissues, caused by gas exchange from the lungs under conditions of high ambient pressure during diving, through anatomical, behavioral, and physiological adaptations (Hooker *et al.,* 2012). Although not a direct injury, variations in marine mammal diving behavior or avoidance responses have been hypothesized to result in nitrogen off-gassing in super-saturated tissues, possibly to the point of deleterious vascular and tissue bubble formation (Hooker *et al.,* 2012; Jepson *et al.,* 2003; Saunders *et al.,* 2008) with resulting symptoms similar to decompression sickness, however the process is still not well understood.

In 2009, Hooker *et al.* tested two mathematical models to predict blood and tissue tension N2 (P_{N2}) using field data from three beaked whale species: northern bottlenose whales, goose-beaked whales, and Blainville's beaked whales. The researchers aimed to determine if physiology (body mass, diving lung volume, and dive response) or dive behavior (dive depth and duration, changes in ascent rate, and diel behavior) would lead to differences in P_{N2} levels and thereby decompression sickness risk between species. In their study, they compared results for previously published time depth recorder data (Hooker and Baird, 1999; Baird *et al.,* 2006, 2008) from goose-beaked whale, Blainville's beaked whale, and northern bottlenose whale. They reported that diving lung volume and extent of the dive response had a large effect on end-dive P_{N2}. Also, results showed that dive profiles had a larger influence on end-dive P_{N2} than body mass differences between species. Despite diel changes (*i.e.,* variation that occurs regularly every day or most days) in dive behavior, P_{N2} levels showed no consistent trend. Model output suggested that all three species live with tissue P_{N2} levels that would cause a significant proportion of decompression sickness cases in terrestrial mammals. The authors concluded that the dive behavior of goose-beaked whale was different from both Blainville's beaked whale and northern bottlenose whale, and resulted in higher predicted tissue and blood N2 levels (Hooker *et al.,* 2009). They also suggested that the prevalence of goose-beaked whales stranding after naval sonar exercises could be explained by either a higher abundance of this species in the affected areas or by possible species differences in behavior and/or physiology related to MF active sonar (Hooker *et al.,* 2009).

Bernaldo de Quiros *et al.* (2012) showed that, among stranded whales, deep diving species of whales had higher abundances of gas bubbles compared to shallow diving species. Kvadsheim *et al.* (2012) estimated blood and tissue P_{N2} levels in species representing shallow, intermediate, and deep diving cetaceans following behavioral responses to sonar and their comparisons found that deep diving species had higher end-dive blood and tissue N2 levels, indicating a higher risk of developing gas bubble emboli compared with shallow diving species. Fahlmann *et al.* (2014) evaluated dive data recorded from sperm, killer, long-finned pilot, Blainville's, and goose-beaked whales before and during exposure to low-frequency (1–2 kHz), as defined by the authors, and mid-frequency (2–7 kHz) active sonar in an attempt to determine if either differences in dive behavior or physiological responses to sonar are plausible risk factors for bubble formation. The authors suggested that CO_2 may initiate bubble formation and growth, while elevated levels of N2 may be important for continued bubble growth. The authors also suggest that if CO_2 plays an important role in bubble formation, a cetacean escaping a sound source may experience increased metabolic rate, CO_2 production, and alteration in cardiac output, which could increase risk of gas bubble emboli. However, as discussed in Kvadsheim *et al.* (2012), the actual observed behavioral responses to sonar from the species in their study (sperm, killer, long-finned pilot, Blainville's beaked, and goose-beaked whales) did not imply any significantly increased risk of decompression sickness due to high levels of N2. Therefore, further information is needed to understand the relationship between exposure to stimuli, behavioral response (discussed in more detail below), elevated N2 levels, and gas bubble emboli in marine mammals. The hypotheses for gas bubble formation related to beaked whale strandings is that beaked whales potentially have strong avoidance responses to MFAS because they sound similar to their main predator, the killer whale (Cox *et al.,* 2006; Southall *et al.,* 2007; Zimmer and Tyack, 2007; Baird *et al.,* 2008; Hooker *et al.,* 2009). Further investigation is needed to assess the potential validity of these hypotheses.

To summarize, while there are several hypotheses, there is little data directly connecting intense, anthropogenic underwater sounds with non-auditory physical effects in marine mammals. The available data do not support identification of a specific exposure level above which non-auditory effects can be expected (Southall *et al.,* 2007) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in these ways. In addition, such effects, if they occur at all, would be expected to be limited to situations where marine mammals were exposed to high powered sounds at very close range over a prolonged period of time, which is not expected to occur based on the speed of the vessels operating sonar in combination with the speed and behavior of marine mammals in the vicinity of sonar.

An object exposed to its resonant frequency will tend to amplify its vibration at that frequency, a phenomenon called acoustic resonance. Acoustic resonance has been proposed as a potential mechanism by which a sonar or sources with similar operating characteristics could damage tissues of marine mammals. In 2002, NMFS convened a panel of government and private scientists to investigate the potential for acoustic resonance to occur in marine mammals (NOAA, 2002). They modeled and evaluated the likelihood that Navy MFAS (2–10 kHz) caused resonance effects in beaked whales that eventually led to their stranding. The workshop participants concluded that resonance in air-filled structures was not likely to have played a primary role in the Bahamas stranding in 2000. They listed several reasons supporting this finding including (among others): tissue displacements at resonance are estimated to be too small to cause tissue damage (*i.e.,* non-auditory injury); tissue-lined air spaces most susceptible to resonance are too large in marine mammals to have resonant frequencies in the ranges used by MFAS or LFAS; lung resonant frequencies increase with depth, and tissue displacements decrease with depth so if resonance is more likely to be caused at depth it is also less likely to have an affect there; and lung tissue damage has not been observed in any mass, multi-species stranding of beaked whales. The frequency at which resonance was predicted to occur in the animals' lungs was 50 Hz, well below the frequencies used by the MFAS systems associated with the Bahamas event. The workshop participants focused on the March 2000 stranding of beaked whales in the Bahamas as high-quality data were available, but the workshop report notes that the results apply to other sonar-related stranding events. For the reasons given by the 2002 workshop participants, we do not anticipate injury due to sonar-induced acoustic resonance from the Action Proponents' proposed activity.

Potential Effects of Explosive Sources on Marine Mammals

Underwater explosive detonations send a shock wave and sound energy through the water and can release gaseous by-products, create an oscillating bubble, or cause a plume of water to shoot up from the water surface. The shock wave and accompanying noise are of most concern to marine animals and the potential effects of an explosive injury to marine mammals would consist of primary blast injury, which refers to injuries resulting from the compression of a body exposed to a blast wave. Blast effects are greatest at the gas-liquid interface (Landsberg, 2000) and are usually observed as barotrauma of gas-containing structures (*e.g.,* lung, gastrointestinal tract) and structural damage to the auditory system (Goertner, 1982; Greaves *et al.,* 1943; Hill, 1978; Office of the Surgeon General, 1991; Richmond *et al.,* 1973; Yelverton *et al.,* 1973). Depending on the intensity of the shock wave and size, location, and depth of the animal, an animal can be injured, killed, suffer non-lethal physical effects, experience hearing related effects with or without behavioral responses, or exhibit temporary behavioral responses or tolerance from hearing the blast sound. Generally, exposures to higher levels of impulse and pressure levels would result in greater impacts to an individual animal.

The near instantaneous high magnitude pressure change near an explosion can injure an animal where tissue material properties significantly differ from the surrounding environment, such as around air-filled cavities in the lungs or gastrointestinal tract. Large pressure changes at tissue-air interfaces in the lungs and gastrointestinal tract may cause tissue rupture, resulting in a range of injuries depending on degree of exposure. The lungs are typically the first site to show any damage, while the solid organs (*e.g.,* liver, spleen, and kidney) are more resistant to blast injury (Clark & Ward, 1943). Odontocetes can also incur hemorrhaging in the acoustic fats in the melon and jaw (Siebert *et al.,* 2022). Recoverable injuries would include slight lung injury, such as capillary interstitial bleeding, and contusions to the gastrointestinal tract. More severe injuries, such as tissue lacerations, major hemorrhage, organ rupture, or air in the chest cavity (pneumothorax), would significantly reduce fitness and likely cause death in the wild. Rupture of the lung may also introduce air into the vascular system, producing air emboli that can cause a stroke or heart attack by restricting oxygen delivery to critical organs.

Injuries resulting from a shock wave take place at boundaries between tissues of different densities. Different velocities are imparted to tissues of different densities, and this can lead to their physical disruption. Intestinal walls can bruise or rupture, with subsequent hemorrhage and escape of gut contents into the body cavity. Less severe gastrointestinal tract injuries include contusions, petechiae (small red or purple spots caused by bleeding in the skin), and slight hemorrhaging (Yelverton *et al.,* 1973).

Relatively little is known about auditory system trauma in marine mammals resulting from explosive exposure, although it is assumed that auditory structures would be vulnerable to blast injuries because the ears are the most sensitive to pressure and, therefore, they are the organs most sensitive to injury (Ketten, 2000). Sound-related damage associated with sound energy from detonations can be theoretically distinct from injury from the shock wave, particularly farther from the explosion. If a noise is audible to an animal, it has the potential to damage the animal's hearing by causing decreased sensitivity (Ketten, 1995). Lethal impacts are those that result in immediate death or serious debilitation in or near an intense source and are not, technically, pure acoustic trauma (Ketten, 1995). Sublethal impacts include hearing loss, which is caused by exposures to perceptible sounds. Severe damage (from the shock wave) to the ears includes tympanic membrane rupture, fracture of the ossicles, damage to the cochlea, hemorrhage, and cerebrospinal fluid leakage into the middle ear. Moderate injury implies partial hearing loss due to tympanic membrane rupture and blood in the middle ear. Permanent hearing loss also can occur when the hair cells are damaged by one very loud event, as well as by prolonged exposure to a loud noise or chronic exposure to noise. The level of impact from blasts depends on both an animal's location and, at outer zones, on its sensitivity to the residual noise (Ketten, 1995). Auditory trauma was found in 2 humpback whales that died after the detonation of a 11,023 lb (5,000 kg) explosive used off Newfoundland during demolition of an offshore oil rig platform (Ketten *et al.,* 1993), but the proximity of the whales to the detonation was unknown. Eardrum rupture was examined in submerged terrestrial mammals exposed to underwater explosions (Richmond *et al.,* 1973; Yelverton *et al.,* 1973); however, results may not be applicable to the anatomical adaptations for underwater hearing in marine mammals.

In general, models predict that an animal would be less susceptible to injury near the water surface because the pressure wave reflected from the water surface would interfere with the direct path pressure wave, reducing positive pressure exposure (Goertner, 1982; Yelverton & Richmond, 1981). This is shown in the records of humans exposed to blast while in the water, which show that the gastrointestinal tract was more likely to be injured than the lungs, likely due to the shallower exposure geometry of the lungs (*i.e.,* closer to the water surface) (Lance *et al.,* 2015). Susceptibility would increase with depth, until normal lung collapse (due to increasing hydrostatic pressure) and increasing ambient pressures again reduce susceptibility (Goertner, 1982). The only known occurrence of mortality or injury to a marine mammal due to a Navy training event involving explosives occurred in March 2011 in nearshore waters off San Diego, California, at the Silver Strand Training Complex (see Strandings Associated with Explosive Use section below).

Controlled tests with a variety of lab animals (mice, rats, dogs, pigs, sheep, and other species) are the best data sources on actual injury to mammals due to underwater exposure to explosions. In the early 1970s, the Lovelace Foundation for Medical Education and Research conducted a series of tests in an artificial pond at Kirtland Air Force Base, New Mexico, to determine the effects of underwater explosions on mammals, with the goal of determining safe ranges for human divers. The resulting data were summarized in two reports (Richmond *et al.,* 1973; Yelverton *et al.,* 1973). Specific physiological observations for each test animal are documented in Richmond *et al.* (1973). Gas-containing internal organs, such as lungs and intestines, were the principle damage sites in submerged terrestrial mammals; this is consistent with earlier studies of mammal exposures to underwater explosions in which lungs were consistently the first areas to show damage, with less consistent damage observed in the gastrointestinal tract (Clark & Ward, 1943; Greaves *et al.,* 1943).

In the Lovelace studies, the first positive acoustic impulse was found to be the metric most related to degree of injury, and size of an animal's gas-containing cavities was thought to play a role in blast injury susceptibility. For these shallow exposures of small terrestrial mammals (masses ranging from 3.4 to 50 kg) to underwater detonations, Richmond *et al.* (1973) reported that no blast injuries were observed when exposures were less than 6 pounds per square inch per millisecond (psi-ms) (40 pascal seconds (Pa-s)), no instances of slight lung hemorrhage occurred below 20 psi-ms (140 Pa-s), and instances of no lung damage were observed in some exposures at higher levels up to 40 psi-ms (280 Pa-s). An impulse of 34 psi-ms (230 Pa-s) resulted in about 50 percent incidence of slight lung hemorrhage. About half of the animals had gastrointestinal tract contusions (with slight ulceration, *i.e.,* some perforation of the mucosal layer) at exposures of 25–27 psi-ms (170–190 Pa-s). Lung injuries were found to be slightly more prevalent than gastrointestinal tract injuries for the same exposure. The anatomical differences between the terrestrial animals used in the Lovelace tests and marine mammals are summarized in Fetherston *et al.* (2019). Goertner (1982) examined how lung cavity size would affect susceptibility to blast injury by considering both marine mammal size and depth in a bubble oscillation model of the lung; however, the Goertner (1982) model did not consider how tissues surrounding the respiratory air spaces would reflect shock wave energy or constrain oscillation (Fetherston *et al.,* 2019).

Goertner (1982) suggested a peak overpressure gastrointestinal tract injury criterion because the size of gas bubbles in the gastrointestinal tract are variable, and their oscillation period could be short relative to primary blast wave exposure duration. The potential for gastrointestinal tract injury, therefore, may not be adequately modeled by the single oscillation bubble methodology used to estimate lung injury due to impulse. Like impulse, however, high instantaneous pressures may damage many parts of the body, but damage to the gastrointestinal tract is used as an indicator of any peak pressure-induced injury due to its vulnerability.

Because gas-containing organs are more vulnerable to primary blast injury, adaptations for diving that allow for collapse of lung tissues with depth may make animals less vulnerable to lung injury with depth. Adaptations for diving include a flexible thoracic cavity, distensible veins that can fill space as air compresses, elastic lung tissue, and resilient tracheas with interlocking cartilaginous rings that provide strength and flexibility (Ridgway, 1972). Denk *et al.* (2020) found intra-species differences in the compliance of tracheobronchial structures of post-mortem cetaceans and pinnipeds under diving hydrostatic pressures, which would affect depth of alveolar collapse. Older literature suggested complete lung collapse depths at approximately 229.7 ft (70 m) for dolphins (Ridgway & Howard, 1979) and 65.6 to 164 ft (20 to 50 m) for phocid seals (Falke *et al.,* 1985; Kooyman *et al.,* 1972). Follow-on work by Kooyman and Sinnett (1982), in which pulmonary shunting was studied in harbor seals and sea lions, suggested that complete lung collapse for these species would be about 557.7 ft (170 m) and about 590.6 (180 m), respectively. Evidence in sea lions suggests that complete collapse might not occur until depths as great as 738.2 ft (225 m); although the depth of collapse and depth of the dive are related, sea lions can affect the depth of lung collapse by varying the amount of air inhaled on a dive (McDonald and Ponganis, 2012). This is an important consideration for all divers who can modulate lung volume and gas exchange prior to diving via the degree of inhalation and during diving via exhalation (Fahlman *et al.,* 2009); indeed, there are noted differences in pre-dive respiratory behavior, with some marine mammals exhibiting pre-dive exhalation to reduce the lung volume (*e.g.,* phocid seals) (Kooyman *et al.,* 1973).

Further Potential Effects of Behavioral Disturbance on Marine Mammal Fitness

The different ways that marine mammals respond to sound are sometimes indicators of the ultimate effect that exposure to a given stimulus will have on the well-being (survival, reproduction, *etc.*) of an animal. The long-term consequences of disturbance, hearing loss, chronic masking, and acute or chronic physiological stress are difficult to predict because of the different factors experienced by individual animals, such as context of stressor exposure, underlying health conditions, and other environmental or anthropogenic stressors. Linking these non-lethal effects on individuals to changes in population growth rates requires long-term data, which is lacking for many populations. We summarize several studies below, but there are few quantitative marine mammal data relating the exposure of marine mammals to sound to effects on reproduction or survival, though data exists for terrestrial species to which we can draw comparisons for marine mammals. Several authors have reported that disturbance stimuli may cause animals to abandon nesting and foraging sites (Sutherland and Crockford, 1993); may cause animals to increase their activity levels and suffer premature deaths or reduced reproductive success when their energy expenditures exceed their energy budgets (Daan *et al.,* 1996; Feare, 1976; Mullner *et al.,* 2004); or may cause animals to experience higher predation rates when they adopt risk-prone foraging or migratory strategies (Frid and Dill, 2002). Each of these studies addressed the consequences of animals shifting from one behavioral state (*e.g.,* resting or foraging) to another behavioral state (*e.g.,* avoidance or escape behavior) because of human disturbance or disturbance stimuli.

Lusseau and Bejder (2007) present data from three long-term studies illustrating the connections between disturbance from whale-watching boats and population-level effects in cetaceans. In Shark Bay Australia, the abundance of bottlenose dolphins was compared within adjacent control and tourism sites over three consecutive 4.5-year periods of increasing tourism levels. Between the second and third time periods, in which tourism doubled, dolphin abundance decreased by 15 percent in the tourism area and did not change significantly in the control area. In Fiordland, New Zealand, two populations (Milford and Doubtful Sounds) of bottlenose dolphins with tourism levels that differed by a factor of seven were observed and significant increases in travelling time and decreases in resting time were documented for both. Consistent short-term avoidance strategies were observed in response to tour boats until a threshold of disturbance was reached (average 68 minutes between interactions), after which the response switched to a longer-term habitat displacement strategy. For one population, tourism only occurred in a part of the home range. However, tourism occurred throughout the home range of the Doubtful Sound population and once boat traffic increased beyond the 68-minute threshold (resulting in abandonment of their home range/ preferred habitat), reproductive success drastically decreased (increased stillbirths) and abundance decreased significantly (from 67 to 56 individuals in a short period). Last, in a study of Northern Resident killer whales off Vancouver Island, exposure to boat traffic was shown to reduce foraging opportunities and increase traveling time. A simple bioenergetics model was applied to show that the reduced foraging opportunities equated to a decreased energy intake of 18 percent, while the increased traveling incurred an increased energy output of 3–4 percent, which suggests that a management action based on avoiding interference with foraging might be particularly effective.

An important variable to consider is duration of disturbance. Severity scales used to assess behavioral responses or marine mammals to acute sound exposures are not appropriate to apply to sustained or chronic exposures, which requires considering the health of a population over time rather than a focus on immediate impacts to individuals (Southall *et al.,* 2021). For example, short-term costs experienced over the course of a week by an otherwise healthy individual may be recouped over time after exposure to the stressor ends. These short-term costs would be unlikely to result in long-term consequences to that individual or to that individual's population. Comparatively, long-term costs accumulated by otherwise healthy individuals over an entire season, year, or throughout a life stage (*e.g.,* pup, juvenile, adult) would be less easily recouped and more likely to result in long-term consequences to that individual or population.

Marine mammals exposed to frequent or intense anthropogenic activities may leave the area, habituate to the activity, or tolerate the disturbance and remain in the area (Wartzok *et al.,* 2003). Highly resident or localized populations may also stay in an area of disturbance because the cost of displacement is higher than the cost of remaining in the area (Forney *et al.,* 2017). As such, an apparent lack of response (*e.g.,* no displacement or avoidance of a sound source) does not necessarily indicate there is no cost to the individual or population, as some resources or habitats may be of such high value that animals may choose to stay, even when experiencing the consequences of stress, masking, or hearing loss (Forney *et al.,* 2017).

Longer term displacement can lead to changes in abundance or distribution patterns of the species in the affected region (Bejder *et al.,* 2006b; Blackwell *et al.,* 2004; Teilmann *et al.,* 2006). For example, gray whales in Baja California, Mexico, abandoned a historical breeding lagoon in the mid-1960s due to an increase in dredging and commercial shipping operations, and only repopulated the lagoon after shipping activities had ceased for several years (Bryant *et al.,* 1984). Mysticetes in the northeast tended to adjust to vessel traffic over several years, trending towards more neutral behavioral responses to passing vessels (Watkins, 1986), indicating that some animals may habituate to high levels of human activity. A study on bottlenose dolphin responses to vessel approaches found that lesser responses in populations of dolphins regularly subjected to high levels of vessel traffic could be a sign of habituation, or it could be that the more sensitive animals in this population previously abandoned the area of higher human activity (Bejder *et al.,* 2006a).

Population characteristics (*e.g.,* whether a population is open or closed to immigration and emigration) can influence sensitivity to disturbance as well; closed populations could not withstand a higher probability of disturbance compared to open populations with no limitation on food (New *et al.,* 2020). Predicting population trends or long-term displacement patterns due to anthropogenic disturbance is challenging due to limited information and survey data for many species over sufficient spatiotemporal scales, as well as a full understanding of how other factors, such as oceanographic oscillations and climate change, affect marine mammal presence (Moore and Barlow, 2013; Barlow, 2016; Moore and Barlow, 2017).

Population models are necessary to understand and link short-term effects to individuals from disturbance (anthropogenic impacts or environmental change) to long-term population consequences. Population models require inputs for the population size and changes in vital rates of the population (*e.g.,* the mean values for survival age, lifetime reproductive success, recruitment of new individuals into the population), to predict changes in population dynamics (*e.g.,* population growth rate). These efforts often rely on bioenergetic models, or energy budget models, which analyze energy intake from food and energy costs for life functions, such as maintenance, growth, and reproduction, either at the individual or population level (Pirotta, 2022), and model sensitivity analyses have identified the most consequential parameters, including prey characteristics, feeding processes, energy expenditure, body size, energy storage, and lactation capability (Pirotta, 2022). However, there is a high level of uncertainty around many parameters in these models (Hütt *et al.,* 2023).

The U.S. National Research Council (NRC) committee on Characterizing Biologically Significant Marine Mammal Behavior developed an initial conceptual model to link acoustic disturbance to population effects and inform data and research needs (NRC, 2005). This Population Consequences of Acoustic Disturbance, or PCAD, conceptual model linked the parameters of sound exposure, behavior change, life function immediately affected, vital rates, and population effects. In its report, the committee found that the relationships between vital rates and population effects were relatively well understood, but that the relationships between the other components of the model were not well-known or easily observed.

Following the PCAD framework (NRC, 2005), an ONR working group developed the Potential Consequences of Disturbance (PCoD), outlining an updated conceptual model of the relationships linking disturbance to changes in behavior and physiology, health, vital rates, and population dynamics. The PCoD model considers all types of disturbance, not solely anthropogenic or acoustic, and incorporates physiological changes, such as stress or injury, along with behavioral changes as a direct result of disturbance (National Academies of Sciences Engineering and Medicine, 2017). In this framework, behavioral and physiological changes can have direct (acute) effects on vital rates, such as when changes in habitat use or increased stress levels raise the probability of mother-calf separation or predation; they can have indirect and long-term (chronic) effects on vital rates, such as when changes in time/energy budgets or increased disease susceptibility affect health, which then affects vital rates; or they can have no effect to vital rates (New *et al.,* 2014; Pirotta *et al.,* 2018a). In addition to outlining this general framework and compiling the relevant literature that supports it, the authors chose four example species for which extensive long-term monitoring data exist (southern elephant seals, NARW, *Ziphidae* beaked whales, and bottlenose dolphins) and developed state-space energetic models that can be used to forecast longer-term, population-level impacts from behavioral changes. While these are very specific models with very specific data requirements that cannot yet be applied broadly to project-specific risk assessments for the majority of species, as well as requiring significant resources and time to conduct (more than is typically available to support regulatory compliance for one project), they are a critical first step towards being able to quantify the likelihood of a population level effect. Since New *et al.* (2014), several publications have described models developed to examine the long-term effects of environmental or anthropogenic disturbance of foraging on various life stages of selected species (sperm whale, Farmer *et al.* (2018); California sea lion, McHuron *et al.* (2018); and blue whale, Pirotta, *et al.* (2018a)).

The PCoD model identifies the types of data that would be needed to assess population-level impacts. These data are lacking for many marine mammal species (Booth *et al.,* 2020). Southall *et al.* (2021) states that future modeling and population simulation studies can help determine population-wide long-term consequences and impact analysis. However, the method to do so is still developing, as there are gaps in the literature, possible sampling biases, and results are rarely ground-truthed, with a few exceptions (Booth *et al.,* 2022; Schwarz *et al.,* 2022). Nowacek *et al.* (2016) reviewed technologies such as passive acoustic monitoring, tagging, and the use of unmanned aerial vehicles which can improve scientists' abilities to study these model inputs and link behavioral changes to individual life functions and ultimately population-level effects. Relevant data needed for improving analyses of population-level consequences resulting from disturbances will continue to be collected during the 7-year period of the LOAs through projects funded by the Navy's Marine Species Monitoring Program. Multiple case studies across marine mammal taxonomic groups have been conducted following the PCoD framework. From these studies, Keen *et al.* (2021) identified themes and contextual factors relevant to assessing impacts to populations due to disturbance, which have been considered in the context of the impacts of the Action Proponents' activities.

A population's movement ecology determines the potential for spatiotemporal overlap with a disturbance. Resident populations or populations that rely on spatially limited habitats for critical life functions (*i.e.,* foraging, breeding) would be at greater risk of repeated or chronic exposure to disturbances than populations that are wide-ranging relative to the footprint of a disturbance (Keen *et al.,* 2021). Even for the same species, differences in habitat use between populations can result in different potential for repeated exposure to individuals for a similar stressor (Costa *et al.,* 2016a). The location and radius of disturbance can impact how many animals are exposed and for how long (Costa *et al.,* 2016b). While some models have shown the advantages of populations with larger ranges, namely the decreased chance of being exposed (Costa *et al.,* 2016b), it's important to consider that for some species, the energetic cost of a longer migration could make a population more sensitive to energy lost through disturbance (Villegas-Amtmann *et al.,* 2017). In addition to ranging patterns, a species' activity budgets and lunging rates can cause variability in their predicted cost of disturbance as well (Pirotta *et al.,* 2021).

Bioenergetics frameworks that examine the impact of foraging disruption on body reserves of individual whales found that rates of daily foraging disruption can predict the number of days to terminal starvation for various life stages (Farmer *et al.,* 2018b). Similarly, when a population is displaced by a stressor, and only has access to areas of poor habitat quality (*i.e.,* low prey abundance) for relocation, bioenergetic models may be more likely to predict starvation, longer recovery times, or extinction (Hin *et al.,* 2023). There is some debate over the use of blubber thickness as a metric of cetacean energy stores and health, as marine mammals may not use their fat stores in a similar manner to terrestrial mammals (Derous *et al.,* 2020).

Resource limitation can impact marine mammal population growth rate regardless of additional anthropogenic disturbance. Stochastic Dynamic Programming models have been used to explore the impact declining prey species has on focal marine mammal predators (McHuron *et al.,* 2023a; McHuron *et al.,* 2023b). A Stochastic Dynamic Programming model determined that a decrease in walleye pollock (*Gadus chalcogrammus*) availability increased the time and distance northern fur seal mothers had to travel offshore, which negatively impacted pup growth rate and wean mass, despite attempts to compensate with longer recovery time on land (McHuron *et al.,* 2023b). Prey is an important factor in long-term consequence models for many species of marine mammals. In disturbance models that predict habitat displacement or otherwise reduced foraging opportunities, populations are being deprived of energy dense prey or ''high quality'' areas which can lead to long-term impacts on fecundity and survival (Czapanskiy *et al.,* 2021; Hin *et al.,* 2019; McHuron *et al.,* 2023a; New *et al.,* 2013b). Prey density limits the energy available for growth, reproduction, and survival. Some disturbance models indicate that the immediate decrease in a portion of the population (*e.g.,* young lactating mothers) is not necessarily detrimental to a population, since as a result, prey availability increases and the population's overall improved body condition reduces the age at first calf (Hin *et al.,* 2021). The timing of a disturbance with seasonally available resources is also important; if a disturbance occurs during periods of low resource availability, the population-level consequences are greater and occur faster than if the disturbance occurs during periods when resource levels are high (Hin *et al.,* 2019). Further, when resources are not evenly distributed, populations with cautious strategies and knowledge of resource variation have an advantage (Pirotta *et al.,* 2020).

Even when modeled alongside several anthropogenic sources of disturbance (*e.g.,* vessel strike, vessel noise, chemical contaminants, sonar), several species of marine mammals are most influenced by lack of prey (Czapanskiy *et al.,* 2021; Murray *et al.,* 2021). Some species like killer whales are especially sensitive to prey abundance due to their limited diet (Murray *et al.,* 2021). The short-term energetic cost of eleven species of cetaceans and mysticetes exposed to mid-frequency active sonar was influenced more by lost foraging opportunities than increased locomotor effort during avoidance (Czapanskiy *et al.,* 2021). Additionally, the model found that mysticetes incurred more energetic cost than odontocetes, even during mild behavioral responses to sonar. These results may be useful in the development of future Population Consequences of Multiple Stressors and PCoD models since they should seek to qualify cetacean health in a more ecologically relevant manner.

PCoD models have been used to assess the impacts of multiple and recurring stressors. A marine mammal population that is already subject to chronic stressors like climate change will likely be more vulnerable to acute disturbances. Models that have looked at populations of cetaceans who are exposed to multiple stressors over several years have found that even one major chronic stressor (*e.g.,* climate change, epizootic disease, oil spill) has severe impacts on population size. A layer of one or more stressor (*e.g.,* seismic surveys) in addition to a chronic stressor (like an oil spill) can yield devastating impacts on a population. These results may vary based on species and location, as one population may be more impacted by chronic shipping noise, while another population may not. However, just because a population doesn't appear to be impacted by one chronic stressor (*e.g.,* shipping noise), does not mean they aren't affected by others, such as climate change or disease (Reed *et al.,* 2020). Recurring or chronic stressors can impact population abundance even when instances of disturbance are short and have minimal behavioral impact on an individual (Farmer *et al.,* 2018a; McHuron *et al.,* 2018b; Pirotta *et al.,* 2019). Some changes to response variables like pup recruitment (survival to age one) aren't noticeable for several years, as the impacts on pup survival does not affect the population until those pups are mature but impacts to young animals will ultimately lead to population-wide declines. The severity of the repeated disturbance can also impact a population's long-term reproductive success. Scenarios with severe repeated disturbance (*e.g.,* 95 percent probability of exposure, with 95 percent reduction in feeding efficiency) can severely reduce fecundity and calf survival, while a weaker disturbance (25 percent probability of exposure, with 25 percent reduction in feeding efficiency) had no population-wide effect on vital rates (Pirotta *et al.,* 2019).

Farmer *et al.* (2018a) modeled how an oil spill led to chronic declines in a sperm whale population over 10 years, and if models included even one more stressor (*i.e.,* behavioral responses to air guns), the population declined even further. However, the amount of additional population decline due to acoustic disturbance depended on the way the dose-response of the noise levels were modeled. A single step-function led to higher impacts than a function with multiple steps and frequency weighting. In addition, the amount of impact from both disturbances was mediated when the metric in the model that described animal resilience was changed to increase resilience to disturbance (*e.g.,* able to make up reserves through increased foraging).

Not all stressors have the same impact for all species and all locations. Another model analyzed the effect of a number of chronic disturbances on two bottlenose dolphin populations in Australia over 5 years (Reed *et al.,* 2020). Results indicated that disturbance from fisheries interactions and shipping noise had little overall impact on population abundances in either location, even in the most extreme impact scenarios modeled. At least in this area, epizootic and climate change scenarios had the largest impact on population size and fecundity.

Recurring stressors can impact population abundance even when individual instances of disturbance are short and have minimal behavioral impact on an individual. A model on California sea lions introduced a generalized disturbance at different times throughout the breeding cycle, with their behavior response being an increase in the duration of a foraging trip by the female (McHuron *et al.,* 2018b). Very short duration disturbances or responses led to little change, particularly if the disturbance was a single event, and changes in the timing of the event in the year had little effect. However, with even relatively short disturbances or mild responses, when a disturbance was modeled as recurring there were resulting reductions in population size and pup recruitment (survival to age one). Often, the effects weren't noticeable for several years, as the impacts on pup survival did not affect the population until those pups were mature.

Stranding and Mortality

The definition for a stranding under title IV of the MMPA is that (A) a marine mammal is dead and is (i) on a beach or shore of the United States; or (ii) in waters under the jurisdiction of the United States (including any navigable waters); or (B) a marine mammal is alive and is (i) on a beach or shore of the United States and is unable to return to the water; (ii) on a beach or shore of the United States and, although able to return to the water, is in need of apparent medical attention; or (iii) in the waters under the jurisdiction of the United States (including any navigable waters), but is unable to return to its natural habitat under its own power or without assistance (see MMPA section 410(3)). This definition is useful for considering stranding events even when they occur beyond lands and waters under the jurisdiction of the United States.

Marine mammal strandings have been linked to a variety of causes, such as illness from exposure to infectious agents, biotoxins, or parasites; starvation; unusual oceanographic or weather events; or anthropogenic causes including fishery interaction, vessel strike, entrainment, entrapment, sound exposure, or combinations of these stressors sustained concurrently or in series. Historically, the cause or causes of most strandings have remained unknown (Geraci *et al.,* 1976; Eaton, 1979, Odell *et al.,* 1980; Best, 1982), but the development of trained, professional stranding response networks and improved analyses have led to a greater understanding of marine mammal stranding causes (Simeone and Moore 2017).

Numerous studies suggest that the physiology, behavior, habitat, social relationships, age, or condition of cetaceans may cause them to strand or might predispose them to strand when exposed to another phenomenon. These suggestions are consistent with the conclusions of numerous other studies that have demonstrated that combinations of dissimilar stressors commonly combine to kill an animal or dramatically reduce its fitness, even though one exposure without the other does not produce the same result (Bernaldo de Quiros *et al.,* 2019; Chroussos, 2000; Creel, 2005; DeVries *et al.,* 2003; Fair and Becker, 2000; Foley *et al.,* 2001; Moberg, 2000; Relyea, 2005a; 2005b, Romero, 2004; Sih *et al.,* 2004).

Historically, stranding reporting and response efforts have been inconsistent, although significant improvements have occurred over the last 25 years. Reporting forms for basic (''Level A'') information, rehabilitation disposition, and human interaction have been standardized nationally (available at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/level-data-collection-marine-mammal-stranding-events*). However, data collected beyond basic information varies by region (and may vary from case to case), and are not standardized across the United States. Logistical conditions such as weather, time, location, and decomposition state may also affect the ability of the stranding network to thoroughly examine a specimen (Carretta *et al.,* 2023; Moore *et al.,* 2013). While the investigation of stranded animals provides insight into the types of threats marine mammal populations face, full investigations are only possible and conducted on a small fraction of the total number of strandings that occur, limiting our understanding of the causes of strandings (Carretta *et al.,* 2016a). Additionally, and due to the variability in effort and data collected, the ability to interpret long-term trends in stranded marine mammals is complicated.

In the United States from 2006–2022, there were 27,781 cetacean strandings and 79,572 pinniped strandings (107,353 total) (P. Onens, NMFS, *pers comm.,* 2024). Several mass strandings (strandings that involve two or more individuals of the same species, excluding a single mother-calf pair) that have occurred over the past two decades have been associated with anthropogenic activities that introduced sound into the marine environment such as naval operations and seismic surveys. An in-depth discussion of strandings can be found in appendix D of the 2024 AFTT Draft Supplemental EIS/OEIS and in the Navy's Technical Report on Marine Mammal Strandings Associated with U.S. Navy Sonar Activities (U.S. Navy Marine Mammal Program & Space and Naval Warfare Systems Command Center Pacific, 2017).

Worldwide, there have been several efforts to identify relationships between cetacean mass stranding events and military active sonar (Cox *et al.,* 2006, Hildebrand, 2004; Taylor *et al.,* 2004). For example, based on a review of mass stranding events around the world consisting of two or more individuals of goose-beaked whales, records from the International Whaling Commission (IWC) (2005) show that a quarter (9 of 41) were associated with concurrent naval patrol, explosion, maneuvers, or MFAS. D'Amico *et al.* (2009) reviewed beaked whale stranding data compiled primarily from the published literature, which provides an incomplete record of stranding events, as many are not written up for publication, along with unpublished information from some regions of the world.

Most of the stranding events reviewed by the IWC involved beaked whales. A mass stranding of goose-beaked whales in the eastern Mediterranean Sea occurred in 1996 (Frantzis, 1998), and mass stranding events involving Gervais' beaked whales, Blainville's beaked whales, and goose-beaked whales occurred off the coast of the Canary Islands in the late 1980s (Simmonds and Lopez-Jurado, 1991). The stranding events that occurred in the Canary Islands and Kyparissiakos Gulf in the late 1990s and the Bahamas in 2000 have been the most intensively-studied mass stranding events and have been associated with naval maneuvers involving the use of tactical sonar. Other cetacean species with naval sonar implicated in stranding events include harbor porpoise (Norman *et al.,* 2004, Wright *et al.,* 2013) and common dolphin (Jepson and Deaville 2009).

Strandings Associated With Active Sonar

Over the past 21 years, there have been 5 stranding events coincident with military MFAS use in which exposure to sonar is believed to have been a contributing factor: Greece (1996); the Bahamas (2000); Madeira (2000); Canary Islands (2002); and Spain (2006) (Cox *et al.,* 2006; Fernandez, 2006; U.S. Navy Marine Mammal Program & Space and Naval Warfare Systems Command Center Pacific, 2017). These five mass strandings have resulted in about 40 known cetacean deaths consisting mostly of beaked whales and with close linkages to MFAS activity. In these circumstances, exposure to non-impulsive acoustic energy was considered a potential indirect cause of death of the marine mammals (Cox *et al.,* 2006). Only one of these stranding events, the Bahamas (2000), was associated with exercises conducted by the U.S. Navy. Additionally, in 2004, during the Rim of the Pacific (RIMPAC) exercises, between 150 and 200 usually pelagic melon-headed whales occupied the shallow waters of Hanalei Bay, Kaua'i, Hawaii for over 28 hours. NMFS determined that MFAS was a plausible, if not likely, contributing factor in what may have been a confluence of events that led to the Hanalei Bay stranding. A number of other stranding events coincident with the operation of MFAS, including the death of beaked whales or other species (minke whales, dwarf sperm whales, pilot whales), have been reported; however, the majority have not been investigated to the degree necessary to determine the cause of the stranding. Most recently, the Independent Scientific Review Panel investigating potential contributing factors to a 2008 mass stranding of melon-headed whales in Antsohihy, Madagascar released its final report suggesting that the stranding was likely initially triggered by an industry seismic survey (Southall *et al.,* 2013). This report suggests that the operation of a commercial high-powered 12 kHz multibeam echosounder during an industry seismic survey was a plausible and likely initial trigger that caused a large group of melon-headed whales to leave their typical habitat and then ultimately strand as a result of secondary factors such as malnourishment and dehydration. The report indicates that the risk of this particular convergence of factors and ultimate outcome is likely very low, but recommends that the potential be considered in environmental planning. Because of the association between tactical MFAS use and a small number of marine mammal strandings, the Navy and NMFS have been considering and addressing the potential for strandings in association with Navy activities for years. In addition to the proposed mitigation measures intended to more broadly minimize impacts to marine mammals, the Navy will abide by the Notification and Reporting Plan, which sets out notification, reporting, and other requirements when dead, injured, or stranded marine mammals are detected in certain circumstances.

Greece (1996)—

Twelve goose-beaked whales stranded atypically (in both time and space) along a 23.7 mi (38.2 km) strand of the Kyparissiakos Gulf coast on May 12 and 13, 1996 (Frantzis, 1998). From May 11 through May 15, the North Atlantic Treaty Organization (NATO) research vessel Alliance was conducting sonar tests with signals of 600 Hz and 3 kHz and source levels of 228 and 226 dB re 1 µPa, respectively (D'Amico and Verboom, 1998; D'Spain *et al.,* 2006). The timing and location of the testing encompassed the time and location of the strandings (Frantzis, 1998).

Necropsies of eight of the animals were performed but were limited to basic external examination and sampling of stomach contents, blood, and skin. No ears or organs were collected, and no histological samples were preserved. No significant apparent abnormalities or wounds were found, however examination of photos of the animals, taken soon after their death, revealed that the eyes of at least four of the individuals were bleeding (Frantzis, 2004). Stomach contents contained the flesh of cephalopods, indicating that feeding had recently taken place (Frantzis, 1998).

All available information regarding the conditions associated with this stranding event was compiled, and many potential causes were examined including major pollution events, prominent tectonic activity, unusual physical or meteorological events, magnetic anomalies, epizootics, and conventional military activities (International Council for the Exploration of the Sea, 2005). However, none of these potential causes coincided in time or space with the mass stranding, or could explain its characteristics (International Council for the Exploration of the Sea, 2005). The robust condition of the animals, plus the recent stomach contents, is inconsistent with pathogenic causes. In addition, environmental causes can be ruled out as there were no unusual environmental circumstances or events before or during this time period and within the general proximity (Frantzis, 2004).

Because of the rarity of this mass stranding of goose-beaked whales in the Kyparissiakos Gulf (first one in historical records), the probability for the two events (the military exercises and the strandings) to coincide in time and location, while being independent of each other, was thought to be extremely low (Frantzis, 1998). However, because full necropsies had not been conducted, and no abnormalities were noted, the cause of the strandings could not be precisely determined (Cox *et al.,* 2006). A Bioacoustics Panel convened by NATO concluded that the evidence available did not allow them to accept or reject sonar exposures as a causal agent in these stranding events. The analysis of this stranding event provided support for, but no clear evidence for, the cause-and-effect relationship of tactical sonar training activities and beaked whale strandings (Cox *et al.,* 2006).

Bahamas (2000)—

NMFS and the Navy prepared a joint report addressing the multi-species stranding in the Bahamas in 2000, which took place within 24 hours of U.S. Navy ships using MFAS as they passed through the Northeast and Northwest Providence Channels on March 15–16, 2000. The ships, which operated both AN/SQS–53C and AN/SQS–56, moved through the channel while emitting sonar pings approximately every 24 seconds. Of the 17 cetaceans that stranded over a 36-hour period (goose-beaked whales, Blainville's beaked whales, minke whales, and a spotted dolphin), 7 animals died on the beach (5 goose-beaked whales, 1 Blainville's beaked whale, and 1 spotted dolphin), while the other 10 were returned to the water alive (though their ultimate fate is unknown). As discussed in the Bahamas report (DOC/DON, 2001), there is no likely association between the minke whale and spotted dolphin strandings and the operation of MFAS.

Necropsies were performed on five of the stranded beaked whales. All five necropsied beaked whales were in good body condition, showing no signs of infection, disease, vessel strike, blunt trauma, or fishery related injuries, and three still had food remains in their stomachs. Auditory structural damage was discovered in four of the whales, specifically bloody effusions or hemorrhaging around the ears. Bilateral intracochlear and unilateral temporal region subarachnoid hemorrhage, with blood clots in the lateral ventricles, were found in two of the whales. Three of the whales had small hemorrhages in their acoustic fats (located along the jaw and in the melon).

A comprehensive investigation was conducted and all possible causes of the stranding event were considered, whether they seemed likely at the outset or not. Based on the way in which the strandings coincided with ongoing naval activity involving tactical MFAS use, in terms of both time and geography, the nature of the physiological effects experienced by the dead animals, and the absence of any other acoustic sources, the investigation team concluded that MFAS aboard U.S. Navy ships that were in use during the active sonar exercise in question were the most plausible source of this acoustic or impulse trauma to beaked whales. This sound source was active in a complex environment that included the presence of a surface duct, unusual and steep bathymetry, a constricted channel with limited egress, intensive use of multiple, active sonar units over an extended period of time, and the presence of beaked whales that appear to be sensitive to the frequencies produced by these active sonars. The investigation team concluded that the cause of this stranding event was the confluence of the Navy MFAS and these contributory factors working together, and further recommended that the Navy avoid operating MFAS in situations where these five factors would be likely to occur. This report does not conclude that all five of these factors must be present for a stranding to occur, nor that beaked whales are the only species that could potentially be affected by the confluence of the other factors. Based on this, NMFS believes that the operation of MFAS in situations where surface ducts exist, or in marine environments defined by steep bathymetry and/or constricted channels may increase the likelihood of producing a sound field with the potential to cause cetaceans (especially beaked whales) to strand, and therefore, suggests the need for increased vigilance while operating MFAS in these areas, especially when beaked whales (or potentially other deep divers) are likely present.

Madeira, Portugal (2000)—

From May 10–14, 2000, three goose-beaked whales were found atypically stranded on two islands in the Madeira archipelago, Portugal (Cox *et al.,* 2006). A fourth animal was reported floating in the Madeiran waters by fisherman but did not come ashore (Woods Hole Oceanographic Institution, 2005). Joint NATO amphibious training peacekeeping exercises involving participants from 17 countries and 80 warships, took place in Portugal during May 2–15, 2000.

The bodies of the three stranded whales were examined postmortem (Woods Hole Oceanographic Institution, 2005), though only one of the stranded whales was fresh enough (24 hours after stranding) to be necropsied (Cox *et al.,* 2006). Results from the necropsy revealed evidence of hemorrhage and congestion in the right lung and both kidneys (Cox *et al.,* 2006). There was also evidence of intercochlear and intracranial hemorrhage similar to that which was observed in the whales that stranded in the Bahamas event (Cox *et al.,* 2006). There were no signs of blunt trauma, and no major fractures, and the cranial sinuses and airways were found to be clear with little or no fluid deposition, which may indicate good preservation of tissues (Woods Hole Oceanographic Institution, 2005).

Several observations on the Madeira stranded beaked whales, such as the pattern of injury to the auditory system, are the same as those observed in the Bahamas strandings. Blood in and around the eyes, kidney lesions, pleural hemorrhages, and congestion in the lungs are particularly consistent with the pathologies from the whales stranded in the Bahamas, and are consistent with stress and pressure related trauma. The similarities in pathology and stranding patterns between these two events suggest that a similar pressure event may have precipitated or contributed to the strandings at both sites (Woods Hole Oceanographic Institution, 2005).

Even though no definitive causal link can be made between the stranding event and naval exercises, certain conditions may have existed in the exercise area that, in their aggregate, may have contributed to the marine mammal strandings (Freitas, 2004): exercises were conducted in areas of at least 547 fathoms (1,000 m) depth near a shoreline where there is a rapid change in bathymetry on the order of 547 to 3,281 fathoms (1,000 to 6,000 m) occurring across a relatively short horizontal distance (Freitas, 2004); multiple ships were operating around Madeira, though it is not known if MFAS was used, and the specifics of the sound sources used are unknown (Cox *et al.,* 2006; Freitas, 2004); and exercises took place in an area surrounded by landmasses separated by less than 35 nmi (65 km) and at least 10 nmi (19 km) in length, or in an embayment. Exercises involving multiple ships employing MFAS near land may produce sound directed towards a channel or embayment that may cut off the lines of egress for marine mammals (Freitas, 2004).

Canary Islands, Spain (2002)—

The southeastern area within the Canary Islands is well known for aggregations of beaked whales due to its ocean depths of greater than 547 fathoms (1,000 m) within a few hundred meters of the coastline (Fernandez *et al.,* 2005). On September 24, 2002, 14 beaked whales were found stranded on Fuerteventura and Lanzarote Islands in the Canary Islands (International Council for Exploration of the Sea, 2005a). Seven whales died, while the remaining seven live whales were returned to deeper waters (Fernandez *et al.,* 2005). Four beaked whales were found stranded dead over the next three days either on the coast or floating offshore. These strandings occurred within close proximity of an international naval exercise that utilized MFAS and involved numerous surface warships and several submarines. Strandings began about four hours after the onset of MFAS activity (International Council for Exploration of the Sea, 2005a; Fernandez *et al.,* 2005).

Eight goose-beaked whales, one Blainville's beaked whale, and one Gervais' beaked whale were necropsied, 6 of them within 12 hours of stranding (Fernandez *et al.,* 2005). No pathogenic bacteria were isolated from the carcasses (Jepson *et al.,* 2003). The animals displayed severe vascular congestion and hemorrhage especially around the tissues in the jaw, ears, brain, and kidneys, displaying marked disseminated microvascular hemorrhages associated with widespread fat emboli (Jepson *et al.,* 2003; International Council for Exploration of the Sea, 2005a). Several organs contained intravascular bubbles, although definitive evidence of gas embolism in vivo is difficult to determine after death (Jepson *et al.,* 2003). The livers of the necropsied animals were the most consistently affected organ, which contained macroscopic gas-filled cavities and had variable degrees of fibrotic encapsulation. In some animals, cavitary lesions had extensively replaced the normal tissue (Jepson *et al.,* 2003). Stomachs contained a large amount of fresh and undigested contents, suggesting a rapid onset of disease and death (Fernandez *et al.,* 2005). Head and neck lymph nodes were enlarged and congested, and parasites were found in the kidneys of all animals (Fernandez *et al.,* 2005).

The association of NATO MFAS use close in space and time to the beaked whale strandings, and the similarity between this stranding event and previous beaked whale mass strandings coincident with sonar use, suggests that a similar scenario and causative mechanism of stranding may be shared between the events. Beaked whales stranded in this event demonstrated brain and auditory system injuries, hemorrhages, and congestion in multiple organs, similar to the pathological findings of the Bahamas and Madeira stranding events. In addition, the necropsy results of the Canary Islands stranding event lead to the hypothesis that the presence of disseminated and widespread gas bubbles and fat emboli were indicative of nitrogen bubble formation, similar to what might be expected in decompression sickness (Jepson *et al.,* 2003; Fernández *et al.,* 2005).

Hanalei Bay (2004)—

On July 3 and 4, 2004, approximately 150 to 200 melon-headed whales occupied the shallow waters of Hanalei Bay, Kaua'i, Hawaii for over 28 hours. Attendees of a canoe blessing observed the animals entering the Bay in a single wave formation at 7 a.m. on July 3, 2004. The animals were observed moving back into the shore from the mouth of the Bay at 9 a.m. The usually pelagic animals milled in the shallow bay and were returned to deeper water with human assistance beginning at 9:30 a.m. on July 4, 2004, and were out of sight by 10:30 a.m.

Only one animal, a calf, was known to have died following this event. The animal was noted alive and alone in the Bay on the afternoon of July 4, 2004, and was found dead in the Bay the morning of July 5, 2004. A full necropsy, magnetic resonance imaging, and computerized tomography examination were performed on the calf to determine the manner and cause of death. The combination of imaging, necropsy and histological analyses found no evidence of infectious, internal traumatic, congenital, or toxic factors. Cause of death could not be definitively determined, but it is likely that maternal separation, poor nutritional condition, and dehydration contributed to the final demise of the animal. Although it is not known when the calf was separated from its mother, the animals' movement into the Bay and subsequent milling and re-grouping may have contributed to the separation or lack of nursing, especially if the maternal bond was weak or this was an inexperienced mother with her first calf.

Environmental factors, abiotic and biotic, were analyzed for any anomalous occurrences that would have contributed to the animals entering and remaining in Hanalei Bay. The Bay's bathymetry is similar to many other sites within the Hawaiian Island chain and dissimilar to sites that have been associated with mass strandings in other parts of the United States. The weather conditions appeared to be normal for that time of year with no fronts or other significant features noted. There was no evidence of unusual distribution, occurrence of predator or prey species, or unusual harmful algal blooms, although Mobley *et al.* (2007) suggested that the full moon cycle that occurred at that time may have influenced a run of squid into the Bay. Weather patterns and bathymetry that have been associated with mass strandings elsewhere were not found to occur in this instance.

The Hanalei event was spatially and temporally correlated with RIMPAC. Official sonar training and tracking exercises in the Pacific Missile Range Facility (PMRF) warning area did not commence until approximately 8 a.m. on July 3 and were thus ruled out as a possible trigger for the initial movement into the bay. However, six naval surface vessels transiting to the operational area on July 2 intermittently transmitted active sonar (for approximately 9 hours total from 1:15 p.m. to 12:30 a.m.) as they approached from the south. The potential for these transmissions to have triggered the whales' movement into Hanalei Bay was investigated. Analyses with the information available indicated that animals to the south and east of Kaua'i could have detected active sonar transmissions on July 2, and reached Hanalei Bay on or before 7 a.m. on July 3. However, data limitations regarding the position of the whales prior to their arrival in the Bay, the magnitude of sonar exposure, behavioral responses of melon-headed whales to acoustic stimuli, and other possible relevant factors preclude a conclusive finding regarding the role of sonar in triggering this event. Propagation modeling suggests that transmissions from sonar use during the July 3 exercise in the PMRF warning area may have been detectable at the mouth of the bay. If the animals responded negatively to these signals, it may have contributed to their continued presence in the bay. The U.S. Navy ceased all active sonar transmissions during exercises in this range on the afternoon of July 3. Subsequent to the cessation of sonar use, the animals were herded out of the bay.

While causation of this stranding event may never be unequivocally determined, NMFS considers the active sonar transmissions of July 2–3, 2004, a plausible, if not likely, contributing factor in what may have been a confluence of events. This conclusion is based on the following: (1) the evidently anomalous nature of the stranding; (2) its close spatiotemporal correlation with wide-scale, sustained use of sonar systems previously associated with stranding of deep-diving marine mammals; (3) the directed movement of two groups of transmitting vessels toward the southeast and southwest coast of Kaua'i; (4) the results of acoustic propagation modeling and an analysis of possible animal transit times to the bay; and (5) the absence of any other compelling causative explanation. The initiation and persistence of this event may have resulted from an interaction of biological and physical factors. The biological factors may have included the presence of an apparently uncommon, deep-diving cetacean species (and possibly an offshore, non-resident group), social interactions among the animals before or after they entered the bay, and/or unknown predator or prey conditions. The physical factors may have included the presence of nearby deep water, multiple vessels transiting in a directed manner while transmitting active sonar over a sustained period, the presence of surface sound ducting conditions, and/or intermittent and random human interactions while the animals were in the bay.

A separate event involving melon-headed whales and rough-toothed dolphins took place over the same period of time in the Northern Mariana Islands (Jefferson *et al.,* 2006), which is several thousand miles from Hawaii. Some 500 to 700 melon-headed whales came into Sasanhaya Bay on July 4, 2004, near the island of Rota and then left of their own accord after 5.5 hours; no known active sonar transmissions occurred in the vicinity of that event. The Rota incident led to scientific debate regarding what, if any, relationship the event had to the simultaneous events in Hawaii and whether they might be related by some common factor (*e.g.,* there was a full moon on July 2, 2004, as well as during other melon-headed whale strandings and nearshore aggregations (Brownell *et al.,* 2009; Lignon *et al.,* 2007; Mobley *et al.,* 2007). Brownell *et al.* (2009) compared the two incidents, along with one other stranding incident at Nuka Hiva in French Polynesia and normal resting behaviors observed at Palmyra Island, in regard to physical features in the areas, melon-headed whale behavior, and lunar cycles. Brownell *et al.,* (2009) concluded that the rapid entry of the whales into Hanalei Bay, their movement into very shallow water far from the 328-ft (100-m) contour, their milling behavior (typical pre-stranding behavior), and their reluctance to leave the bay constituted an unusual event that was not similar to the events that occurred at Rota, which appear to be similar to observations of melon-headed whales resting normally at Palmyra Island. Additionally, there was no correlation between lunar cycle and the types of behaviors observed in the Brownell *et al.* (2009) examples.

Spain (2006)—

The Spanish Cetacean Society reported an atypical mass stranding of four beaked whales that occurred January 26, 2006, on the southeast coast of Spain, near Mojácar (Gulf of Vera) in the Western Mediterranean Sea. According to the report, two of the whales were discovered the evening of January 26 and were found to be still alive. Two other whales were discovered during the day on January 27 but had already died. The first three animals were located near the town of Mojácar and the fourth animal was found dead, a few kilometers north of the first three animals. From January 25–26, 2006, Standing NATO Response Force Maritime Group Two (five of seven ships including one U.S. ship under NATO Operational Control) had conducted active sonar training against a Spanish submarine within 50 nmi (93 km) of the stranding site.

Veterinary pathologists necropsied the two male and two female goose-beaked whales. According to the pathologists, the most likely primary cause of this type of beaked whale mass stranding event was anthropogenic acoustic activities, most probably anti-submarine MFAS used during the military naval exercises. However, no positive acoustic link was established as a direct cause of the stranding. Even though no causal link can be made between the stranding event and naval exercises, certain conditions may have existed in the exercise area that, in their aggregate, may have contributed to the marine mammal strandings (Freitas, 2004). Exercises were conducted in areas of at least 547 fathoms (1,000 m) depth near a shoreline where there is a rapid change in bathymetry on the order of 547 to 3,281 fathoms (1,000 to 6,000 m) occurring across a relatively short horizontal distance (Freitas, 2004). Multiple ships (in this instance, five) were operating MFAS in the same area over extended periods of time (in this case, 20 hours) in close proximity; and exercises took place in an area surrounded by landmasses, or in an embayment. Exercises involving multiple ships employing MFAS near land may have produced sound directed towards a channel or embayment that may have cut off the lines of egress for the affected marine mammals (Freitas, 2004).

Honaunau Bay (2022)—

On March 25, 2022, a beaked whale (species unknown) stranded in Honaunau Bay, Hawaii. The animal was observed swimming into shore and over rocks. Bystanders intervened to turn the animal off of the rocks, and it swam back out of the Bay on its own. Locals reported hearing a siren or alarm type of sound underwater on the same day, and a Navy vessel was observed from shore on the following day. The Navy confirmed it used CAS within 27 nmi (50 km) and 48 hours of the time of stranding, though the stranding has not been definitively linked to the Navy's CAS use.

Behaviorally Mediated Responses to MFAS That May Lead To Stranding

Although the confluence of Navy MFAS with the other contributory factors noted in the 2001 NMFS/Navy joint report was identified as the cause of the 2000 Bahamas stranding event, the specific mechanisms that led to that stranding (or the others) are not well understood, and there is uncertainty regarding the ordering of effects that led to the stranding. It is unclear whether beaked whales were directly injured by sound (*e.g.,* acoustically mediated bubble growth, as addressed above) prior to stranding or whether a behavioral response to sound occurred that ultimately caused the beaked whales to be injured and strand.

Although causal relationships between beaked whale stranding events and active sonar remain unknown, several authors have hypothesized that stranding events involving these species in the Bahamas and Canary Islands may have been triggered when the whales changed their dive behavior in a startled response to exposure to active sonar or to further avoid exposure (Cox *et al.,* 2006; Rommel *et al.,* 2006). These authors proposed three mechanisms by which the behavioral responses of beaked whales upon being exposed to active sonar might result in a stranding event. These include the following: gas bubble formation caused by excessively fast surfacing; remaining at the surface too long when tissues are supersaturated with nitrogen; or diving prematurely when extended time at the surface is necessary to eliminate excess nitrogen. More specifically, beaked whales that occur in deep waters that are in close proximity to shallow waters (for example, the ''canyon areas'' that are cited in the Bahamas stranding event; see D'Spain and D'Amico, 2006), may respond to active sonar by swimming into shallow waters to avoid further exposures and strand if they were not able to swim back to deeper waters. Second, beaked whales exposed to active sonar might alter their dive behavior. Changes in their dive behavior might cause them to remain at the surface or at depth for extended periods of time which could lead to hypoxia directly by increasing their oxygen demands or indirectly by increasing their energy expenditures (to remain at depth) and increase their oxygen demands as a result. If beaked whales are at depth when they detect a ping from an active sonar transmission and change their dive profile, this could lead to the formation of significant gas bubbles, which could damage multiple organs or interfere with normal physiological function (Cox *et al.,* 2006; Rommel *et al.,* 2006; Zimmer and Tyack, 2007). Baird *et al.* (2005) found that slow ascent rates from deep dives and long periods of time spent within 164 ft (50 m) of the surface were typical for both goose-beaked and Blainville's beaked whales, the two species involved in mass strandings related to naval sonar. These two behavioral mechanisms may be necessary to purge excessive dissolved nitrogen concentrated in their tissues during their frequent long dives (Baird *et al.,* 2005). Baird *et al.* (2005) further suggests that abnormally rapid ascents or premature dives in response to high-intensity sonar could indirectly result in physical harm to the beaked whales, through the mechanisms described above (gas bubble formation or non-elimination of excess nitrogen). In a review of the previously published data on the potential impacts of sonar on beaked whales, Bernaldo de Quirós *et al.* (2019) suggested that the effect of MFAS on beaked whales varies among individuals or populations, and that predisposing conditions such as previous exposure to sonar and individual health risk factors may contribute to individual outcomes (such as decompression sickness).

Because many species of marine mammals make repetitive and prolonged dives to great depths, it has long been assumed that marine mammals have evolved physiological mechanisms to protect against the effects of rapid and repeated decompressions. Although several investigators have identified physiological adaptations that may protect marine mammals against nitrogen gas supersaturation (alveolar collapse and elective circulation; Kooyman *et al.,* 1972; Ridgway and Howard, 1979), Ridgway and Howard (1979) reported that bottlenose dolphins that were trained to dive repeatedly had muscle tissues that were substantially supersaturated with nitrogen gas. Houser *et al.* (2001b) used these data to model the accumulation of nitrogen gas within the muscle tissue of other marine mammal species and concluded that cetaceans that dive deep and have slow ascent or descent speeds would have tissues that are more supersaturated with nitrogen gas than other marine mammals. Based on these data, Cox *et al.* (2006) hypothesized that a critical dive sequence might make beaked whales more prone to stranding in response to acoustic exposures. The sequence began with (1) very deep (to depths as deep as 1.2 mi (2 km)) and long (as long as 90 minutes) foraging dives; (2) relatively slow, controlled ascents; and (3) a series of ''bounce'' dives between 328 and 1,312 ft (100 and 400 m) in depth (see Zimmer and Tyack, 2007). They concluded that acoustic exposures that disrupted any part of this dive sequence (for example, causing beaked whales to spend more time at surface without the bounce dives that are necessary to recover from the deep dive) could produce excessive levels of nitrogen supersaturation in their tissues, leading to gas bubble and emboli formation that produces pathologies similar to decompression sickness.

Zimmer and Tyack (2007) modeled nitrogen tension and bubble growth in several tissue compartments for several hypothetical dive profiles and concluded that repetitive shallow dives (defined as a dive where depth does not exceed the depth of alveolar collapse, approximately 236 ft (72 m) for goose-beaked whale), perhaps as a consequence of an extended avoidance response to sonar sound, could pose a risk for decompression sickness and that this risk should increase with the duration of the response. Their models also suggested that unrealistically rapid rates of ascent from normal dive behaviors are unlikely to result in supersaturation to the extent that bubble formation would be expected. Tyack *et al.* (2006) suggested that emboli observed in animals exposed to mid-frequency range sonar (Jepson *et al.,* 2003; Fernandez *et al.,* 2005; Fernández *et al.,* 2012) could stem from a behavioral response that involves repeated dives shallower than the depth of lung collapse. Given that nitrogen gas accumulation is a passive process (*i.e.,* nitrogen is metabolically inert), a bottlenose dolphin was trained to repetitively dive a profile predicted to elevate nitrogen saturation to the point that nitrogen bubble formation was predicted to occur. However, inspection of the vascular system of the dolphin via ultrasound did not demonstrate the formation of asymptomatic nitrogen gas bubbles (Houser *et al.,* 2007). Baird *et al.* (2008), in a beaked whale tagging study off Hawaii, showed that deep dives are equally common during day or night, but ''bounce dives'' are typically a daytime behavior, possibly associated with visual predator avoidance. This may indicate that ''bounce dives'' are associated with something other than behavioral regulation of dissolved nitrogen levels, which would be necessary day and night.

Additional predictive modeling conducted to date has been performed with many unknowns about the respiratory physiology of deep-diving breath-hold animals. For example, Denk *et al.* (2020) found intra-species differences in the compliance of tracheobronchial structures of post-mortem cetaceans and pinnipeds under diving hydrostatic pressures, which would affect depth of alveolar collapse. Although, as hypothesized by Garcia Parraga *et al.* (2018) and reviewed in Fahlman *et al.,* (2021), mechanisms may exist that allow marine mammals to create a pulmonary shunt without the need for hydrostatic pressure-induced lung collapse, *i.e.,* by varying perfusion to the lung independent of lung collapse and degree of ventilation. If such a mechanism exists, then assumptions in prior gas models require reconsideration, the degree of nitrogen gas accumulation associated with dive profiles needs to be re-evaluated, and behavioral responses potentially leading to a destabilization of the relationship between pulmonary ventilation and perfusion should be considered. Costidis and Rommel (2016) suggested that gas exchange may continue to occur across the tissues of air-filled sinuses in deep diving odontocetes below the depth of lung collapse if hydrostatic pressures are high enough to drive gas exchange across into non-capillary veins.

If marine mammals respond to an Action Proponent vessel that is transmitting active sonar in the same way that they might respond to a predator, their probability of flight responses could increase when they perceive that Action Proponent vessels are approaching them directly, because a direct approach may convey detection and intent to capture (Burger and Gochfeld, 1981, 1990; Cooper, 1997; Cooper, 1998). The probability of flight responses could also increase as received levels of active sonar increase (and the ship is, therefore, closer) and as ship speeds increase (that is, as approach speeds increase). For example, the probability of flight responses in Dall's sheep (*Ovis dalli dalli*) (Frid 2001a; Frid 2001b), ringed seals (Born *et al.,* 1999), Pacific brant (*Branta bernicla nigricans*) and Canada geese (*B. canadensis*) increased as a helicopter or fixed-wing aircraft approached groups of these animals more directly (Ward *et al.,* 1999). Bald eagles (*Haliaeetus leucocephalus*) perched on trees alongside a river were also more likely to flee from a paddle raft when their perches were closer to the river or were closer to the ground (Steidl and Anthony, 1996).

Despite the many theories involving bubble formation (both as a direct cause of injury, see Non-Auditory Injury section and an indirect cause of stranding), Southall *et al.* (2007) summarizes that there is either scientific disagreement or a lack of information regarding each of the following important points: (1) received acoustical exposure conditions for animals involved in stranding events; (2) pathological interpretation of observed lesions in stranded marine mammals; (3) acoustic exposure conditions required to induce such physical trauma directly; (4) whether noise exposure may cause behavioral responses (such as atypical diving behavior) that secondarily cause bubble formation and non-auditory injury; and (5) the extent the post mortem artifacts introduced by decomposition before sampling, handling, freezing, or necropsy procedures affect interpretation of observed lesions.

Strandings Associated With Explosive Use

Silver Strand (2011)—

During a Navy training event on March 4, 2011, at the Silver Strand Training Complex in San Diego, California, three or possibly four dolphins were killed in an explosion. During an underwater detonation training event, a pod of 100 to 150 long-beaked common dolphins were observed moving towards the 700-yd (640.1-m) exclusion zone around the explosive charge, monitored by personnel in a safety boat and participants in a dive boat. Approximately 5 minutes remained on a time-delay fuse connected to a single 8.76 lb (3.97 kg) explosive charge (C–4 and detonation cord). Although the dive boat was placed between the pod and the explosive in an effort to guide the dolphins away from the area, that effort was unsuccessful and three long-beaked common dolphins near the explosion died. The Navy recovered those animals and transferred them to the local stranding network for necropsy. In addition to the three dolphins found dead on March 4, the remains of a fourth dolphin were discovered on March 7, 2011, near Oceanside, California (3 days later and approximately 42 mi (68 km) north of the detonation), which might also have been related to this event. Upon necropsy, all four animals were found to have sustained typical mammalian primary blast injuries (Danil and St Leger, 2011). Association of the fourth stranding with the training event is uncertain because dolphins strand on a regular basis in the San Diego area. Details such as the dolphins' depth and distance from the explosive at the time of the detonation could not be estimated from the 250 yd (228.6 m) standoff point of the observers in the dive boat or the safety boat.

These dolphin mortalities are the only known occurrence of a Navy training or testing event involving impulsive energy (underwater detonation) that caused mortality or injury to a marine mammal. Despite this being a rare occurrence, the Navy reviewed training requirements, safety procedures, and possible mitigation measures and implemented changes to reduce the potential for this to occur in the future.

Discussions of procedures associated with underwater explosives training and other training events are presented in the Proposed Mitigation Measures section.

Kyle of Durness, Scotland (2011)—

On July 22, 2011, a mass stranding event involving long-finned pilot whales occurred at Kyle of Durness, Scotland. An investigation by Brownlow *et al.* (2015) considered unexploded ordnance detonation activities at a Ministry of Defense bombing range, conducted by the Royal Navy prior to and during the strandings, as a plausible contributing factor in the mass stranding event. While Brownlow *et al.* (2015) concluded that the serial detonations of underwater ordnance were an influential factor in the mass stranding event (along with the presence of a potentially compromised animal and navigational error in a topographically complex region), they also suggest that mitigation measures—which included observations from a zodiac only and by personnel not experienced in marine mammal observation, among other deficiencies—were likely insufficient to assess if cetaceans were in the vicinity of the detonations. The authors also cite information from the Ministry of Defense indicating ''an extraordinarily high level of activity'' (*i.e.,* frequency and intensity of underwater explosions) on the range in the days leading up to the stranding.

Strandings on the Atlantic Coast and the Gulf of America

Stranded marine mammals are reported along the entire Atlantic Coast and Gulf of America each year. Marine mammals strand due to natural or anthropogenic causes; the majority of reported type of occurrences in marine mammal strandings in this region include fishery interactions, illness, predation, and vessel strikes (Henry *et al.,* 2024). Stranding events that are associated with active UMEs on the Atlantic Coast and the Gulf of America (inclusive of the AFTT Study Area) were previously discussed in the Description of Marine Mammals in the Area of Specified Activities section.

Potential Effects of Vessel Strike

Vessel strikes of marine mammals can result in death or serious injury of the animal. Wounds resulting from vessel strike may include massive trauma, hemorrhaging, broken bones, or propeller lacerations (Knowlton and Kraus, 2001). An animal at the surface could be struck directly by a vessel, a surfacing animal could hit the bottom of a vessel, or an animal just below the surface could be cut by a vessel's propeller. Superficial strikes may not kill or result in the death of the animal. Lethal interactions are typically associated with large whales, which are occasionally found draped across the bulbous bow of large commercial ships upon arrival in port. Although smaller cetaceans are more maneuverable in relation to large vessels than are large whales, they may also be susceptible to strike. The severity of injuries typically depends on the size and speed of the vessel (Knowlton and Kraus, 2001; Laist *et al.,* 2001; Vanderlaan and Taggart, 2007; Conn and Silber, 2013). Impact forces increase with speed, as does the probability of a strike at a given distance (Silber *et al.,* 2010; Gende *et al.,* 2011).

The most vulnerable marine mammals are those that spend extended periods of time at the surface in order to restore oxygen levels within their tissues after deep dives (*e.g.,* the sperm whale; Jaquet & Whitehead, 1996; Watkins *et al.,* 1999). Additionally, NARW mother-calf pairs spend 45 to 80 percent of their time surface resting or near-surface feeding during the first nine months of the calf's life (Cusano *et al.,* 2019), making them more susceptible to vessel strike. Further, some baleen whales seem generally unresponsive to vessel sound, making them more susceptible to vessel strikes (Nowacek *et al.,* 2004). These species are primarily large, slow-moving whales. Marine mammal responses to vessels may include avoidance and changes in dive pattern (NRC, 2003).

Wounds resulting from vessel strike may include massive trauma, hemorrhaging, broken bones, or propeller lacerations (Knowlton and Kraus, 2001). An animal at the surface could be struck directly by a vessel, a surfacing animal could hit the bottom of a vessel, or an animal just below the surface could be cut by a vessel's propeller. Impact forces increase with speed as does the probability of a strike at a given distance (Silber *et al.,* 2010; Gende *et al.,* 2011). An examination of all known vessel strikes from all shipping sources (civilian and military) indicates vessel speed is a principal factor in whether a vessel strike results in death or serious injury (Knowlton and Kraus, 2001; Laist *et al.,* 2001; Jensen and Silber, 2003; Pace and Silber, 2005; Vanderlaan and Taggart, 2007). In assessing records in which vessel speed was known, Laist *et al.* (2001) found a direct relationship between the occurrence of a whale strike and the speed of the vessel involved in the collision. The authors concluded that most deaths occurred when a vessel was traveling in excess of 13 kn (24 km/hr).

Jensen and Silber (2003) detailed 292 records of known or probable vessel strikes of all large whale species from 1975 to 2002. Of these, vessel speed at the time of collision was reported for 58 cases. Of these 58 cases, 39 (or 67 percent) resulted in serious injury or death (19 of those resulted in serious injury as determined by blood in the water, propeller gashes or severed tailstock, and fractured skull, jaw, vertebrae, hemorrhaging, massive bruising or other injuries noted during necropsy and 20 resulted in death). Operating speeds of vessels that struck various species of large whales ranged from 2 to 51 kn (3.7 to 94.5 km/hr). The majority (79 percent) of these strikes occurred at speeds of 13 kn (24 km/hr) or greater. The average speed that resulted in serious injury or death was 18.6 kn (34.4 km/hr). Pace and Silber (2005) found that the probability of death or serious injury increased rapidly with increasing vessel speed. Specifically, the predicted probability of serious injury or death increased from 45 to 75 percent as vessel speed increased from 10 to 14 kn (18.5 to 25.9 km/hr), and exceeded 90 percent at 17 kn (31.5 km/hr). Higher speeds during strikes result in greater force of impact and also appear to increase the chance of severe injuries or death. While modeling studies have suggested that hydrodynamic forces pulling whales toward the vessel hull increase with increasing speed (Clyne, 1999; Knowlton *et al.,* 1995), this is inconsistent with Silber *et al.* (2010), which demonstrated that there is no such relationship (*i.e.,* hydrodynamic forces are independent of speed).

In a separate study, Vanderlaan and Taggart (2007) analyzed the probability of lethal mortality of large whales at a given speed, showing that the greatest rate of change in the probability of a lethal injury to a large whale as a function of vessel speed occurs between 8.6 and 15 kn (15.9 and 27.8 km/hr). The chances of a lethal injury decline from approximately 80 percent at 15 kn to approximately 20 percent at 8.6 kn (15.9 km/hr). At speeds below 11.8 kn (21.9 km/hr), the chances of lethal injury drop below 50 percent, while the probability asymptotically increases toward 100 percent above 15 kn (27.8 km/hr). Garrison *et al.* (2025) reviewed and updated available data on whale-vessel interactions in U.S. waters to determine the effects of vessel speed and size on lethality of strikes of large whales, and found vessel size class had a significant effect on the probability of lethality. Decreasing vessel speeds reduced the likelihood of a lethal outcome for all vessel size classes modeled, with the strongest effect for vessels less than 354 ft (108 m) long. Notably, the probability that a strike by a very large vessel (length) will be lethal exceeded 0.80 at all speeds greater than 5 kn (9.26 km/hr) (Garrison *et al.,* 2025).

The Jensen and Silber (2003) report notes that the database represents a minimum number of strikes, because the vast majority probably goes undetected or unreported. In contrast, Action Proponent vessels are likely to detect any strike that does occur because of the required personnel training and Lookouts (as described in the Proposed Mitigation Measures section), and they are required to report all vessel strikes involving marine mammals.

In the AFTT Study Area, commercial traffic is heaviest in the nearshore waters, near major ports and in the shipping lanes along the entire U.S. East Coast and along the northern coast of the Gulf of America, while military vessel traffic is primarily concentrated between the mouth of the Chesapeake Bay and Jacksonville, Florida (Mintz, 2016). An examination of vessel traffic within the AFTT Study Area determined that military vessel occurrence is two orders of magnitude lower than that of commercial traffic. The study also revealed that while commercial traffic is relatively steady throughout the year, military vessel usage within the range complexes is episodic, based on specific exercises being conducted at different times of the year (Mintz, 2012); however, military vessel use within inshore waters occurs regularly and routinely consists of high-speed small craft movements. Juvenile whales of some species may be particularly vulnerable to vessel strikes due to their particular habitat use and surface foraging behavior in nearshore waters, where smaller vessel numbers are higher (Stepanuk *et al.,* 2021).

Over a period of 18 years from 1995 to 2012 there were a total of 19 Navy vessel strikes in the AFTT Study Area. Eight of the strikes resulted in a confirmed death; but in 11 of the 19 strikes, the fate of the animal was unknown. It is possible that some of the 11 reported strikes resulted in recoverable injury or were not marine mammals at all, but another large marine species (*e.g.,* basking shark). However, it is prudent to consider that all of the strikes could have resulted in the death of a marine mammal. From 2009 to 2024, there have been a total of three whale strikes by the U.S. Navy (one in 2011, two in 2012), and three whale strikes by the U.S. Coast Guard (two in 2009, one in 2024) reported in the AFTT Study Area. In the 2009 Coast Guard strike of two whales, the whales were observed swimming away with no apparent injuries. All known strikes of large whales by the U.S. Navy and the U.S. Coast Guard in the AFTT Study Area have been in the VACAPES Operating Area. In 2021, a small Navy vessel struck a dolphin in Saint Andrew's Pass, Florida (offshore Panama City, Florida).

Between 2007 and 2009, the Navy developed and distributed additional training, mitigation, and reporting tools to Navy operators to improve marine mammal protection and to ensure compliance with permit requirements. In 2009, the Navy implemented Marine Species Awareness Training designed to improve effectiveness of visual observation for marine mammals and other marine resources. In subsequent years, the Navy issued refined policy guidance on vessel strikes in order to collect the most accurate and detailed data possible in response to a possible incident (also see the Notification and Reporting Plan for this proposed rule). For over a decade, the Navy has implemented the Protective Measures Assessment Protocol software tool, which provides operators with notification of the required mitigation and a visual display of the planned training or testing activity location overlaid with relevant environmental data.

Marine Mammal Habitat

The proposed training and testing activities could potentially affect marine mammal habitat through the introduction of impacts to the prey species of marine mammals, acoustic habitat (sound in the water column), water quality, and biologically important habitat for marine mammals. Each of these potential effects was considered in the 2024 AFTT Draft Supplemental EIS/OEIS and was determined not to have adverse effects on marine mammal habitat. Based on the information below and the supporting information included in the 2024 AFTT Draft Supplemental EIS/OEIS, NMFS has determined that the proposed training and training activities would not have adverse or long-term impacts on marine mammal habitat.

Effects to Prey

Sound may affect marine mammals through impacts on the abundance, behavior, or distribution of prey species (*e.g.,* crustaceans, cephalopods, fish, zooplankton). Marine mammal prey varies by species, season, and location and, for some species, is not well-documented. Here, we describe studies regarding the effects of noise on known marine mammal prey.

Fish utilize the soundscape and components of sound in their environment to perform important functions such as foraging, predator avoidance, mating, and spawning (*e.g.,* Zelick *et al.,* 1999; Fay, 2009). The most likely effects on fishes exposed to loud, intermittent, low-frequency sounds are behavioral responses (*i.e.,* flight or avoidance). Short duration, sharp sounds (such as pile driving or air guns) can cause overt or subtle changes in fish behavior and local distribution. The response of fish to acoustic sources depends on the physiological state of the fish, past exposures, motivation (*e.g.,* feeding, spawning, migration), and other environmental factors. Key impacts to fishes may include behavioral responses, hearing damage, barotrauma (pressure-related injuries), and mortality. While it is clear that the behavioral responses of individual prey, such as displacement or other changes in distribution, can have direct impacts on the foraging success of marine mammals, the effects on marine mammals of individual prey that experience hearing damage, barotrauma, or mortality is less clear, though obviously population scale impacts that meaningfully reduce the amount of prey available could have more serious impacts.

Fishes, like other vertebrates, have a variety of different sensory systems to glean information from ocean around them (Astrup and Mohl, 1993; Astrup, 1999; Braun and Grande, 2008; Carroll *et al.,* 2017; Hawkins and Johnstone, 1978; Ladich and Popper, 2004; Ladich and Schulz-Mirbach, 2016; Mann, 2016; Nedwell *et al.,* 2004; Popper *et al.,* 2003; Popper *et al.,* 2005). Depending on their hearing anatomy and peripheral sensory structures, which vary among species, fishes hear sounds using pressure and particle motion sensitivity capabilities and detect the motion of surrounding water (Fay *et al.,* 2008) (terrestrial vertebrates generally only detect pressure). Most marine fishes primarily detect particle motion using the inner ear and lateral line system, while some fishes possess additional morphological adaptations or specializations that can enhance their sensitivity to sound pressure, such as a gas-filled swim bladder (Braun and Grande, 2008; Popper and Fay, 2011). Hearing capabilities vary considerably between different fish species with data only available for just over 100 species out of the 34,000 marine and freshwater fish species (Eschmeyer and Fong, 2016). In order to better understand acoustic impacts on fishes, fish hearing groups are defined by species that possess a similar continuum of anatomical features which result in varying degrees of hearing sensitivity (Popper and Hastings, 2009a). There are four hearing groups defined for all fish species (modified from Popper *et al.,* 2014) within this analysis and they include: fishes without a swim bladder (*e.g.,* flatfish, sharks, rays, *etc.*); fishes with a swim bladder not involved in hearing (*e.g.,* salmon, cod, pollock, *etc.*); fishes with a swim bladder involved in hearing (*e.g.,* sardines, anchovy, herring, *etc.*); and fishes with a swim bladder involved in hearing and high-frequency hearing (*e.g.,* shad and menhaden). Most marine mammal fish prey species would not be likely to perceive or hear mid- or high-frequency sonars. While hearing studies have not been done on sardines and northern anchovies, it would not be unexpected for them to possess hearing similarities to Pacific herring (up to 2–5 kHz) (Mann *et al.,* 2005). Currently, less data are available to estimate the range of best sensitivity for fishes without a swim bladder.

In terms of physiology, multiple scientific studies have documented a lack of mortality or physiological effects to fish from exposure to low- and mid-frequency sonar and other sounds (Halvorsen *et al.,* 2012; Jørgensen *et al.,* 2005; Juanes *et al.,* 2017; Kane *et al.,* 2010; Kvadsheim and Sevaldsen, 2005; Popper *et al.,* 2007; Popper *et al.,* 2016; Watwood *et al.,* 2016). Techer *et al.* (2017) exposed carp in floating cages for up to 30 days to low-power 23 and 46 kHz sources without any significant physiological response. Other studies have documented either a lack of TTS in species whose hearing range cannot perceive military sonar, or for those species that could perceive sonar-like signals, any TTS experienced would be recoverable (Halvorsen *et al.,* 2012; Ladich and Fay, 2013; Popper and Hastings, 2009a, 2009b; Popper *et al.,* 2014; Smith, 2016). Only fishes that have specializations that enable them to hear sounds above about 2,500 Hz (2.5 kHz) such as herring (Halvorsen *et al.,* 2012; Mann *et al.,* 2005; Mann, 2016; Popper *et al.,* 2014) would have the potential to receive TTS or exhibit behavioral responses from exposure to mid-frequency sonar. In addition, any sonar induced TTS to fish whose hearing range could perceive sonar would only occur in the narrow spectrum of the source (*e.g.,* 3.5 kHz) compared to the fish's total hearing range (*e.g.,* 0.01 kHz to 5 kHz). Overall, military sonar sources are much narrower in terms of source frequency compared to a given fish species full hearing range (Halvorsen *et al.,* 2012; Jørgensen *et al.,* 2005; Juanes *et al.,* 2017; Kane *et al.,* 2010; Kvadsheim & Sevaldsen, 2005; Popper *et al.,* 2007; Popper and Hawkins, 2016; Watwood *et al.,* 2016).

In terms of behavioral responses, Juanes *et al.* (2017) discuss the potential for negative impacts from anthropogenic soundscapes on fish, but the author's focus was on broader based sounds such as ship and boat noise sources. Watwood *et al.* (2016) also documented no behavioral responses by reef fish after exposure to MFAS. Doksaeter *et al.* (2009; 2012) reported no behavioral responses to mid-frequency military sonar by Atlantic herring; specifically, no escape responses (vertically or horizontally) were observed in free swimming herring exposed to mid-frequency sonar transmissions. Based on these results (Doksaeter *et al.,* 2009; Doksaeter *et al.,* 2012; Sivle *et al.,* 2012), Sivle *et al.* (2014) created a model in order to report on the possible population-level effects on Atlantic herring from active naval sonar. The authors concluded that the use of military sonar poses little risk to populations of herring regardless of season, even when the herring populations are aggregated and directly exposed to sonar. Finally, Bruintjes *et al.* (2016) commented that fish exposed to any short-term noise within their hearing range might initially startle, but would quickly return to normal behavior. Occasional behavioral responses to intermittent explosions and impulsive sound sources are unlikely to cause long-term consequences for individual fish or populations. Fish that experience hearing loss as a result of exposure to explosions and impulsive sound sources may have a reduced ability to detect relevant sounds such as predators, prey, or social vocalizations. However, PTS has not been known to occur in fishes and any hearing loss in fish may be as temporary as the timeframe required to repair or replace the sensory cells that were damaged or destroyed (Popper *et al.,* 2005; Popper *et al.,* 2014; Smith *et al.,* 2006). It is not known if damage to auditory nerve fibers could occur, and if so, whether fibers would recover during this process.

It is also possible for fish to be injured or killed by an explosion in the immediate vicinity of the surface from dropped or fired ordnance, or near the bottom from shallow water bottom-placed underwater mine warfare detonations. Physical effects from pressure waves generated by underwater sounds (*e.g.,* underwater explosions) could potentially affect fish within proximity of training or testing activities. SPLs of sufficient strength have been known to cause injury to fish and fish mortality (summarized in Popper *et al.,* 2014). The shock wave from an underwater explosion is lethal to fish at close range, causing massive organ damage and non-auditory injury and internal bleeding (Keevin and Hempen, 1997). At greater distance from the detonation point, the extent of mortality or injury depends on a number of factors including fish size, body shape, orientation, and species (Keevin and Hempen, 1997; Wright, 1982). At the same distance from the source, larger fish are generally less susceptible to death or injury, elongated forms that are round in cross-section are less at risk than deep-bodied forms, and fish oriented sideways to the blast suffer the greatest impact (Edds-Walton and Finneran, 2006; O'Keeffe, 1984; O'Keeffe and Young, 1984; Wiley *et al.,* 1981; Yelverton *et al.,* 1975). Species with gas-filled organs are more susceptible to injury and mortality than those without them (Gaspin, 1975; Gaspin *et al.,* 1976; Goertner *et al.,* 1994). Barotrauma injuries have been documented during controlled exposure to impact pile driving (an impulsive noise source, as are explosives and air guns) (Halvorsen *et al.,* 2012b; Casper *et al.,* 2013).

Fish not killed or driven from a location by an explosion might change their behavior, feeding pattern, or distribution. Changes in behavior of fish have been observed as a result of sound produced by explosives, with effect intensified in areas of hard substrate (Wright, 1982). However, Navy explosive use avoids hard substrate to the best extent practical during underwater detonations, or deep-water surface detonations. Stunning from pressure waves could also temporarily immobilize fish, making them more susceptible to predation. The abundances of various fish (and invertebrates) near the detonation point for explosives could be altered for a few hours before animals from surrounding areas repopulate the area. However, these populations would likely be replenished as waters near the detonation point are mixed with adjacent waters. Repeated exposure of individual fish to sounds from underwater explosions is not likely and exposures are expected to be short-term and localized. Long-term consequences for fish populations would not be expected. Several studies have demonstrated that air gun sounds might affect the distribution and behavior of some fishes, potentially impacting foraging opportunities or increasing energetic costs (*e.g.,* Fewtrell and McCauley, 2012; Pearson *et al.,* 1992; Skalski *et al.,* 1992; Santulli *et al.,* 1999; Paxton *et al.,* 2017).

For fishes exposed to military sonar, there would be limited sonar use spread out in time and space across large offshore areas such that only small areas are actually ensonified (tens of miles) compared to the total life history distribution of fish prey species. There would be no probability for mortality or physical injury from sonar, and for most species, no or little potential for hearing or behavioral effects, except to a few select fishes with hearing specializations (*e.g.,* herring) that could perceive mid-frequency sonar. Training and testing exercises involving explosions are dispersed in space and time; therefore, repeated exposure of individual fishes is unlikely. Mortality and injury effects to fishes from explosives would be localized around the area of a given in-water explosion, but only if individual fish and the explosive (and immediate pressure field) were co-located at the same time. Fishes deeper in the water column or on the bottom would not be affected by water surface explosions. Repeated exposure of individual fish to sound and energy from underwater explosions is not likely given fish movement patterns, especially schooling prey species. Most acoustic effects, if any, are expected to be short-term and localized. Long-term consequences for fish populations, including key prey species within the AFTT Study Area, would not be expected.

Vessels and in-water devices do not normally collide with adult fish, particularly those that are common marine mammal prey, most of which can detect and avoid them. Exposure of fishes to vessel strike stressors is limited to those fish groups that are large, slow-moving, and may occur near the surface, such as ocean sunfish, whale sharks, basking sharks, and manta rays. With the exception of sturgeon, these species are distributed widely in offshore portions of the AFTT Study Area. Any isolated cases of a military vessel striking an individual could injure that individual, impacting the fitness of an individual fish. Vessel strikes would not pose a risk to most of the other marine fish groups, because many fish can detect and avoid vessel movements, making strikes rare and allowing the fish to return to their normal behavior after the ship or device passes. As a vessel approaches a fish, they could have a detectable behavioral or physiological response (*e.g.,* swimming away and increased heart rate) as the passing vessel displaces them. However, such responses are not expected to have lasting effects on the survival, growth, recruitment, or reproduction of these marine fish groups at the population level and therefore would not have an impact on marine mammal species as prey items.

In addition to fish, prey sources such as marine invertebrates could potentially be impacted by sound stressors as a result of the proposed activities. However, most marine invertebrates' ability to sense sounds is very limited. In most cases, marine invertebrates would not respond to impulsive and non-impulsive sounds, although they may detect and briefly respond to nearby low-frequency sounds. These short-term responses would likely be inconsequential to invertebrate populations.

Invertebrates appear to be able to detect sounds (Pumphrey, 1950; Frings and Frings, 1967) and are most sensitive to low-frequency sounds (Packard *et al.,* 1990; Budelmann and Williamson, 1994; Lovell *et al.,* 2005; Mooney *et al.,* 2010). Data on response of invertebrates such as squid, another marine mammal prey species, to anthropogenic sound is more limited (de Soto, 2016; Sole *et al.,* 2017b). Data suggest that cephalopods are capable of sensing the particle motion of sounds and detect low frequencies up to 1–1.5 kHz, depending on the species, and so are likely to detect air gun noise (Kaifu *et al.,* 2008; Hu *et al.,* 2009; Mooney *et al.,* 2010; Samson *et al.,* 2014). Sole *et al.* (2017b) reported physiological injuries to cuttlefish in cages placed at-sea when exposed during a controlled exposure experiment to low-frequency sources (315 Hz, 139 to 142 dB re 1 μPa^2 and 400 Hz, 139 to 141 dB re 1 μPa^2). Fewtrell and McCauley (2012) reported squids maintained in cages displayed startle responses and behavioral changes when exposed to seismic air gun sonar (136–162 re 1 $\mu Pa^2 s$). However, the sources Sole *et al.* (2017a) and Fewtrell and McCauley (2012) used are not similar and were much lower than typical military sources within the AFTT Study Area. Nor do the studies address the issue of individual displacement outside of a zone of impact when exposed to sound. Jones *et al.* (2020) found that when squid (*Doryteuthis (Amerigo) pealeii*) were exposed to impulse pile driving noise, body pattern changes, inking, jetting, and startle responses were observed and nearly all squid exhibited at least one response. However, these responses occurred primarily during the first eight impulses and diminished quickly, indicating potential rapid, short-term habituation.

Cephalopods have a specialized sensory organ inside the head called a statocyst that may help an animal determine its position in space (orientation) and maintain balance (Budelmann, 1992). Packard *et al.* (1990) showed that cephalopods were sensitive to particle motion, not sound pressure, and Mooney *et al.* (2010) demonstrated that squid statocysts act as an accelerometer through which particle motion of the sound field can be detected. Auditory injuries (lesions occurring on the statocyst sensory hair cells) have been reported upon controlled exposure to low-frequency sounds, suggesting that cephalopods are particularly sensitive to low-frequency sound (Andre *et al.,* 2011; Sole *et al.,* 2013). Behavioral responses, such as inking and jetting, have also been reported upon exposure to low-frequency sound (McCauley *et al.,* 2000b; Samson *et al.,* 2014). Squids, like most fish species, are likely more sensitive to low frequency sounds, and may not perceive mid- and high-frequency sonars such as military sonars. Cumulatively for squid as a prey species, individual and population impacts from exposure to military sonar and explosives, like fish, are not likely to be significant, and explosive impacts would be short-term and localized.

Explosions and pile driving would likely kill or injure nearby marine invertebrates. Vessels also have the potential to impact marine invertebrates by disturbing the water column or sediments, or directly striking organisms (Bishop, 2008). The propeller wash (water displaced by propellers used for propulsion) from vessel movement and water displaced from vessel hulls can potentially disturb marine invertebrates in the water column and is a likely cause of zooplankton mortality (Bickel *et al.,* 2011). The localized and short-term exposure to explosions or vessels could displace, injure, or kill zooplankton, invertebrate eggs or larvae, and macro-invertebrates. However, mortality or long-term consequences for a few animals is unlikely to have measurable effects on overall populations. Long-term consequences to marine invertebrate populations would not be expected as a result of exposure to sounds of vessels in the AFTT Study Area. Impacts to benthic communities from impulsive sound generated by active acoustic sound sources are not well documented. (*e.g.,* Andriguetto-Filho *et al.,* 2005; Payne *et al.,* 2007; 2008; Boudreau *et al.,* 2009). There are no published data that indicate whether temporary or permanent threshold shifts, auditory masking, or behavioral effects occur in benthic invertebrates (Hawkins *et al.,* 2014) and some studies showed no short-term or long-term effects of air gun exposure (*e.g.,* Andriguetto-Filho *et al.,* 2005; Payne *et al.,* 2007; 2008; Boudreau *et al.,* 2009). Exposure to air gun signals was found to significantly increase mortality in scallops, in addition to causing significant changes in behavioral patterns during exposure (Day *et al.,* 2017). However, the authors state that the observed levels of mortality were not beyond naturally occurring rates. Explosions and pile driving could potentially kill or injure nearby marine invertebrates; however, mortality or long-term consequences for a few animals is unlikely to have measurable effects on overall populations.

There is little information concerning potential impacts of noise on zooplankton populations. However, one study (McCauley *et al.,* 2017) investigated zooplankton abundance, diversity, and mortality before and after exposure to air gun noise, finding that the mortality rate for zooplankton after air gun exposure was two to three times more compared with controls for all taxa. The majority of taxa present were copepods and cladocerans; for these taxa, the range within which effects on abundance were detected was up to approximately 0.75 mi (1.2 km). In order to have significant impacts on *r*-selected species (species that produce a large number of offspring and contribute few resources to each individual offspring) such as plankton, the spatial or temporal scale of impact must be large in comparison with the ecosystem concerned (McCauley *et al.,* 2017).

Notably, a recently described study produced results inconsistent with those of McCauley *et al.* (2017). Researchers conducted a field and laboratory study to assess if exposure to air gun noise affects mortality, predator escape response, or gene expression of the copepod *Calanus finmarchicus* (Fields *et al.,* 2019). Immediate mortality of copepods was significantly higher, relative to controls, at distances of 16.4 ft (5 m) or less from the air guns. Mortality one week after the air gun blast was significantly higher in the copepods placed 32.8 ft (10 m) from the air gun but was not significantly different from the controls at a distance of 65.6 ft (20 m) from the air gun. The increase in mortality, relative to controls, did not exceed 30 percent at any distance from the air gun. Moreover, the authors caution that even this higher mortality in the immediate vicinity of the air guns may be more pronounced than what would be observed in free-swimming animals due to increased flow speed of fluid inside bags containing the experimental animals. There were no sublethal effects on the escape performance or the sensory threshold needed to initiate an escape response at any of the distances from the air gun that were tested. Whereas McCauley *et al.* (2017) reported an SEL of 156 dB at a range of 1,670–2,158.8 ft (509–658 m), with zooplankton mortality observed at that range, Fields *et al.* (2019) reported an SEL of 186 dB at a range of 82 ft (25 m), with no reported mortality at that distance. The large scale of effect observed here is of concern—particularly where repeated noise exposure is expected—and further study is warranted.

Military expended materials resulting from training and testing activities could potentially result in minor long-term changes to benthic habitat, however the impacts of small amounts of expended materials are unlikely to have measurable effects on overall populations. Military expended materials may be colonized over time by benthic organisms that prefer hard substrate and would provide structure that could attract some species of fish or invertebrates.

Overall, the combined impacts of sound exposure, explosions, vessel strikes, and military expended materials resulting from the proposed activities would not be expected to have measurable effects on populations of marine mammal prey species. Prey species exposed to sound might move away from the sound source, experience TTS, experience masking of biologically relevant sounds, or show no obvious direct effects. Mortality from decompression injuries is possible in close proximity to a sound, but only limited data on mortality in response to air gun noise exposure are available (Fields *et al.,* 2019, Hawkins *et al.,* 2014, McCauley *et al.,* 2017). The most likely impacts for most prey species in a given area would be temporary avoidance of the area. Surveys using towed air gun arrays move through an area relatively quickly, limiting exposure to multiple impulsive sounds. In all cases, sound levels would return to ambient once a survey ends and the noise source is shut down and, when exposure to sound ends, behavioral and/or physiological responses are expected to end relatively quickly (McCauley *et al.,* 2000b). The duration of fish avoidance of a given area after survey effort stops is unknown, but a rapid return to normal recruitment, distribution, and behavior is anticipated. While the potential for disruption of spawning aggregations or schools of important prey species can be meaningful on a local scale, the mobile and temporary nature of most surveys and the likelihood of temporary avoidance behavior suggest that impacts would be minor. Long-term consequences to marine invertebrate populations would not be expected as a result of exposure to sounds or vessels in the AFTT Study Area.

Acoustic Habitat

Acoustic habitat is the soundscape which encompasses all of the sound present in a particular location and time, as a whole when considered from the perspective of the animals experiencing it. Animals produce sound for, or listen for sounds produced by, conspecifics (communication during feeding, mating, and other social activities), other animals (finding prey or avoiding predators), and the physical environment (finding suitable habitats, navigating). Together, sounds made by animals and the geophysical environment (*e.g.,* produced by earthquakes, lightning, wind, rain, waves) make up the natural contributions to the total acoustics of a place. These acoustic conditions, termed acoustic habitat, are one attribute of an animal's total habitat.

Soundscapes are also defined by, and acoustic habitat influenced by, the total contribution of anthropogenic sound. This may include incidental emissions from sources such as vessel traffic or may be intentionally introduced to the marine environment for data acquisition purposes (as in the use of air gun arrays) or for military training and testing purposes (as in the use of sonar and explosives and other acoustic sources). Anthropogenic noise varies widely in its frequency, content, duration, and loudness, and these characteristics greatly influence the potential habitat-mediated effects to marine mammals (please also see the previous discussion in the Masking section), which may range from local effects for brief periods of time to chronic effects over large areas and for long durations. Depending on the extent of effects to habitat, animals may alter their communications signals (thereby potentially expending additional energy) or miss acoustic cues (either conspecific or adventitious). Problems arising from a failure to detect cues are more likely to occur when noise stimuli are chronic and overlap with biologically relevant cues used for communication, orientation, and predator/prey detection (Francis and Barber, 2013). For more detail on these concepts see, *e.g.,* Barber *et al.,* 2009; Pijanowski *et al.,* 2011; Francis and Barber, 2013; Lillis *et al.,* 2014.

The term ''listening area'' refers to the region of ocean over which sources of sound can be detected by an animal at the center of the space. Loss of communication space concerns the area over which a specific animal signal (used to communicate with conspecifics in biologically important contexts such as foraging or mating) can be heard, in noisier relative to quieter conditions (Clark *et al.,* 2009). Lost listening area concerns the more generalized contraction of the range over which animals would be able to detect a variety of signals of biological importance, including eavesdropping on predators and prey (Barber *et al.,* 2009). Such metrics do not, in and of themselves, document fitness consequences for the marine animals that live in chronically noisy environments. Long-term population-level consequences mediated through changes in the ultimate survival and reproductive success of individuals are difficult to study, and particularly so underwater. However, it is increasingly well documented that aquatic species rely on qualities of natural acoustic habitats, with researchers quantifying reduced detection of important ecological cues (*e.g.,* Francis and Barber, 2013; Slabbekoorn *et al.,* 2010) as well as survivorship consequences in several species (*e.g.,* Simpson *et al.,* 2014; Nedelec *et al.,* 2015).

The sounds produced during training and testing activities can be widely dispersed or concentrated in small areas for varying periods. Sound produced from training and testing activities in the AFTT Study Area is temporary and transitory. Any anthropogenic noise attributed to training and testing activities in the AFTT Study Area would be temporary and the affected area would be expected to immediately return to the original state when these activities cease.

Water Quality

Training and testing activities may introduce water quality constituents into the water column. Based on the analysis of the 2024 AFTT Draft Supplemental EIS/OEIS, military expended materials (*e.g.,* undetonated explosive materials) would be released in quantities and at rates that would not result in a violation of any water quality standard or criteria. NMFS has reviewed this analysis and concurs that it reflects the best available science. High-order explosions consume most of the explosive material, creating typical combustion products. For example, in the case of Royal Demolition Explosive, 98 percent of the products are common seawater constituents and the remainder is rapidly diluted below threshold effect level. Explosion by-products associated with high order detonations present no secondary stressors to marine mammals through sediment or water. However, low order detonations and unexploded ordnance present elevated likelihood of impacts on marine mammals.

Indirect effects of explosives and unexploded ordnance to marine mammals via sediment is possible in the immediate vicinity of the ordnance. Degradation products of Royal Demolition Explosive are not toxic to marine organisms at realistic exposure levels (Rosen and Lotufo, 2010). Relatively low solubility of most explosives and their degradation products means that concentrations of these contaminants in the marine environment are relatively low and readily diluted. Furthermore, while explosives and their degradation products were detectable in marine sediment approximately 6–12 inches (0.15–0.3 m) away from degrading ordnance, the concentrations of these compounds were not statistically distinguishable from background beyond 3–6 ft (1–2 m) from the degrading ordnance. Taken together, it is possible that marine mammals could be exposed to degrading explosives, but it would be within a very small radius of the explosive (1–6 ft (0.3–2 m)).

Equipment used by the Action Proponents within the AFTT Study Area, including ships and other marine vessels, aircraft, and other equipment, are also potential sources of by-products. All equipment is properly maintained in accordance with applicable Navy, Coast Guard and legal requirements. All such operating equipment meets Federal water quality standards, where applicable.

Estimated Take of Marine Mammals

This section indicates the number of takes that NMFS is proposing to authorize, which is based on the amount of take that NMFS anticipates is reasonably likely to occur. NMFS coordinated closely with the Action Proponents in the development of their incidental take application, and preliminarily agrees that the methods the Action Proponents have put forth described herein to estimate take (including the model, thresholds, and density estimates), and the resulting numbers are based on the best available science and appropriate for authorization.

Takes would be predominantly in the form of harassment, but a small number of mortalities are also possible. For this military readiness activity, the MMPA defines ''harassment'' as (i) Any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) Any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where the behavioral patterns are abandoned or significantly altered (Level B harassment).

Proposed authorized takes would primarily be in the form of Level B harassment, as use of the acoustic (*e.g.,* active sonar, pile driving, and seismic air guns) and explosive sources is most likely to result in disruption of natural behavioral patterns to a point where they are abandoned or significantly altered (as defined specifically at the beginning of this section, but referred to generally as behavioral disturbance) for marine mammals, either via direct behavioral disturbance or TTS. There is also the potential for Level A harassment, in the form of auditory injury to result from exposure to the sound sources utilized in military readiness activities. Lastly, no more than 6 serious injuries or mortalities total (over the 7-year period) of large whales could potentially occur through vessel strikes, and 13 serious injuries or mortalities (over the 7-year period) from explosive use. Although we analyze the impacts of these potential serious injuries or mortalities that are proposed for authorization, the proposed mitigation and monitoring measures are expected to minimize the likelihood (*i.e.,* further lower the already low probability) that vessel strike (and the associated serious injury or mortality) would occur, as well as the severity of other takes.

Generally speaking, for acoustic impacts NMFS estimates the amount and type of harassment by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals would experience behavioral disturbance or incur some degree of temporary or permanent hearing impairment; (2) the area or volume of water that would be ensonified above these levels in a day or event; (3) the density or occurrence of marine mammals within these ensonified areas; and (4) the number of days of activities or events.

Acoustic Thresholds

Using the best available science, NMFS, in coordination with the Navy, has established acoustic thresholds that identify the most appropriate received level of underwater sound above which marine mammals exposed to these sound sources could be reasonably expected to directly incur a disruption in behavior patterns to a point where they are abandoned or significantly altered (equated to onset of Level B harassment), or to incur TTS onset (equated to Level B harassment via the indirect disruptions of behavioral patterns) or AUD INJ onset (equated to Level A harassment). Thresholds have also been developed to identify the pressure and impulse levels above which animals may incur non-auditory injury or mortality from exposure to explosive detonation.

Hearing Impairment (TTS/AUD INJ), Non-Auditory Injury, and Mortality

NMFS' 2024 Technical Guidance (NMFS, 2024) identifies dual criteria to assess AUD INJ (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). The Updated Technical Guidance also identifies criteria to predict TTS, which is not considered injury and falls into the Level B harassment category. The Action Proponents' specified activities include the use of non-impulsive (sonar, vibratory pile driving) and impulsive (explosives, air guns, impact pile driving) sources.

For the consideration of impacts on hearing in Phase IV, marine mammals were divided into nine groups for analysis: very low-frequency cetaceans (VLF), low-frequency cetaceans (LF), high-frequency cetaceans (HF), very high-frequency cetaceans (VHF), sirenians (SI), phocid carnivores in water and in air (PCW and PCA, respectively), and otariids and other non-phocid marine carnivores in water and air (OCW and OCA, respectively). For each group, a frequency-dependent weighting function and numeric thresholds for the onset of TTS and the onset of AUD INJ were estimated. The onset of TTS is defined as a TTS of 6 dB measured approximately 2–5 minutes after exposure. A TTS of 40 dB is used as a proxy for the onset of AUD INJ; *i.e.,* it is assumed that exposures beyond those capable of causing 40 dB of TTS have the potential to result in PTS or other auditory injury (*e.g.,* loss of cochlear neuron synapses). Exposures just sufficient to cause TTS or AUD INJ are denoted as ''TTS onset'' or ''AUD INJ onset'' exposures. Onset levels are treated as step functions or ''all-or-nothing'' thresholds: exposures above the TTS or AUD INJ onset level are assumed to always result in TTS or AUD INJ, while exposures below the TTS or AUD INJ onset level are assumed to not cause TTS or AUD INJ. For non-impulsive exposures, onset levels are specified in frequency-weighted sound exposure level (SEL); for impulsive exposures, dual metrics of weighted SEL and unweighted peak sound pressure level (SPL) are used.

To compare Phase IV weighting functions and TTS/AUD INJ SEL thresholds to those used in Phase III, both the weighting function shape and the weighted threshold values were considered; the weighted thresholds by themselves only indicate the TTS/AUD INJ threshold at the most susceptible frequency (based on the relevant weighting function). In contrast, the TTS/AUD INJ exposure functions incorporate both the shape of the weighting function and the weighted threshold value and provide the best means of comparing the frequency-dependent TTS/AUD INJ thresholds for Phase III and Phase IV.

The most significant differences between the Phase III and Phase IV functions and thresholds include the following:

(1) Mysticetes were divided into two groups (VLF and LF), with the upper hearing limit for the LF group increased from Phase III to match recent hearing measurements in minke whales (Houser *et al.,* 2024);

(2) Group names were changed from Phase III to be consistent with Southall *et al.* (2019). Specifically, the Phase III mid-frequency (MF) cetacean group is now designated as the high-frequency (HF) cetacean group, and the group previously designated as high-frequency (HF) cetaceans is now the very-high frequency (VHF) cetacean group;

(3) For the HF group, Phase IV onset TTS/AUD INJ thresholds are lower compared to Phase III at frequencies below approximately 10 kHz. This is a result of new TTS onset data for dolphins at low frequencies (Finneran *et al.,* 2023);

(4) For the PCW group, new TTS data for harbor seals (Kastelein *et al.,* 2020b; Kastelein *et al.,* 2020e) resulted in slightly lower TTS/AUD INJ thresholds at high frequencies compared to Phase III; and

(5) For group OCW, new TTS data for California sea lions (Kastelein *et al.,* 2021b; Kastelein *et al.,* 2022a, 2022b) resulted in significantly lower TTS/AUD INJ thresholds compared to Phase III.

Of note, the thresholds and weighting function for the LF cetacean hearing group in NMFS' 2024 Technical Guidance (NMFS, 2024) match the Navy's VLF cetacean hearing group. However, the weighting function for those hearing groups differs between the two documents (*i.e.,* the Navy's LF cetacean group has a different weighting function from NMFS) due to the Houser *et al.* (2024) minke whale data incorporated into Navy 2024, but not NMFS (2024). While NMFS' 2024 Technical Guidance differs from the criteria that the Action Proponents used to assess AUD INJ and TTS for low-frequency cetaceans, NMFS concurs that the criteria the Action Proponents applied are appropriate for assessing the impacts of their proposed action. The criteria used by the Action Proponents are conservative in that those criteria show greater sensitivity at higher frequencies (*i.e.,* application of those criteria result in a higher amount of estimated take by higher frequency sonars than would result from application of NMFS' 2024 Technical Guidance) which is where more of the take is expected.

These thresholds (table 17 and table 18) were developed by compiling and synthesizing the best available science and soliciting input multiple times from both public and peer reviewers. The references, analysis, and methodology used in the development of the thresholds are described in Updated Technical Guidance, which may be accessed at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance.*

TABLE 17—ACOUSTIC THRESHOLDS IDENTIFYING THE ONSET OF TTS AND AUD INJ FOR NON-IMPULSIVE SOUND SOURCES BY FUNCTIONAL HEARING GROUP

Group	TTS threshold SEL (weighted)	AUD INJ threshold SEL (weighted)
Very low-frequency (VLF)	177	197
Low-frequency (LF)	177	197

TABLE 17—ACOUSTIC THRESHOLDS IDENTIFYING THE ONSET OF TTS AND AUD INJ FOR NON-IMPULSIVE SOUND SOURCES BY FUNCTIONAL HEARING GROUP—Continued

Group	TTS threshold SEL (weighted)	AUD INJ threshold SEL (weighted)
High-frequency (HF)	181	201
Very high-frequency (VHF)	161	181
Otariid carnivores in water (OW)	179	199
Phocid carnivores in water (PW)	175	195

Note: SEL thresholds in dB re 1 μPa²s underwater.

Based on the best available science, the Action Proponents (in coordination with NMFS) used the acoustic and pressure thresholds indicated in table 17 to predict the onset of behavioral harassment, AUD INJ, TTS, non-auditory injury, and mortality due to explosive sources.

For explosive activities using single detonations (*i.e.,* no more than one detonation within a day), such as those described in the proposed activity, NMFS uses TTS onset thresholds to assess the likelihood of behavioral harassment, rather than the Level B harassment threshold for multiple detonations indicated in table 18. While marine mammals may also respond to single explosive detonations, these responses are expected to more typically be in the form of startle response, rather than a more meaningful disruption of a behavioral pattern. On the rare occasion that a single detonation might result in a behavioral response that qualifies as Level B harassment, it would be expected to be in response to a comparatively higher received level. Accordingly, NMFS considers the potential for these responses to be quantitatively accounted for through the application of the TTS criteria, which, as noted above, is 5 dB higher than the behavioral harassment threshold for multiple explosives.

TABLE 18—EXPLOSIVE THRESHOLDS FOR MARINE MAMMALS FOR AUD INJ, TTS, AND BEHAVIOR

[Multiple detonations]

Hearing group	AUD INJ impulsive threshold *	TTS impulsive threshold *	Behavioral threshold (multiple detonations)
Very Low-Frequency (VLF)/Low-Frequency (LF) Cetaceans.	*Cell 1:* $L_{pk,flat}$: 222 dB; $L_{E,LF,24h}$: 183 dB.	*Cell 2:* $L_{pk,flat}$: 216 dB $L_{E,LF,24h}$: 168 dB.	*Cell 3:* $L_{E,LF,24h}$: 163 dB.
High-Frequency (HF) Cetaceans	*Cell 4:* $L_{pk,flat}$: 230 dB $L_{E,HF,24h}$: 193 dB.	*Cell 5:* $L_{pk,flat}$: 224 dB $L_{E,HF,24h}$: 178 dB.	*Cell 6:* $L_{E,HF,24h}$: 173 dB.
Very High-Frequency (VHF) Cetaceans.	*Cell 7:* $L_{pk,flat}$: 202 dB $L_{E,VHF,24h}$: 159 dB.	*Cell 8:* $L_{pk,flat}$: 196 dB $L_{E,VHF,24h}$: 144 dB.	*Cell 9:* $L_{E,VHF,24h}$: 139 dB.
Phocid Pinnipeds (PW) (Underwater).	*Cell 10:* $L_{pk,flat}$: 223 dB $L_{E,PW,24h}$: 183 dB.	*Cell 11:* $L_{pk,flat}$: 217 dB $L_{E,PW,24h}$: 168 dB.	*Cell 12:* $L_{E,PW,24h}$: 163 dB.
Otariid Pinnipeds (OW) (Underwater).	*Cell 13:* $L_{pk,flat}$: 230 dB $L_{E,OW,24h}$: 185 dB.	*Cell 14:* $L_{pk,flat}$: 224 dB $L_{E,OW,24h}$: 170 dB.	*Cell 15:* $L_{E,OW,24h}$: 165 dB.

Note: Peak sound pressure level ($L_{p,0\text{-}pk}$) has a reference value of 1 μPa, and weighted cumulative sound exposure level ($L_{E,p}$) has a reference value of 1 μPa²s. In this Table, criteria are abbreviated to be more reflective of International Organization for Standardization standards (ISO, 2017; ISO, 2020). The subscript "flat" is being included to indicate peak sound pressure are flat weighted or unweighted within the generalized hearing range of marine mammals underwater (*i.e.,* 7 Hz to 165 kHz). The subscript associated with cumulative sound exposure level criteria indicates the designated marine mammal auditory weighting function (LF, HF, and VHF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The weighted cumulative sound exposure level criteria could be exceeded in a multitude of ways (*i.e.,* varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these criteria will be exceeded.

* Dual metric criteria for impulsive sounds: Use whichever criteria results in the larger isopleth for calculating AUD INJ onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level criteria associated with impulsive sounds, the PK SPL criteria are recommended for consideration for non-impulsive sources.

The criterion for mortality is based on severe lung injury observed in terrestrial mammals exposed to underwater explosions as recorded in Goertner (1982). The criteria for non-auditory injury are based on slight lung injury or gastrointestinal (G.I.) tract injury observed in the same data set. Mortality and slight lung injury impacts to marine mammals are estimated using impulse thresholds based on both calf/pup/juvenile and adult masses (see the "Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase 4)" technical report (U.S. Department of the Navy, 2024)). The peak pressure threshold applies to all species and age classes. Unlike the prior analysis (Phase III), this analysis relies on the onset rather than the mean estimated threshold for these effects. This revision results in a small increase in the predicted non-auditory injuries and mortalities for the same event versus prior analyses. Thresholds are provided in table 19 for use in non-auditory injury assessment for marine mammals exposed to underwater explosives.

TABLE 19—NON-AUDITORY INJURY THRESHOLDS FOR UNDERWATER EXPLOSIVES

Hearing group	Mortality–Impulse *	Injury–Impulse *	Injury–Peak pressure
All Marine Mammals	*Cell 1:* Modified Goertner model; Equation 1.	*Cell 2:* Modified Goertner model; Equation 2.	*Cell 3:* $L_{p,0\text{-}pk,flat}$: 237 dB.

Note: Peak sound pressure (L_{pk}) has a reference value of 1 μPa. In this table, thresholds are abbreviated to reflect ANSI (2013). However, ANSI defines peak sound pressure as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript ''flat'' is being included to indicate peak sound pressure should be flat weighted or unweighted within the overall marine mammal generalized hearing range.

* Lung injury (severe and slight) thresholds are dependent on animal mass (Recommendation: table C.9 from U.S. Department of the Navy (2017) based on adult and/or calf/pup mass by species).

Modified Goertner Equations for severe and slight lung injury (pascal-second):

Equation 1: $103M^{1/3}(1 + D/10.1)^{1/6}$ Pa-s

Equation 2: $47.5M^{1/3}(1 + D/10.1)^{1/6}$ Pa-s

M animal (adult and/or calf/pup) mass (kg) (table C.9 in DoN 2017).

D animal depth (meters).

Level B Harassment by Behavioral Disturbance

Though significantly driven by received level and distance, the onset of Level B harassment by behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors and can be difficult to predict (Southall *et al.,* 2007, Ellison *et al.,* 2012). As discussed in the Potential Effects of Specified Activities on Marine Mammals and Their Habitat section, marine mammal responses to sound (some of which are considered disturbances that rise to the level of a take) are highly variable and context specific, *i.e.,* they are affected by differences in acoustic conditions; differences between species and populations; differences in gender, age, reproductive status, or social behavior; and other prior experience of the individuals. This means there is support for considering alternative approaches for estimating Level B behavioral harassment. Although the statutory definition of Level B harassment for military readiness activities means that a natural behavior pattern of a marine mammal is significantly altered or abandoned, the current state of science for determining those thresholds is somewhat unsettled.

Despite the rapidly evolving science, there are still challenges in quantifying expected behavioral responses that qualify as take by Level B harassment, especially where the goal is to use one or two predictable indicators (*e.g.,* received level and distance) to predict responses that are also driven by additional factors that cannot be easily incorporated into the thresholds (*e.g.,* context). So, while the criteria that identify Level B harassment by behavioral disturbance (referred to as ''behavioral harassment thresholds'') have been refined to better consider the best available science (*e.g.,* incorporating both received level and distance), they also still have some built-in factors to address the challenge noted. For example, while duration of observed responses in the data are now considered in the thresholds, some of the responses that are informing take thresholds are of a very short duration, such that it is possible some of these responses might not always rise to the level of disrupting behavior patterns to a point where they are abandoned or significantly altered. We describe the application of this behavioral harassment threshold as identifying the maximum number of instances in which marine mammals could be reasonably expected to experience a disruption in behavior patterns to a point where they are abandoned or significantly altered. In summary, we believe these behavioral harassment criteria are the most appropriate method for predicting Level B harassment by behavioral disturbance given the best available science and the associated uncertainty.

Sonar—

In its analysis of impacts associated with sonar acoustic sources (which was coordinated with NMFS), the Action Proponents used an updated approach, as described below. Many of the behavioral responses identified using the Action Proponents' quantitative analysis are most likely to be of moderate severity as described in the Southall *et al.* (2021) behavioral response severity scale. These ''moderate'' severity responses were considered significant if they were sustained for the duration of the exposure or longer. Within the Action Proponents' quantitative analysis, many responses are predicted from exposure to sound that may exceed an animal's Level B behavioral harassment threshold for only a single exposure (a few seconds) to several minutes, and it is likely that some of the resulting estimated behavioral responses that are counted as Level B harassment would not constitute ''significantly altering or abandoning natural behavioral patterns,'' *i.e.,* the estimated number of takes by Level B harassment due to behavioral disturbance and response is likely somewhat of an overestimate.

As noted above, the Action Proponents coordinated with NMFS to develop behavioral harassment thresholds specific to their military readiness activities utilizing active sonar that identify at what received level and distance Level B harassment by behavioral disturbance would be expected to result. These behavioral harassment thresholds consist of behavioral response functions (BRFs) and associated distance cut-off conditions, and are also referred to, together, as ''the criteria.'' These criteria are used to estimate the number of animals that may exhibit a behavioral response that rises to the level of a take when exposed to sonar and other transducers. The way the criteria were derived is discussed in detail in the ''Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase 4)'' technical report (U.S. Department of the Navy, 2024). Developing these behavioral harassment criteria involved multiple steps. All peer-reviewed published behavioral response studies conducted both in the field and on captive animals were examined in order to understand the breadth of behavioral responses of marine mammals to sonar and other transducers. Marine mammals were divided into four groups for analysis: mysticetes (all baleen whales), odontocetes (most toothed whales, dolphins, and porpoises), sensitive species (beaked whales and harbor porpoise), and pinnipeds (true seals, sea lions, walruses, sea otters, polar bears). These groups are like the groups used in the behavioral response analysis (Phase III), with the exception of combining beaked whales and harbor porpoise into a single curve. For each group, a biphasic BRF was developed using the best available data and Bayesian dose response models developed at the University of St. Andrews. The BRF base probability of response on the highest SPL (rms) received level.

The analysis of BRFs differs from the previous phase (Phase III) due to the addition of new data and the separation of some species groups. The Sensitive Species BRF is more sensitive at lower received levels but less sensitive at higher received levels than the prior beaked whale and harbor porpoise functions. The Odontocete BRF is less sensitive across all received levels due to including additional behavioral response research, which will result in a lower number of behavioral responses than in the prior analysis for the same event, but also reduces the avoidance of auditory effects. The Pinnipeds (in-water) BRF is more sensitive due to the inclusion of additional captive pinniped data (only three behavioral studies using captive pinnipeds were available for the derivation of the BRF). Behavioral studies of captive animals can be difficult to extrapolate to wild animals due to several factors (*e.g.,* use of trained subjects). This means the pinniped BRF likely overestimates effects compared to observed responses of wild pinnipeds to sound and anthropogenic activity. The Mysticete BRF is less sensitive across most received levels due to including additional behavioral response research. This will result in a lower number of behavioral responses than in the prior analysis for the same event, but also reduces the avoidance of auditory effects.

The BRFs only relate the highest received level of sound to the probability that an animal will have a behavioral response. The BRFs do not account for the duration or pattern of use of any individual sound source or of the activity as a whole; the number of sound sources that may be operating simultaneously; or how loud the animal may perceive the sonar signal to be based on the frequency of the sonar versus the animal's hearing range.

Criteria for assessing marine mammal behavioral responses to sonars use the metric of highest received sound level (rms) to evaluate the risk of immediate responses by exposed animals. Currently, there are limited data to develop criteria that include the context of an exposure, characteristics of individual animals, behavioral state, duration of an exposure, sound source duty cycle, and the number of individual sources in an activity (although these factors certainly influence the severity of a behavioral response) and, further, even where certain contextual factors may be predictive where known, it is difficult to reliably predict when such factors will be present.

The BRFs also do not account for distance. At moderate to low received levels the correlation between probability of response and received level is very poor and it appears that other variables mediate behavioral responses (*e.g.,* Ellison *et al.,* 2011) such as the distance between the animal and the sound source. For this analysis, distance between the animal and the sound source (*i.e.,* range) was initially included, however, range was too confounded with received level and therefore did not provide additional information about the possibility of response.

Data suggest that beyond a certain distance, significant behavioral responses are unlikely. At shorter ranges (less than 10 km) some behavioral responses have been observed at received levels below 140 dB re 1 μPa. Thus, proximity may mediate behavioral responses at lower received levels. Since most data used to derive the BRFs are within 10 km of the source, probability of response at farther ranges is not well-represented. Therefore, the source-receiver range must be considered separately to estimate likely significant behavioral responses.

This analysis applies behavioral cut-off conditions to responses predicted using the BRFs. Animals within a specified distance and above a minimum probability of response are assumed to have a significant behavioral response. The cut-off distance is based on the farthest source-animal distance across all known studies where animals exhibited a significant behavioral response. Animals beyond the cut-off distance but with received levels above the sound pressure level associated with a probability of response of 0.50 on the BRF are also assumed to have a significant behavioral response. The actual likelihood of significant behavioral responses occurring beyond the distance cut-off is unknown. Significant behavioral responses beyond 100 km are unlikely based on source-animal distance and attenuated received levels. The behavioral cut-off conditions and additional information on the derivation of the cut-off conditions can be found in table 2.2–3 of the ''Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase 4)'' technical report (U.S. Department of the Navy, 2024).

The Action Proponents used cutoff distances beyond which the potential of significant behavioral responses (and therefore Level B harassment) is considered to be unlikely (see table 20). These distances were determined by examining all available published field observations of behavioral responses to sonar or sonar-like signals that included the distance between the sound source and the marine mammal. Behavioral effects calculations are based on the maximum SPL to which a modeled marine mammal is exposed. There is empirical evidence to suggest that animals are more likely to exhibit significant behavioral responses to moderate levels sounds that are closer and less likely to exhibit behavioral responses when exposed to moderate levels of sound from a source that is far away. To account for this, the Action Proponents have implemented behavioral cutoffs that consider both received sound level and distance from the source. These updated cutoffs conditions are unique to each behavioral hearing group, and are outlined in table 20.

TABLE 20—BEHAVIORAL CUT-OFF CONDITIONS FOR EACH BEHAVIORAL HEARING GROUP

Behavioral group	Received level associated with p(0.50) on the behavioral response function (dB rms)	Cut-off range (km)
Sensitive Species	133	40
Odontocetes	168	15
Mysticetes	185	10
Pinnipeds	156	5

Note: Sensitive Species includes beaked whales and harbor porpoises.

The Action Proponents and NMFS have used the best available science to address the challenging differentiation between significant and non-significant behavioral responses (*i.e.,* whether the behavior has been abandoned or significantly altered such that it qualifies as harassment), but have erred on the cautious side where uncertainty exists (*e.g.,* counting these lower duration responses as take), which likely results in some degree of overestimation of Level B harassment by behavioral disturbance. We consider application of these behavioral harassment thresholds, therefore, as identifying the maximum number of instances in which marine mammals could be reasonably expected to experience a disruption in behavior patterns to a point where they are abandoned or significantly altered (*i.e.,* Level B harassment). NMFS has carefully reviewed the criteria (*i.e.,* BRFs and cutoff distances for the species), and agrees that it is the best available science and is the appropriate method to use at this time for determining impacts to marine mammals from military sonar and other transducers and for calculating take and to support the determinations made in this proposed rule. Because this is the most appropriate method for estimating Level B harassment given the best available science and uncertainty on the topic, it is these numbers of Level B harassment by behavioral disturbance that are analyzed in the Preliminary Analysis and Negligible Impact Determination section and would be authorized.

Air Guns, Pile Driving, and Explosives—

Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses generalized acoustic thresholds based on received level to estimate the onset of behavioral harassment for sources other than active sonar. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μPa (rms) for continuous (*e.g.,* vibratory pile-driving, drilling) and above 160 dB re 1 μPa (rms) for non-explosive impulsive (*e.g.,* seismic air guns) or intermittent (*e.g.,* scientific sonar) sources. For the Action Proponents' activities, to estimate behavioral effects from air guns, the threshold of 160 dB re 1 μPa (rms) is used and the root mean square calculation for air guns is based on the duration defined by 90 percent of the cumulative energy in the impulse. The indicated thresholds were also applied to estimate behavioral effects from impact and vibratory pile driving (table 21). These thresholds are the same as those applied in the prior analysis (Phase III) of these stressors in the Study Area, although the explosive behavioral threshold has shifted, corresponding to changes in the TTS thresholds.

TABLE 21—BEHAVIORAL RESPONSE THRESHOLDS FOR AIR GUN, PILE DRIVING, AND EXPLOSIVES

Sound source	Behavioral threshold
Air gun	160 dB rms re 1 μPa SPL.
Impact pile driving	160 dB rms re 1 μPa SPL.
Vibratory pile driving	120 dB rms re 1 μPa SPL.
Single explosion	TTS onset threshold (weighted SEL).
Multiple explosions	5 dB less than the TTS onset threshold (weighted SEL).

While the best available science for assessing behavioral responses of marine mammals to impulsive sounds relies on data from seismic and pile driving sources, it is likely that these predicted responses using a threshold based on seismic and pile driving represent a worst-case scenario compared to behavioral responses to explosives used in military readiness activities, which would typically consist of single impulses or a cluster of impulses rather than long-duration, repeated impulses (*e.g.,* large-scale air gun arrays).

For single explosions at received sound levels below hearing loss thresholds, the most likely behavioral response is a brief alerting or orienting response. Since no further sounds follow the initial brief impulses, significant behavioral responses would not be expected to occur. If a significant response were to occur, the Action Proponents' analysis assumes it would be as a result of an exposure at levels within the range of auditory impacts (TTS and AUD INJ). Because of this approach, the number of auditory impacts is higher than the number of behavioral impacts in the quantified results for some stocks.

If more than one explosive event occurs within any given 24-hour period during a military readiness activity, behavioral disturbance is considered more likely to occur and specific criteria are applied to predict the number of animals that may have a behavioral response. For events with multiple explosions, the behavioral threshold used in this analysis is 5 dB less than the TTS onset threshold. This value is derived from observed onsets of behavioral response by test subjects (bottlenose dolphins) during non-impulse TTS testing (Schlundt *et al.,* 2000).

Navy Acoustic Effects Model

The Navy Acoustic Effects Model (NAEMO) is their standard model for assessing acoustic effects on marine mammals. NAEMO calculates sound energy propagation from sonar and other transducers, air guns, and explosives during military readiness activities and the sound received by animat dosimeters. Animat dosimeters are virtual representations of marine mammals distributed in the area around the modeled activity and each dosimeter records its individual sound "dose." The model bases the distribution of animats over the AFTT Study Area on the density values in the Navy Marine Species Density Database (NMSDD) and distributes animats in the water column proportional to the known time that species spend at varying depths.

The model accounts for environmental variability of sound propagation in both distance and depth when computing the sound level received by the animats. The model conducts a statistical analysis based on multiple model runs to compute the estimated effects on animals. The number of animats that exceed the thresholds for effects is tallied to provide an estimate of the number of marine mammals that could be affected.

Assumptions in NAEMO intentionally err on the side of overestimation when there are unknowns. The specified activities are modeled as though they would occur regardless of proximity to marine mammals, meaning that the implementation of power downs or shut downs are not modeled or, thereby, considered in the take estimates. For more information on this process, see the discussion in the *Estimated Take from Acoustic Stressors* section below. Many explosions from ordnance such as bombs and missiles actually occur upon impact with above-water targets. However, for this analysis, sources such as these were modeled as exploding underwater. This overestimates the amount of explosive and acoustic energy entering the water.

The model estimates the acoustic impacts caused by sonars and other transducers, explosives, and air guns during individual military readiness exercises. During any individual modeled event, impacts to individual animats are considered over 24-hour periods. The animats do not represent actual animals, but rather they represent a distribution of animals based on density and abundance data, which allows for a statistical analysis of the number of instances that marine mammals may be exposed to sound levels resulting in an effect. Therefore, the model estimates the number of instances in which an effect threshold was exceeded over the course of a year, but does not estimate the number of individual marine mammals that may be impacted over a year (*i.e.,* some marine mammals could be impacted several times, while others would not experience any impact). A detailed explanation of the Navy's Acoustic Effects Model is provided in the technical report ''Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing'' (U.S. Department of the Navy, 2024).

As NAEMO interrogates the simulation data in the Animat Processor, exposures that are both outside the distance cutoff and below the received level cutoff are omitted when determining the maximum SPL for each animat. This differs from Phase III, in which only distance cutoffs were applied, meaning that all exposures outside the distance cutoffs were omitted, with no consideration of received level.

The presence of the two cutoff criteria in Phase IV provides a more accurate and conservative estimation of behavioral effects because louder exposures that would have been omitted previously, when only a distance cutoff was applied, are considered in Phase IV, while the estimation of behavioral effects still omits exposures at distances and received levels that would be unlikely to produce a significant behavioral response. NAEMO retains the capability of calculating behavioral effects without the cutoffs applied, depending on user preference.

The impulsive behavioral criteria are not based on the probability of a behavioral response but rather on a single SPL metric. For consideration of impulsive behavioral effects, the cutoff conditions in table 20 are not applied.

Pile Driving

The Action Proponents performed a quantitative analysis without NAEMO to estimate the number of times marine mammals could be affected by pile driving and extraction used during proposed training activities. The analysis considered details of the activity, sound exposure criteria, and the number and distribution of marine mammals. This information was then used in an ''area*density'' model in which the areas within each footprint (*i.e.,* harassment zone) that encompassed a potential effect were calculated for a given day's activities. The effects analyzed included behavioral response, TTS, and AUD INJ for marine mammals.

Then, these areas were multiplied by the density of each marine species within the nearshore environment to estimate the number of effects. Uniform density values for species expected to be present in the nearshore areas where pile driving could occur were estimated using the NMSDD or available survey data specific to the activity location. More detail is provided in the 2024 AFTT Draft Supplemental EIS/OEIS. Since the same animal can be ''taken'' every day (*i.e.,* 24-hour reset time), the number of predicted effects from a given day were multiplied by the number of days for that activity. This generated a total estimated number of effects over the entire activity, which was then multiplied by the maximum number of times per year this activity could happen. The result was the estimated effects per species and stock in a year.

Range to Effects

This section provides range (distance) to effects for sonar and other active acoustic sources as well as explosives to specific acoustic thresholds determined using NAEMO. Ranges are determined by modeling the distance that noise from a source will need to propagate to reach exposure level thresholds specific to a hearing group that will cause behavioral response, TTS, AUD INJ, non-auditory injury, and mortality. Ranges to effects (tables 22 through 42) are utilized to help predict impacts from acoustic and explosive sources and assess the benefit of mitigation zones. Marine mammals exposed within these ranges for the shown duration are predicted to experience the associated effect. Range to effects is important information in not only predicting acoustic impacts, but also in verifying the accuracy of model results against real-world situations and determining adequate mitigation ranges to avoid higher level effects, especially physiological effects to marine mammals.

Sonar

Ranges to effects for sonar were determined by modeling the distance that sound would need to propagate to reach exposure level thresholds specific to a hearing group that would cause behavioral response, TTS, and AUD INJ, as described in the ''Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase 4)'' technical report (U.S. Department of the Navy, 2024). The ranges do not account for an animal avoiding a source nor for the movement of the platform, both of which would influence the actual range to onset of auditory effects during an actual exposure.

Table 22 through table 26 below provide the ranges to TTS and AUD INJ for marine mammals from exposure durations of 1, 30, 60, and 120 seconds for six sonar systems proposed for use (see also appendix A of the application). Due to the lower acoustic thresholds for TTS versus AUD INJ, ranges to TTS are larger. Successive pings can be expected to add together, further increasing the range to the onset of TTS and AUD INJ.

TABLE 22—VERY LOW-FREQUENCY CETACEAN RANGES TO EFFECTS FOR SONAR

Sonar type	Depth (m)	Duration (s)	Range to TTS	Range to AUD INJ
Dipping Sonar	≤200	1	160 m (34 m)	12 m (6 m).
Dipping Sonar	≤200	30	330 m (70 m)	21 m (10 m).
Dipping Sonar	≤200	60	460 m (98 m)	25 m (10 m).
Dipping Sonar	≤200	120	700 m (145 m)	35 m (8 m).

TABLE 22—VERY LOW-FREQUENCY CETACEAN RANGES TO EFFECTS FOR SONAR—Continued

Sonar type	Depth (m)	Duration (s)	Range to TTS	Range to AUD INJ
Dipping Sonar	>200	1	140 m (42 m)	0 m (1 m).
Dipping Sonar	>200	30	250 m (81 m)	0 m (8 m).
Dipping Sonar	>200	60	330 m (115 m)	18 m (11 m).
Dipping Sonar	>200	120	499 m (172 m)	35 m (15 m).
MF1 Ship Sonar	≤200	1	1,528 m (635 m)	90 m (10 m).
MF1 Ship Sonar	≤200	30	1,528 m (635 m)	90 m (10 m).
MF1 Ship Sonar	≤200	60	2,514 m (1,176 m)	140 m (19 m).
MF1 Ship Sonar	≤200	120	3,264 m (1,592 m)	180 m (27 m).
MF1 Ship Sonar	>200	1	1,000 m (449 m)	85 m (3 m).
MF1 Ship Sonar	>200	30	1,000 m (449 m)	85 m (3 m).
MF1 Ship Sonar	>200	60	1,750 m (804 m)	130 m (6 m).
MF1 Ship Sonar	>200	120	2,250 m (1,143 m)	170 m (9 m).
MF1C Ship Sonar	≤200	1	1,542 m (637 m)	90 m (10 m).
MF1C Ship Sonar	≤200	30	3,306 m (1,596 m)	180 m (27 m).
MF1C Ship Sonar	≤200	60	4,917 m (2,648 m)	273 m (51 m).
MF1C Ship Sonar	≤200	120	6,944 m (4,219 m)	447 m (92 m).
MF1C Ship Sonar	>200	1	1,000 m (460 m)	85 m (3 m).
MF1C Ship Sonar	>200	30	2,250 m (1,162 m)	170 m (9 m).
MF1C Ship Sonar	>200	60	4,278 m (1,747 m)	250 m (15 m).
MF1C Ship Sonar	>200	120	5,750 m (2,558 m)	370 m (37 m).
MF1K Ship Sonar	≤200	1	200 m (27 m)	13 m (2 m).
MF1K Ship Sonar	≤200	30	412 m (77 m)	24 m (1 m).
MF1K Ship Sonar	≤200	60	575 m (106 m)	30 m (1 m).
MF1K Ship Sonar	≤200	120	885 m (191 m)	45 m (3 m).
MF1K Ship Sonar	>200	1	190 m (7 m)	11 m (6 m).
MF1K Ship Sonar	>200	30	340 m (18 m)	23 m (11 m).
MF1K Ship Sonar	>200	60	440 m (31 m)	30 m (2 m).
MF1K Ship Sonar	>200	120	625 m (58 m)	40 m (2 m).
Mine-Hunting Sonar	≤200	1	3 m (2 m)	0 m (0 m).
Mine-Hunting Sonar	≤200	30	6 m (3 m)	0 m (0 m).
Mine-Hunting Sonar	≤200	60	9 m (5 m)	0 m (0 m).
Mine-Hunting Sonar	≤200	120	13 m (7 m)	1 m (0 m).
Mine-Hunting Sonar	>200	1	0 m (0 m)	0 m (0 m).
Mine-Hunting Sonar	>200	30	5 m (2 m)	0 m (0 m).
Mine-Hunting Sonar	>200	60	8 m (4 m)	0 m (0 m).
Mine-Hunting Sonar	>200	120	12 m (6 m)	0 m (0 m).
Sonobuoy Sonar	≤200	1	13 m (7 m)	0 m (0 m).
Sonobuoy Sonar	≤200	30	25 m (11 m)	0 m (0 m).
Sonobuoy Sonar	≤200	60	35 m (15 m)	0 m (1 m).
Sonobuoy Sonar	≤200	120	50 m (16 m)	0 m (2 m).
Sonobuoy Sonar	>200	1	0 m (7 m)	0 m (0 m).
Sonobuoy Sonar	>200	30	23 m (12 m)	0 m (0 m).
Sonobuoy Sonar	>200	60	35 m (17 m)	0 m (0 m).
Sonobuoy Sonar	>200	120	50 m (20 m)	0 m (0 m).

Note: Median ranges are shown with standard deviation ranges in parentheses. The Action Proponents split the LF functional hearing group into LF and VLF based on Houser *et al.,* (2024), however, NMFS updated acoustic technical guidance (NMFS, 2024) does not include these data but we have included the VLF group here for reference.

TABLE 23—LOW-FREQUENCY CETACEAN RANGES TO EFFECTS FOR SONAR

Sonar type	Depth (m)	Duration (s)	Range to TTS	Range to AUD INJ
Dipping Sonar	≤200	1	166 m (63 m)	12 m (5 m).
Dipping Sonar	≤200	30	333 m (109 m)	21 m (7 m).
Dipping Sonar	≤200	60	465 m (138 m)	25 m (8 m).
Dipping Sonar	≤200	120	701 m (154 m)	35 m (12 m).
Dipping Sonar	>200	1	140 m (78 m)	0 m (6 m).
Dipping Sonar	>200	30	220 m (120 m)	13 m (10 m).
Dipping Sonar	>200	60	280 m (156 m)	24 m (12 m).
Dipping Sonar	>200	120	440 m (110 m)	35 m (18 m).
MF1 Ship Sonar	≤200	1	1,653 m (658 m)	95 m (10 m).
MF1 Ship Sonar	≤200	30	1,653 m (658 m)	95 m (10 m).
MF1 Ship Sonar	≤200	60	2,653 m (1,213 m)	140 m (20 m).
MF1 Ship Sonar	≤200	120	3,486 m (1,632 m)	180 m (27 m).
MF1 Ship Sonar	>200	1	1,042 m (498 m)	90 m (4 m).
MF1 Ship Sonar	>200	30	1,042 m (498 m)	90 m (4 m).
MF1 Ship Sonar	>200	60	1,819 m (863 m)	140 m (5 m).
MF1 Ship Sonar	>200	120	2,694 m (1,210 m)	180 m (8 m).
MF1C Ship Sonar	≤200	1	1,653 m (660 m)	93 m (10 m).

TABLE 23—LOW-FREQUENCY CETACEAN RANGES TO EFFECTS FOR SONAR—Continued

Sonar type	Depth (m)	Duration (s)	Range to TTS	Range to AUD INJ
MF1C Ship Sonar	≤200	30	3,528 m (1,637 m)	180 m (27 m).
MF1C Ship Sonar	≤200	60	5,208 m (2,724 m)	286 m (52 m).
MF1C Ship Sonar	≤200	120	7,458 m (4,345 m)	461 m (95 m).
MF1C Ship Sonar	>200	1	1,056 m (511 m)	90 m (4 m).
MF1C Ship Sonar	>200	30	2,708 m (1,231 m)	180 m (8 m).
MF1C Ship Sonar	>200	60	4,514 m (1,834 m)	260 m (16 m).
MF1C Ship Sonar	>200	120	6,167 m (2,656 m)	380 m (41 m).
MF1K Ship Sonar	≤200	1	200 m (28 m)	14 m (1 m).
MF1K Ship Sonar	≤200	30	429 m (80 m)	25 m (0 m).
MF1K Ship Sonar	≤200	60	596 m (112 m)	30 m (1 m).
MF1K Ship Sonar	≤200	120	915 m (203 m)	45 m (3 m).
MF1K Ship Sonar	>200	1	190 m (6 m)	14 m (1 m).
MF1K Ship Sonar	>200	30	350 m (14 m)	24 m (1 m).
MF1K Ship Sonar	>200	60	450 m (33 m)	30 m (0 m).
MF1K Ship Sonar	>200	120	650 m (72 m)	45 m (0 m).
Mine-Hunting Sonar	≤200	1	9 m (5 m)	0 m (0 m).
Mine-Hunting Sonar	≤200	30	18 m (9 m)	1 m (1 m).
Mine-Hunting Sonar	≤200	60	25 m (11 m)	2 m (1 m).
Mine-Hunting Sonar	≤200	120	35 m (14 m)	3 m (2 m).
Mine-Hunting Sonar	>200	1	8 m (4 m)	0 m (0 m).
Mine-Hunting Sonar	>200	30	17 m (8 m)	1 m (0 m).
Mine-Hunting Sonar	>200	60	25 m (11 m)	2 m (1 m).
Mine-Hunting Sonar	>200	120	35 m (10 m)	3 m (1 m).
Sonobuoy Sonar	≤200	1	12 m (8 m)	0 m (0 m).
Sonobuoy Sonar	≤200	30	25 m (11 m)	0 m (0 m).
Sonobuoy Sonar	≤200	60	40 m (16 m)	0 m (1 m).
Sonobuoy Sonar	≤200	120	55 m (23 m)	0 m (1 m).
Sonobuoy Sonar	>200	1	0 m (7 m)	0 m (0 m).
Sonobuoy Sonar	>200	30	20 m (12 m)	0 m (0 m).
Sonobuoy Sonar	>200	60	35 m (19 m)	0 m (0 m).
Sonobuoy Sonar	>200	120	55 m (27 m)	0 m (0 m).

Note: Median ranges are shown with standard deviation ranges in parentheses. The Action Proponents split the LF functional hearing group into LF and VLF based on Houser *et al.,* (2024), however, NMFS updated acoustic technical guidance (NMFS, 2024) does not include these data but we have included the VLF group here for reference.

TABLE 24—HIGH-FREQUENCY CETACEAN RANGES TO EFFECTS FOR SONAR

Sonar type	Depth (m)	Duration (s)	Range to TTS	Range to AUD INJ
Dipping Sonar	≤200	1	55 m (18 m)	5 m (2 m).
Dipping Sonar	≤200	30	120 m (42 m)	9 m (3 m).
Dipping Sonar	≤200	60	170 m (60 m)	12 m (5 m).
Dipping Sonar	≤200	120	270 m (90 m)	18 m (6 m).
Dipping Sonar	>200	1	50 m (27 m)	0 m (2 m).
Dipping Sonar	>200	30	100 m (56 m)	0 m (4 m).
Dipping Sonar	>200	60	140 m (77 m)	0 m (6 m).
Dipping Sonar	>200	120	209 m (113 m)	0 m (8 m).
MF1 Ship Sonar	≤200	1	832 m (189 m)	45 m (3 m).
MF1 Ship Sonar	≤200	30	832 m (189 m)	45 m (3 m).
MF1 Ship Sonar	≤200	60	1,208 m (357 m)	65 m (6 m).
MF1 Ship Sonar	≤200	120	1,500 m (561 m)	85 m (9 m).
MF1 Ship Sonar	>200	1	600 m (117 m)	45 m (11 m).
MF1 Ship Sonar	>200	30	600 m (117 m)	45 m (11 m).
MF1 Ship Sonar	>200	60	892 m (263 m)	65 m (13 m).
MF1 Ship Sonar	>200	120	1,000 m (421 m)	85 m (6 m).
MF1C Ship Sonar	≤200	1	835 m (189 m)	45 m (3 m).
MF1C Ship Sonar	≤200	30	1,500 m (562 m)	85 m (9 m).
MF1C Ship Sonar	≤200	60	2,514 m (1,075 m)	130 m (17 m).
MF1C Ship Sonar	≤200	120	4,069 m (1,805 m)	200 m (30 m).
MF1C Ship Sonar	>200	1	600 m (120 m)	45 m (11 m).
MF1C Ship Sonar	>200	30	1,000 m (432 m)	85 m (6 m).
MF1C Ship Sonar	>200	60	1,736 m (783 m)	130 m (8 m).
MF1C Ship Sonar	>200	120	3,028 m (1,363 m)	200 m (12 m).
MF1K Ship Sonar	≤200	1	100 m (9 m)	7 m (3 m).
MF1K Ship Sonar	≤200	30	190 m (25 m)	13 m (3 m).
MF1K Ship Sonar	≤200	60	270 m (42 m)	17 m (3 m).
MF1K Ship Sonar	≤200	120	430 m (80 m)	25 m (1 m).
MF1K Ship Sonar	>200	1	100 m (19 m)	7 m (3 m).
MF1K Ship Sonar	>200	30	180 m (11 m)	13 m (6 m).

TABLE 24—HIGH-FREQUENCY CETACEAN RANGES TO EFFECTS FOR SONAR—Continued

Sonar type	Depth (m)	Duration (s)	Range to TTS	Range to AUD INJ
MF1K Ship Sonar	>200	60	240 m (11 m)	17 m (7 m).
MF1K Ship Sonar	>200	120	350 m (18 m)	25 m (9 m).
Mine-Hunting Sonar	≤200	1	8 m (4 m)	0 m (0 m).
Mine-Hunting Sonar	≤200	30	15 m (6 m)	1 m (0 m).
Mine-Hunting Sonar	≤200	60	22 m (8 m)	1 m (1 m).
Mine-Hunting Sonar	≤200	120	30 m (9 m)	2 m (1 m).
Mine-Hunting Sonar	>200	1	7 m (3 m)	0 m (0 m).
Mine-Hunting Sonar	>200	30	15 m (5 m)	0 m (0 m).
Mine-Hunting Sonar	>200	60	21 m (7 m)	0 m (1 m).
Mine-Hunting Sonar	>200	120	25 m (6 m)	0 m (1 m).
Sonobuoy Sonar	≤200	1	8 m (4 m)	0 m (0 m).
Sonobuoy Sonar	≤200	30	18 m (8 m)	0 m (0 m).
Sonobuoy Sonar	≤200	60	25 m (12 m)	0 m (0 m).
Sonobuoy Sonar	≤200	120	35 m (13 m)	0 m (1 m).
Sonobuoy Sonar	>200	1	0 m (4 m)	0 m (0 m).
Sonobuoy Sonar	>200	30	0 m (9 m)	0 m (0 m).
Sonobuoy Sonar	>200	60	0 m (12 m)	0 m (0 m).
Sonobuoy Sonar	>200	120	25 m (16 m)	0 m (1 m).

Note: Median ranges are shown with standard deviation ranges in parentheses.

TABLE 25—VERY HIGH-FREQUENCY CETACEAN RANGES TO EFFECTS FOR SONAR

Sonar type	Depth (m)	Duration (s)	Range to TTS	Range to AUD INJ
Dipping Sonar	≤200	1	100 m (37 m)	8 m (3 m).
Dipping Sonar	≤200	30	210 m (79 m)	14 m (5 m).
Dipping Sonar	≤200	60	291 m (97 m)	19 m (6 m).
Dipping Sonar	≤200	120	454 m (104 m)	25 m (8 m).
Dipping Sonar	>200	1	95 m (49 m)	0 m (3 m).
Dipping Sonar	>200	30	180 m (98 m)	0 m (6 m).
Dipping Sonar	>200	60	230 m (125 m)	14 m (8 m).
Dipping Sonar	>200	120	310 m (75 m)	24 m (12 m).
MF1 Ship Sonar	≤200	1	2,750 m (1,203 m)	150 m (19 m).
MF1 Ship Sonar	≤200	30	2,750 m (1,203 m)	150 m (19 m).
MF1 Ship Sonar	≤200	60	4,347 m (2,022 m)	230 m (36 m).
MF1 Ship Sonar	≤200	120	5,306 m (2,709 m)	293 m (51 m).
MF1 Ship Sonar	>200	1	1,806 m (867 m)	150 m (6 m).
MF1 Ship Sonar	>200	30	1,806 m (867 m)	150 m (6 m).
MF1 Ship Sonar	>200	60	3,569 m (1,420 m)	220 m (12 m).
MF1 Ship Sonar	>200	120	4,500 m (1,761 m)	270 m (15 m).
MF1C Ship Sonar	≤200	1	2,778 m (1,206 m)	150 m (19 m).
MF1C Ship Sonar	≤200	30	5,472 m (2,717 m)	295 m (51 m).
MF1C Ship Sonar	≤200	60	7,861 m (4,337 m)	480 m (94 m).
MF1C Ship Sonar	≤200	120	10,896 m (6,387 m)	750 m (163 m).
MF1C Ship Sonar	>200	1	1,806 m (892 m)	150 m (6 m).
MF1C Ship Sonar	>200	30	4,514 m (1,802 m)	270 m (16 m).
MF1C Ship Sonar	>200	60	6,139 m (2,607 m)	390 m (42 m).
MF1C Ship Sonar	>200	120	8,403 m (3,750 m)	550 m (95 m).
MF1K Ship Sonar	≤200	1	350 m (61 m)	20 m (1 m).
MF1K Ship Sonar	≤200	30	724 m (139 m)	35 m (1 m).
MF1K Ship Sonar	≤200	60	976 m (222 m)	50 m (3 m).
MF1K Ship Sonar	≤200	120	1,306 m (456 m)	85 m (6 m).
MF1K Ship Sonar	>200	1	300 m (9 m)	16 m (3 m).
MF1K Ship Sonar	>200	30	525 m (46 m)	35 m (0 m).
MF1K Ship Sonar	>200	60	700 m (78 m)	50 m (2 m).
MF1K Ship Sonar	>200	120	1,000 m (138 m)	85 m (3 m).
Mine-Hunting Sonar	≤200	1	130 m (54 m)	9 m (1 m).
Mine-Hunting Sonar	≤200	30	291 m (115 m)	16 m (2 m).
Mine-Hunting Sonar	≤200	60	453 m (161 m)	24 m (3 m).
Mine-Hunting Sonar	≤200	120	653 m (198 m)	35 m (6 m).
Mine-Hunting Sonar	>200	1	90 m (6 m)	8 m (1 m).
Mine-Hunting Sonar	>200	30	150 m (15 m)	15 m (0 m).
Mine-Hunting Sonar	>200	60	210 m (30 m)	22 m (0 m).
Mine-Hunting Sonar	>200	120	300 m (45 m)	30 m (0 m).
Sonobuoy Sonar	≤200	1	65 m (22 m)	0 m (3 m).
Sonobuoy Sonar	≤200	30	140 m (67 m)	9 m (4 m).
Sonobuoy Sonar	≤200	60	218 m (98 m)	15 m (5 m).
Sonobuoy Sonar	≤200	120	349 m (128 m)	22 m (7 m).
Sonobuoy Sonar	>200	1	65 m (31 m)	0 m (1 m).

TABLE 25—VERY HIGH-FREQUENCY CETACEAN RANGES TO EFFECTS FOR SONAR—Continued

Sonar type	Depth (m)	Duration (s)	Range to TTS	Range to AUD INJ
Sonobuoy Sonar	>200	30	110 m (60 m)	0 m (5 m).
Sonobuoy Sonar	>200	60	180 m (87 m)	10 m (6 m).
Sonobuoy Sonar	>200	120	280 m (72 m)	21 m (10 m).

Note: Median ranges are shown with standard deviation ranges in parentheses.

TABLE 26—PHOCID CARNIVORE IN WATER RANGES TO EFFECTS FOR SONAR

Sonar type	Depth (m)	Duration (s)	Range to TTS	Range to AUD INJ
Dipping Sonar	≤200	1	208 m (63 m)	0 m (7 m).
Dipping Sonar	≤200	30	410 m (87 m)	22 m (8 m).
Dipping Sonar	≤200	60	564 m (117 m)	30 m (10 m).
Dipping Sonar	≤200	120	853 m (170 m)	45 m (15 m).
Dipping Sonar	>200	1	170 m (80 m)	0 m (6 m).
Dipping Sonar	>200	30	300 m (73 m)	0 m (11 m).
Dipping Sonar	>200	60	400 m (84 m)	0 m (14 m).
Dipping Sonar	>200	120	600 m (131 m)	35 m (21 m).
MF1 Ship Sonar	≤200	1	2,181 m (982 m)	120 m (16 m).
MF1 Ship Sonar	≤200	30	2,181 m (982 m)	120 m (16 m).
MF1 Ship Sonar	≤200	60	3,417 m (1,671 m)	186 m (28 m).
MF1 Ship Sonar	≤200	120	4,306 m (2,258 m)	240 m (41 m).
MF1 Ship Sonar	>200	1	1,500 m (708 m)	120 m (5 m).
MF1 Ship Sonar	>200	30	1,500 m (708 m)	120 m (5 m).
MF1 Ship Sonar	>200	60	2,667 m (1,231 m)	180 m (9 m).
MF1 Ship Sonar	>200	120	3,819 m (1,543 m)	230 m (13 m).
MF1C Ship Sonar	≤200	1	2,181 m (982 m)	120 m (16 m).
MF1C Ship Sonar	≤200	30	4,333 m (2,258 m)	240 m (41 m).
MF1C Ship Sonar	≤200	60	6,194 m (3,650 m)	381 m (77 m).
MF1C Ship Sonar	≤200	120	8,556 m (5,510 m)	606 m (130 m).
MF1C Ship Sonar	>200	1	1,500 m (708 m)	120 m (5 m).
MF1C Ship Sonar	>200	30	3,819 m (1,543 m)	230 m (13 m).
MF1C Ship Sonar	>200	60	5,264 m (2,269 m)	330 m (28 m).
MF1C Ship Sonar	>200	120	7,292 m (3,235 m)	480 m (59 m).
MF1K Ship Sonar	≤200	1	270 m (43 m)	17 m (6 m).
MF1K Ship Sonar	≤200	30	557 m (104 m)	30 m (4 m).
MF1K Ship Sonar	≤200	60	775 m (155 m)	40 m (3 m).
MF1K Ship Sonar	≤200	120	1,000 m (312 m)	65 m (5 m).
MF1K Ship Sonar	>200	1	240 m (8 m)	16 m (6 m).
MF1K Ship Sonar	>200	30	430 m (27 m)	30 m (11 m).
MF1K Ship Sonar	>200	60	550 m (47 m)	35 m (14 m).
MF1K Ship Sonar	>200	120	800 m (98 m)	60 m (3 m).
Mine-Hunting Sonar	≤200	1	15 m (5 m)	0 m (0 m).
Mine-Hunting Sonar	≤200	30	25 m (6 m)	0 m (1 m).
Mine-Hunting Sonar	≤200	60	40 m (8 m)	0 m (2 m).
Mine-Hunting Sonar	≤200	120	65 m (13 m)	4 m (2 m).
Mine-Hunting Sonar	>200	1	14 m (4 m)	0 m (0 m).
Mine-Hunting Sonar	>200	30	25 m (2 m)	0 m (1 m).
Mine-Hunting Sonar	>200	60	35 m (2 m)	0 m (1 m).
Mine-Hunting Sonar	>200	120	50 m (2 m)	3 m (2 m).
Sonobuoy Sonar	≤200	1	21 m (9 m)	0 m (0 m).
Sonobuoy Sonar	≤200	30	35 m (11 m)	0 m (1 m).
Sonobuoy Sonar	≤200	60	50 m (15 m)	0 m (2 m).
Sonobuoy Sonar	≤200	120	75 m (23 m)	0 m (3 m).
Sonobuoy Sonar	>200	1	0 m (10 m)	0 m (0 m).
Sonobuoy Sonar	>200	30	35 m (17 m)	0 m (1 m).
Sonobuoy Sonar	>200	60	50 m (22 m)	0 m (2 m).
Sonobuoy Sonar	>200	120	75 m (33 m)	0 m (2 m).

Note: Median ranges are shown with standard deviation ranges in parentheses.

Air Guns

Ranges to effects for air guns were determined by modeling the distance that sound would need to propagate to reach exposure level thresholds specific to a hearing group that would cause behavioral response, TTS, and AUD INJ, as described in the ''Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase 4)'' report (U.S. Department of the Navy, 2024)). The air gun ranges to effects for TTS and AUD INJ in table 27 are based on the metric (*i.e.,* SEL or SPL) that produced larger ranges.

TABLE 27—RANGE TO EFFECTS FOR AIR GUNS

Functional hearing group	Depth (m)	Behavioral disturbance	Range to TTS	Range to AUD INJ
VLF	≤200	145 m (20 m)	27 m (1 m)	4 m (1 m).
VLF	>200	143 m (20 m)	26 m (1 m)	4 m (1 m).
LF	≤200	130 m (18 m)	12 m (0 m)	2 m (0 m).
LF	>200	130 m (17 m)	12 m (0 m)	2 m (0 m).
HF	≤200	146 m (20 m)	2 m (0 m)	1 m (0 m).
HF	>200	145 m (18 m)	2 m (0 m)	1 m (0 m).
VHF	≤200	150 m (18 m)	56 m (3 m)	27 m (2 m).
VHF	>200	148 m (16 m)	55 m (3 m)	27 m (2 m).
PW	≤200	142 m (18 m)	5 m (1 m)	2 m (0 m).
PW	>200	139 m (17 m)	5 m (1 m)	2 m (0 m).

Note: The values listed for TTS and AUD INJ are the greater of the respective SPL and SEL ranges. Median ranges are shown with standard deviation ranges in parentheses. The Action Proponents split the LF functional hearing group into LF and VLF based on Houser *et al.,* (2024), however, NMFS updated acoustic technical guidance (NMFS, 2024) does not include these data but we have included the VLF group here for reference.

Pile Driving

Only two stocks of bottlenose dolphins (Gulf of America Northern Coastal stock and Mississippi Sound, Lake Borgne, and Bay Boudreau stock) are expected to be present in the nearshore waters of Gulfport, Mississippi, where impact and vibratory pile driving and extraction is proposed to occur up to four times per year. Table 28 shows the predicted ranges to AUD INJ, TTS, and behavioral response for the HF hearing group (the only functional hearing group expected in the vicinity of pile driving and extraction activities) that were analyzed for their exposure to impact and vibratory pile driving. These ranges were estimated based on activity parameters described in the Acoustic Stressors section of the Explosive and Acoustic Analysis Report (see appendix A of the application) and using the calculations described in the Quantitative Analysis Technical Report (see ''Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing'' (U.S. Department of the Navy, 2024)).

TABLE 28—RANGE TO EFFECTS FOR HIGH-FREQUENCY CETACEANS FROM PILE DRIVING

Pile type	Method	Behavioral response (m)	TTS (m)	AUD INJ (m)
16-inch timber/plastic	Impact	46	17	2
16-inch timber/plastic	Vibratory	6,310	17	1
24-inch steel sheet	Vibratory	3,981	11	0

Explosives

The following section provides the range (distance) over which specific physiological or behavioral effects are expected to occur based on the explosive criteria (see section 6.2.1 (Impacts from Explosives) of the application and the ''Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase 4)'' report (U.S. Department of the Navy, 2024)) and the explosive propagation calculations from NAEMO. The range to effects are shown for a range of explosive bins, from E1 (0.1–0.25 lb NEW) to E16 (greater than 7,250–14,500 lb NEW (ship shock trial only)) (table 29 through table 33). Ranges are determined by modeling the distance that noise from an explosion would need to propagate to reach exposure level thresholds specific to a hearing group that would cause behavioral response (to the degree of Level B behavioral harassment), TTS, and AUD INJ. NMFS has reviewed the range distance to effect data provided by the Action Proponents and concurs with the analysis. Range to effects is important information in not only predicting impacts from explosives, but also in verifying the accuracy of model results against real-world situations and determining adequate mitigation ranges to avoid higher level effects, especially injury to marine mammals. For additional information on how ranges to impacts from explosions were estimated, see the technical report ''Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing'' (U.S. Department of the Navy, 2024).

Table 29 through table 33 show the minimum, average, and maximum ranges to onset of auditory and likely behavioral effects that rise to the level of Level B harassment for all functional hearing groups based on the developed thresholds. Ranges are provided for a representative source depth and cluster size (the number of rounds fired, or buoys dropped, within a very short duration) for each bin. Ranges for behavioral response are only provided if more than one explosive cluster occurs. As noted previously, single explosions at received sound levels below TTS and AUD INJ thresholds are most likely to result in a brief alerting or orienting response. For events with multiple explosions, sound from successive explosions can be expected to accumulate and increase the range to the onset of an impact based on SEL thresholds. Modeled ranges to TTS and AUD INJ based on peak pressure for a single explosion generally exceed the modeled ranges based on SEL even when accumulated for multiple explosions. Peak pressure-based ranges are estimated using the best available science; however, data on peak pressure at far distances from explosions are very limited. The explosive ranges to effects for TTS and AUD INJ that are in the tables are based on the metric (*i.e.,* SEL or SPL) that produced larger ranges.

Table 34 shows ranges to non-auditory injury and mortality as a function of animal mass and explosive bin. For non-auditory injury, the larger of the ranges to slight lung injury or gastrointestinal tract injury was used as a conservative estimate, and the boxplots in appendix A to the application present ranges for both metrics for comparison. For the non-auditory metric, ranges are only available for a cluster size of one. Animals within water volumes encompassing the estimated range to non-auditory injury would be expected to receive minor injuries at the outer ranges, increasing to more substantial injuries, and finally mortality as an animal approaches the detonation point.

TABLE 29—VERY LOW-FREQUENCY CETACEAN RANGES TO EFFECTS FOR EXPLOSIVES

Bin	Depth (m)	Cluster size	Range to behavioral disturbance	Range to TTS	Range to AUD INJ
E1	≤200	1	NA	310 m (149 m)	97 m (6 m).
E1	≤200	25	1,250 m (336 m)	800 m (112 m)	199 m (39 m).
E1	≤200	100	5,049 m (2,982 m)	1,604 m (1,238 m)	353 m (74 m).
E1	>200	1	NA	305 m (88 m)	96 m (6 m).
E2	≤200	1	NA	292 m (9 m)	98 m (0 m).
E3	≤200	1	NA	542 m (531 m)	206 m (22 m).
E3	≤200	10	3,569 m (2,949 m)	1,264 m (904 m)	274 m (75 m).
E3	>200	1	NA	480 m (275 m)	208 m (20 m).
E3	>200	10	1,500 m (881 m)	925 m (301 m)	290 m (67 m).
E4	≤200	1	NA	2,625 m (1,017 m)	378 m (143 m).
E4	>200	1	NA	1,000 m (160 m)	353 m (34 m).
E5	≤200	1	NA	879 m (1,240 m)	309 m (35 m).
E5	≤200	8	11,590 m (7,473 m)	5,375 m (3,258 m)	389 m (119 m).
E5	>200	1	NA	650 m (221 m)	304 m (33 m).
E5	>200	8	1,750 m (1,403 m)	1,000 m (654 m)	420 m (92 m).
E6	≤200	1	NA	1,472 m (2,322 m)	421 m (56 m).
E6	≤200	4	16,812 m (4,849 m)	7,131 m (3,505 m)	421 m (56 m).
E6	>200	1	NA	743 m (100 m)	426 m (43 m).
E7	≤200	1	NA	2,649 m (919 m)	510 m (62 m).
E7	>200	1	NA	2,989 m (1,004 m)	515 m (66 m).
E8	≤200	1	NA	5,619 m (1,462 m)	767 m (114 m).
E8	>200	1	NA	5,577 m (1,617 m)	781 m (115 m).
E9	≤200	1	NA	6,717 m (3,010 m)	676 m (98 m).
E9	>200	1	NA	6,141 m (2,970 m)	646 m (89 m).
E10	≤200	1	NA	12,778 m (4,320 m)	875 m (153 m).
E10	>200	1	NA	12,964 m (3,612 m)	912 m (158 m).
E11	≤200	1	NA	23,156 m (5,301 m)	3,790 m (770 m).
E11	>200	1	NA	22,108 m (4,622 m)	3,625 m (664 m).
E12	≤200	1	NA	14,652 m (4,177 m)	1,105 m (465 m).
E12	>200	1	NA	16,150 m (3,598 m)	1,093 m (205 m).
E16	>200	1	NA	57,600 m (5,145 m)	16,753 m (2,305 m).

Note: Behavioral response criteria are applied to explosive clusters >1. The values listed for TTS and AUD INJ are the greater of the respective SPL and SEL ranges. Median ranges are shown with standard deviation ranges in parentheses. The Action Proponents split the LF functional hearing group into LF and VLF based on Houser *et al.,* (2024), however, NMFS updated acoustic technical guidance (NMFS, 2024) does not include these data but we have included the VLF group here for reference. E1 (0.1–0.25 lbs), E2 (>0.25–0.5 lbs), E3 (>0.5–2.5 lbs), E4 (>2.5–5 lbs), E5 (>5–10 lbs), E6 (>10–20 lbs), E7 (>20–60 lbs), E8 (>60–100 lbs), E9 (>100–250 lbs), E10 (>250–500 lbs), E11 (>500–675 lbs), E12 (>675–1,000 lbs), E16 (10,000 lbs).

TABLE 30—LOW-FREQUENCY CETACEAN RANGES TO EFFECTS FOR EXPLOSIVES

Bin	Depth (m)	Cluster size	Range to behavioral disturbance	Range to TTS	Range to AUD INJ
E1	≤200	1	NA	350 m (149 m)	99 m (4 m).
E1	≤200	25	1,625 m (321 m)	982 m (46 m)	288 m (28 m).
E1	≤200	100	5,021 m (2,386 m)	1,993 m (1,282 m)	501 m (53 m).
E1	>200	1	NA	340 m (51 m)	99 m (5 m).
E2	≤200	1	NA	375 m (6 m)	98 m (0 m).
E3	≤200	1	NA	626 m (459 m)	195 m (22 m).
E3	≤200	10	3,312 m (2,425 m)	1,500 m (817 m)	371 m (62 m).
E3	>200	1	NA	550 m (254 m)	196 m (18 m).
E3	>200	10	1,743 m (1,121 m)	1,000 m (333 m)	330 m (41 m).
E4	≤200	1	NA	2,347 m (913 m)	353 m (120 m).
E4	>200	1	NA	1,000 m (152 m)	350 m (36 m).
E5	≤200	1	NA	956 m (1,114 m)	292 m (33 m).
E5	≤200	8	9,667 m (5,924 m)	4,569 m (2,412 m)	509 m (78 m).
E5	>200	1	NA	725 m (173 m)	289 m (33 m).
E5	>200	8	1,750 m (1,640 m)	1,250 m (793 m)	470 m (78 m).
E6	≤200	1	NA	1,431 m (2,018 m)	412 m (79 m).
E6	≤200	4	11,125 m (4,506 m)	6,000 m (2,989 m)	500 m (51 m).
E6	>200	1	NA	922 m (855 m)	417 m (76 m).
E7	≤200	1	NA	2,818 m (1,316 m)	492 m (147 m).
E7	>200	1	NA	2,822 m (1,165 m)	495 m (173 m).

TABLE 30—LOW-FREQUENCY CETACEAN RANGES TO EFFECTS FOR EXPLOSIVES—Continued

Bin	Depth (m)	Cluster size	Range to behavioral disturbance	Range to TTS	Range to AUD INJ
E8	≤200	1	NA	4,664 m (1,107 m)	745 m (111 m).
E8	>200	1	NA	4,656 m (1,243 m)	746 m (106 m).
E9	≤200	1	NA	4,954 m (2,390 m)	656 m (92 m).
E9	>200	1	NA	4,786 m (3,126 m)	623 m (92 m).
E10	≤200	1	NA	9,549 m (3,317 m)	850 m (166 m).
E10	>200	1	NA	10,163 m (3,324 m)	889 m (171 m).
E11	≤200	1	NA	17,248 m (5,803 m)	2,753 m (791 m).
E11	>200	1	NA	15,925 m (5,288 m)	2,625 m (668 m).
E12	≤200	1	NA	11,344 m (2,290 m)	1,003 m (112 m).
E12	>200	1	NA	12,974 m (2,952 m)	982 m (108 m).
E16	>200	1	NA	43,847 m (4,420 m)	9,408 m (2,314 m).

Note: Behavioral response criteria are applied to explosive clusters >1. The values listed for TTS and AUD INJ are the greater of the respective SPL and SEL ranges. Median ranges are shown with standard deviation ranges in parentheses. The Action Proponents split the LF functional hearing group into LF and VLF based on Houser *et al.,* (2024), however, NMFS updated acoustic technical guidance (NMFS, 2024) does not include these data but we have included the VLF group here for reference. E1 (0.1–0.25 lbs), E2 (>0.25–0.5 lbs), E3 (>0.5–2.5 lbs), E4 (>2.5–5 lbs), E5 (>5–10 lbs), E6 (>10–20 lbs), E7 (>20–60 lbs), E8 (>60–100 lbs), E9 (>100–250 lbs), E10 (>250–500 lbs), E11 (>500–675 lbs), E12 (>675–1,000 lbs), E16 (10,000 lbs).

TABLE 31—HIGH-FREQUENCY CETACEAN RANGES TO EFFECTS FOR EXPLOSIVES

Bin	Depth (m)	Cluster size	Range to behavioral disturbance	Range to TTS	Range to AUD INJ
E1	≤200	1	NA	110 m (19 m)	45 m (1 m).
E1	≤200	25	757 m (71 m)	514 m (49 m)	113 m (6 m).
E1	≤200	100	1,004 m (133 m)	747 m (77 m)	240 m (18 m).
E1	>200	1	NA	90 m (3 m)	44 m (1 m).
E2	≤200	1	NA	156 m (1 m)	45 m (1 m).
E3	≤200	1	NA	230 m (57 m)	94 m (5 m).
E3	≤200	10	881 m (205 m)	597 m (114 m)	150 m (15 m).
E3	>200	1	NA	190 m (23 m)	95 m (5 m).
E3	>200	10	525 m (172 m)	366 m (79 m)	120 m (7 m).
E4	≤200	1	NA	427 m (108 m)	130 m (13 m).
E4	>200	1	NA	278 m (20 m)	126 m (15 m).
E5	≤200	1	NA	370 m (118 m)	138 m (11 m).
E5	≤200	8	1,083 m (343 m)	787 m (105 m)	220 m (19 m).
E5	>200	1	NA	250 m (28 m)	137 m (10 m).
E5	>200	8	625 m (209 m)	450 m (139 m)	170 m (10 m).
E6	≤200	1	NA	479 m (174 m)	187 m (15 m).
E6	≤200	4	884 m (122 m)	674 m (95 m)	220 m (18 m).
E6	>200	1	NA	341 m (27 m)	191 m (11 m).
E7	≤200	1	NA	544 m (67 m)	239 m (18 m).
E7	>200	1	NA	552 m (68 m)	237 m (20 m).
E8	≤200	1	NA	719 m (93 m)	333 m (37 m).
E8	>200	1	NA	713 m (101 m)	327 m (40 m).
E9	≤200	1	NA	731 m (90 m)	336 m (29 m).
E9	>200	1	NA	739 m (99 m)	325 m (31 m).
E10	≤200	1	NA	872 m (96 m)	400 m (37 m).
E10	>200	1	NA	898 m (107 m)	398 m (36 m).
E11	≤200	1	NA	1,857 m (420 m)	839 m (153 m).
E11	>200	1	NA	1,788 m (375 m)	840 m (159 m).
E12	≤200	1	NA	1,053 m (96 m)	490 m (43 m).
E12	>200	1	NA	1,053 m (67 m)	488 m (40 m).
E16	>200	1	NA	4,306 m (646 m)	1,986 m (367 m).

Note: Behavioral response criteria are applied to explosive clusters >1. The values listed for TTS and AUD INJ are the greater of the respective SPL and SEL ranges. Median ranges are shown with standard deviation ranges in parentheses. E1 (0.1–0.25 lbs), E2 (>0.25–0.5 lbs), E3 (>0.5–2.5 lbs), E4 (>2.5–5 lbs), E5 (>5–10 lbs), E6 (>10–20 lbs), E7 (>20–60 lbs), E8 (>60–100 lbs), E9 (>100–250 lbs), E10 (>250–500 lbs), E11 (>500–675 lbs), E12 (>675–1,000 lbs), E16 (10,000 lbs).

TABLE 32—VERY HIGH-FREQUENCY CETACEAN RANGES TO EFFECTS FOR EXPLOSIVES

Bin	Depth (m)	Cluster size	Range to behavioral disturbance	Range to TTS	Range to AUD INJ
E1	≤200	1	NA	2,306 m (1,200 m)	756 m (54 m).
E1	≤200	25	8,750 m (2,277 m)	6,201 m (1,446 m)	1,507 m (294 m).
E1	≤200	100	12,639 m (3,565 m)	9,500 m (2,588 m)	2,986 m (991 m).
E1	>200	1	NA	1,750 m (1,283 m)	756 m (67 m).
E2	≤200	1	NA	2,319 m (189 m)	636 m (41 m).
E3	≤200	1	NA	4,229 m (1,812 m)	1,369 m (214 m).

TABLE 32—VERY HIGH-FREQUENCY CETACEAN RANGES TO EFFECTS FOR EXPLOSIVES—Continued

Bin	Depth (m)	Cluster size	Range to behavioral disturbance	Range to TTS	Range to AUD INJ
E3	≤200	10	12,403 m (5,829 m)	9,181 m (4,143 m)	2,319 m (986 m).
E3	>200	1	NA	3,188 m (2,063 m)	1,358 m (218 m).
E3	>200	10	7,931 m (3,781 m)	5,417 m (2,727 m)	1,750 m (521 m).
E4	≤200	1	NA	7,708 m (3,229 m)	3,718 m (510 m).
E4	>200	1	NA	6,956 m (940 m)	3,708 m (476 m).
E5	≤200	1	NA	6,188 m (2,432 m)	2,389 m (607 m).
E5	≤200	8	16,743 m (6,550 m)	12,785 m (4,590 m)	3,708 m (1,410 m).
E5	>200	1	NA	5,139 m (1,394 m)	2,400 m (650 m).
E5	>200	8	6,944 m (3,970 m)	5,139 m (1,394 m)	2,400 m (650 m).
E6	≤200	1	NA	8,450 m (1,848 m)	4,163 m (982 m).
E6	≤200	4	14,139 m (2,139 m)	10,806 m (1,894 m)	4,163 m (982 m).
E6	>200	1	NA	8,161 m (1,685 m)	4,142 m (886 m).
E7	≤200	1	NA	9,972 m (2,473 m)	5,417 m (1,153 m).
E7	>200	1	NA	10,797 m (2,602 m)	5,417 m (1,234 m).
E8	≤200	1	NA	15,042 m (2,913 m)	8,474 m (1,510 m).
E8	>200	1	NA	14,576 m (2,952 m)	8,508 m (1,647 m).
E9	≤200	1	NA	17,125 m (4,607 m)	9,306 m (2,744 m).
E9	>200	1	NA	18,111 m (4,553 m)	9,257 m (2,571 m).
E10	≤200	1	NA	23,389 m (5,616 m)	14,477 m (3,639 m).
E10	>200	1	NA	24,140 m (5,392 m)	14,360 m (3,368 m).
E11	≤200	1	NA	32,167 m (5,134 m)	20,460 m (3,618 m).
E11	>200	1	NA	31,136 m (5,579 m)	19,871 m (3,817 m).
E12	≤200	1	NA	22,356 m (4,938 m)	13,444 m (3,602 m).
E12	>200	1	NA	23,368 m (4,434 m)	14,097 m (2,913 m).
E16	>200	1	NA	63,764 m (5,297 m)	46,979 m (5,225 m).

Note: Behavioral response criteria are applied to explosive clusters >1. The values listed for TTS and AUD INJ are the greater of the respective SPL and SEL ranges. Median ranges are shown with standard deviation ranges in parentheses. E1 (0.1–0.25 lbs), E2 (>0.25–0.5 lbs), E3 (>0.5–2.5 lbs), E4 (>2.5–5 lbs), E5 (>5–10 lbs), E6 (>10–20 lbs), E7 (>20–60 lbs), E8 (>60–100 lbs), E9 (>100–250 lbs), E10 (>250–500 lbs), E11 (>500–675 lbs), E12 (>675–1,000 lbs), E16 (10,000 lbs).

TABLE 33—PHOCID CARNIVORE IN WATER RANGES TO EFFECTS FOR EXPLOSIVES

Bin	Depth (m)	Cluster size	Range to behavioral disturbance	Range to TTS	Range to AUD INJ
E1	≤200	1	NA	342 m (110 m)	88 m (4 m).
E1	≤200	25	1,493 m (265 m)	994 m (40 m)	309 m (25 m).
E1	≤200	100	3,861 m (2,008 m)	1,833 m (880 m)	500 m (52 m).
E1	>200	1	NA	310 m (36 m)	88 m (5 m).
E2	≤200	1	NA	382 m (5 m)	91 m (1 m).
E3	≤200	1	NA	625 m (278 m)	188 m (16 m).
E3	≤200	10	2,715 m (1,485 m)	1,319 m (604 m)	393 m (50 m).
E3	>200	1	NA	550 m (174 m)	188 m (13 m).
E3	>200	10	1,500 m (909 m)	974 m (267 m)	320 m (20 m).
E4	≤200	1	NA	1,569 m (638 m)	303 m (37 m).
E4	>200	1	NA	925 m (83 m)	304 m (32 m).
E5	≤200	1	NA	879 m (736 m)	273 m (22 m).
E5	≤200	8	5,840 m (3,339 m)	2,611 m (1,253 m)	517 m (61 m).
E5	>200	1	NA	625 m (144 m)	270 m (20 m).
E5	>200	8	1,750 m (1,211 m)	1,083 m (616 m)	420 m (50 m).
E6	≤200	1	NA	1,055 m (1,248 m)	361 m (40 m).
E6	≤200	4	6,556 m (3,277 m)	2,410 m (1,313 m)	487 m (43 m).
E6	>200	1	NA	725 m (178 m)	368 m (29 m).
E7	≤200	1	NA	1,471 m (301 m)	418 m (35 m).
E7	>200	1	NA	1,480 m (304 m)	411 m (36 m).
E8	≤200	1	NA	2,974 m (660 m)	683 m (96 m).
E8	>200	1	NA	2,900 m (761 m)	704 m (92 m).
E9	≤200	1	NA	2,761 m (812 m)	611 m (88 m).
E9	>200	1	NA	2,713 m (702 m)	578 m (87 m).
E10	≤200	1	NA	4,917 m (1,223 m)	770 m (117 m).
E10	>200	1	NA	4,967 m (1,132 m)	790 m (148 m).
E11	≤200	1	NA	12,592 m (2,706 m)	2,312 m (460 m).
E11	>200	1	NA	11,950 m (2,415 m)	2,225 m (366 m).
E12	≤200	1	NA	5,578 m (1,142 m)	903 m (110 m).
E12	>200	1	NA	6,146 m (1,343 m)	869 m (93 m).
E16	>200	1	NA	24,319 m (1,977 m)	5,478 m (1,106 m).

Note: Behavioral response criteria are applied to explosive clusters >1. The values listed for TTS and AUD INJ are the greater of the respective SPL and SEL ranges. Median ranges are shown with standard deviation ranges in parentheses. E1 (0.1–0.25 lbs), E2 (>0.25–0.5 lbs), E3 (>0.5–2.5 lbs), E4 (>2.5–5 lbs), E5 (>5–10 lbs), E6 (>10–20 lbs), E7 (>20–60 lbs), E8 (>60–100 lbs), E9 (>100–250 lbs), E10 (>250–500 lbs), E11 (>500–675 lbs), E12 (>675–1,000 lbs), E16 (10,000 lbs).

TABLE 34—EXPLOSIVE RANGES TO NON-AUDITORY INJURY AND MORTALITY FOR ALL MARINE MAMMAL HEARING GROUPS AS A FUNCTION OF ANIMAL MASS

Bin	Effect	10 kg	250 kg	1,000 kg	5,000 kg	25,000 kg	72,000 kg
E1	Non-auditory injury	22 m (0 m)	22 m (1 m)	22 m (1 m)	22 m (1 m)	22 m (0 m)	22 m (0 m).
E1	Mortality	4 m (0 m)	1 m (1 m)	0 m (0 m)	0 m (0 m)	0 m (0 m)	0 m (0 m).
E2	Non-auditory injury	26 m (1 m)	25 m (1 m)	26 m (2 m)	26 m (0 m)	26 m (1 m)	26 m (0 m).
E2	Mortality	4 m (0 m)	2 m (1 m)	1 m (0 m)	0 m (0 m)	0 m (0 m)	0 m (0 m).
E3	Non-auditory injury	47 m (1 m)	47 m (3 m)	46 m (5 m)	46 m (2 m)	46 m (2 m)	46 m (2 m).
E3	Mortality	10 m (1 m)	5 m (2 m)	2 m (1 m)	1 m (0 m)	0 m (0 m)	0 m (0 m).
E4	Non-auditory injury	58 m (6 m)	58 m (6 m)	60 m (7 m)	64 m (6 m)	62 m (8 m)	64 m (5 m).
E4	Mortality	23 m (3 m)	12 m (4 m)	5 m (1 m)	3 m (1 m)	2 m (0 m)	1 m (0 m).
E5	Non-auditory injury	74 m (4 m)	73 m (7 m)	73 m (10 m)	75 m (4 m)	73 m (6 m)	75 m (4 m).
E5	Mortality	17 m (3 m)	9 m (3 m)	4 m (1 m)	3 m (1 m)	1 m (0 m)	1 m (0 m).
E6	Non-auditory injury	95 m (4 m)	95 m (7 m)	94 m (11 m)	97 m (5 m)	94 m (9 m)	97 m (4 m).
E6	Mortality	34 m (7 m)	16 m (6 m)	8 m (2 m)	5 m (1 m)	2 m (1 m)	1 m (0 m).
E7	Non-auditory injury	121 m (8 m)	122 m (9 m)	121 m (15 m)	125 m (7 m)	117 m (18 m)	125 m (7 m).
E7	Mortality	40 m (9 m)	19 m (7 m)	11 m (4 m)	7 m (2 m)	3 m (2 m)	2 m (1 m).
E8	Non-auditory injury	206 m (38 m)	159 m (19 m)	159 m (21 m)	162 m (18 m)	158 m (20 m)	165 m (19 m).
E8	Mortality	74 m (15 m)	34 m (13 m)	16 m (5 m)	11 m (2 m)	3 m (2 m)	3 m (1 m).
E9	Non-auditory injury	207 m (77 m)	184 m (13 m)	179 m (16 m)	189 m (11 m)	174 m (11 m)	196 m (11 m).
E9	Mortality	94 m (39 m)	22 m (19 m)	12 m (1 m)	8 m (1 m)	4 m (0 m)	3 m (0 m).
E10	Non-auditory injury	316 m (82 m)	219 m (13 m)	216 m (15 m)	224 m (13 m)	214 m (13 m)	231 m (12 m).
E10	Mortality	152 m (38 m)	54 m (39 m)	15 m (2 m)	10 m (1 m)	6 m (0 m)	4 m (0 m).
E11	Non-auditory injury	770 m (170 m)	421 m (154 m)	382 m (68 m)	433 m (72 m)	372 m (68 m)	452 m (63 m).
E11	Mortality	368 m (53 m)	197 m (66 m)	89 m (11 m)	55 m (8 m)	25 m (5 m)	21 m (3 m).
E12	Non-auditory injury	475 m (99 m)	277 m (16 m)	275 m (19 m)	277 m (19 m)	273 m (17 m)	298 m (16 m).
E12	Mortality	235 m (52 m)	118 m (53 m)	18 m (10 m)	13 m (1 m)	7 m (0 m)	5 m (0 m).
E16	Non-auditory injury	3,139 m (786 m)	1,451 m (505 m)	1,003 m (115 m)	1,097 m (119 m)	1,004 m (122 m)	1,155 m (132 m).
E16	Mortality	1,222 m (163 m)	850 m (167 m)	491 m (62 m)	350 m (34 m)	189 m (10 m)	134 m (18 m).

Note: Median ranges with standard deviation ranges in parentheses. For non-auditory injury ranges, the greater of the respective ranges for 1 percent chance of gastro-intestinal tract injury and 1 percent chance of injury. E1 (0.1–0.25 lbs), E2 (>0.25–0.5 lbs), E3 (>0.5–2.5 lbs), E4 (>2.5–5 lbs), E5 (>5–10 lbs), E6 (>10–20 lbs), E7 (>20–60 lbs), E8 (>60–100 lbs), E9 (>100–250 lbs), E10 (>250–500 lbs), E11 (>500–675 lbs), E12 (>675–1,000 lbs), E16 (10,000 lbs).

Marine Mammal Density

A quantitative analysis of impacts on a species or stock requires data on their abundance and distribution that may be affected by anthropogenic activities in the potentially impacted area. The most appropriate metric for this type of analysis is density, which is the number of animals present per unit area. Marine species density estimation requires a significant amount of effort to both collect and analyze data to produce a reasonable estimate. Unlike surveys for terrestrial wildlife, many marine species spend much of their time submerged and are not easily observed. In order to collect enough sighting data to make reasonable density estimates, multiple observations are required, often in areas that are not easily accessible (*e.g.,* far offshore). Ideally, marine mammal species sighting data would be collected for the specific area and time period (*e.g.,* season) of interest and density estimates derived accordingly. However, in many places, poor weather conditions and high sea states prohibit the completion of comprehensive visual surveys.

For most cetacean species, abundance is estimated using line-transect surveys or mark-recapture studies (*e.g.,* Barlow, 2010; Barlow and Forney, 2007; Calambokidis *et al.,* 2008). This is the general approach applied in estimating cetacean abundance in NMFS SARs. Although the single value provides a good average estimate of abundance (total number of individuals) for a specified area, it does not provide information on the species distribution or concentrations within that area, and it does not estimate density for other timeframes or seasons that were not surveyed. More recently, spatial habitat modeling has been used to estimate cetacean densities (*e.g.,* Roberts *et al.* 2023). These models estimate cetacean density as a continuous function of habitat variables (*e.g.,* sea surface temperature, seafloor depth, *etc.*) and thus allow predictions of cetacean densities on finer spatial scales than traditional line-transect or mark recapture analyses, and for areas that have not been surveyed. Within the geographic area that was modeled, densities can be predicted wherever these habitat variables can be measured or estimated.

Ideally, density data would be available for all species throughout the Study Area year-round, in order to best estimate the impacts of specified activities on marine species. However, in many places, vessel availability, lack of funding, inclement weather conditions, and high sea states prevent the completion of comprehensive year-round surveys. Even with surveys that are completed, poor conditions may result in lower sighting rates for species that would typically be sighted with greater frequency under favorable conditions. Lower sighting rates preclude having an acceptably low uncertainty in the density estimates. A high level of uncertainty, indicating a low level of confidence in the density estimate, is typical for species that are rare or difficult to sight. In areas where survey data are limited or non-existent, known or inferred associations between marine habitat features and the likely presence of specific species are sometimes used to predict densities in the absence of actual animal sightings. Consequently, there is no single source of density data for every area, species, and season because of the fiscal costs, resources, and effort involved in providing enough survey coverage to sufficiently estimate density.

To characterize the marine species density for large oceanic regions, the Action Proponents review, critically assess, and prioritize existing density estimates from multiple sources, requiring the development of a systematic method for selecting the most appropriate density estimate for each combination of species/stock, area, and season. The selection and compilation of the best available marine species density data resulted in the NMSDD, which includes seasonal density values for every marine mammal species and stock present within the AFTT Study Area. This database is described in the ''U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area'' technical report (U.S. Department of the Navy, 2024), hereafter referred to as the Density Technical Report. NMFS reviewed all cetacean densities provided by the Action Proponents prior to use in their acoustic analysis for the current rulemaking process.

A variety of density data and density models are needed to develop a density database that encompasses the entirety of the AFTT Study Area. Because these data are collected using different methods with varying amounts of accuracy and uncertainty, the Action Proponents have developed a hierarchy to ensure the most accurate data is used when available. The Density Technical Report describes these models in detail and provides detailed explanations of the models applied to each species density estimate. The below list describes possible models in order of preference and use:

1. Density estimates from spatial models are preferred and used when available because they provide an estimate with the least amount of uncertainty by deriving estimates for divided segments of the sampling area. These models (see DiMatteo *et al.* (2024), Garrison *et al.* (2023a, 2023b), and Roberts *et al.* (2023)) predict spatial variability of animal presence based on habitat variables (*e.g.,* sea surface temperature, seafloor depth, *etc.*). Density spatial models are developed for areas, species, and, when available, specific timeframes (months or seasons) with sufficient survey data; therefore, this model cannot be used for species with low numbers of sightings. In the AFTT Study Area, density spatial models are available for certain species along the east coast to the offshore extent of available survey data and in the Gulf of America. For species not covered by the newer generation of models, the older Roberts *et al.* (2016) density estimates from Phase III could be used.

2. Design-based density models predict animal density based on survey data. Like spatial density models, they are applied to areas with survey data. Design-based density models may be stratified, in which a density is predicted for each sub-region of a survey area, allowing for better prediction of species distribution across the density model area. In the AFTT Study Area, stratified density models are used for certain species on both the east coast and the Gulf of America. In addition, a few species' stratified density models are applied to areas east of regions with available survey data and cover a substantial portion of the Atlantic Ocean portion of the AFTT Study Area.

3. Extrapolative models are used in areas where there is insufficient or no survey data. These models use a limited set of environmental variables to predict probable species densities based on environmental observations during actual marine mammal surveys (see Mannocci *et al.* (2017)). In the AFTT Study Area, extrapolative models are typically used east of regions with available survey data and cover a substantial portion of the Atlantic Ocean of the AFTT Study Area. Because some unsurveyed areas have oceanographic conditions that are very different from surveyed areas (*e.g.,* the Labrador Sea and North Atlantic gyre) and some species models rely on a very limited data set, the predictions of some species' extrapolative density models and some regions of certain species' extrapolative density models are considered highly speculative. Extrapolative models are not used in the Gulf of America.

4. Existing relative environmental suitability models include a high degree of uncertainty, but are applied when no other model is available.

When interpreting the results of the quantitative analysis, as described in the Density Technical Report for Phase III (U.S. Department of the Navy, 2017), ''it is important to consider that even the best estimate of marine species density is really a model representation of the values of concentration where these animals might occur. Each model is limited to the variables and assumptions considered by the original data source provider. No mathematical model representation of any biological population is perfect and with regards to marine species biodiversity, any single model method will not completely explain the actual distribution and abundance of marine mammal species. It is expected that there would be anomalies in the results that need to be evaluated, with independent information for each case, to support if we might accept or reject a model or portions of the model.''

The Action Proponents' estimates of abundance (based on density estimates used in the AFTT Study Area) utilize NMFS' SARs. For some species, the stock assessment for a given species may exceed the Navy's density prediction because those species' home range extends beyond the Study Area boundaries. For other species, the stock assessment abundance may be much less than the number of animals in the Navy's modeling given that the AFTT Study Area extends beyond the U.S. waters covered by the SAR abundance estimate. The primary source of density estimates are geographically specific survey data and either peer-reviewed line-transect estimates or habitat-based density models that have been extensively validated to provide the most accurate estimates possible.

NMFS coordinated with the Navy in the development of its take estimates and concurs that the Navy's approach for density appropriately utilizes the best available science. Later, in the Preliminary Analysis and Negligible Impact Determination section, we assess how the estimated take numbers compare to stock abundance in order to better understand the potential number of individuals impacted, and the rationale for which abundance estimate is used is included there.

Estimated Take From Acoustic Stressors

The 2024 AFTT Draft Supplemental EIS/OEIS considered all military readiness activities proposed to occur in the AFTT Study Area that have the potential to result in the MMPA defined take of marine mammals. The Action Proponents determined that the three stressors below could result in the incidental taking of marine mammals. NMFS has reviewed the Action Proponents' data and analysis and determined that it is complete and accurate and agrees that the following stressors have the potential to result in takes by harassment of marine mammals from the specified activities:

- Acoustics (sonars and other transducers, air guns, pile driving/extraction);
- Explosives (explosive shock wave and sound, assumed to encompass the risk due to fragmentation); and
- Vessel strike.

Acoustic and explosive sources are likely to result in incidental takes of marine mammals by harassment. Explosive sources and vessel strikes have the potential to result in incidental take by injury, serious injury, and/or mortality.

The quantitative analysis process used for the 2024 AFTT Draft Supplemental EIS/OEIS and the application to estimate potential exposures to marine mammals resulting from acoustic and explosive stressors is detailed in the technical report titled ''Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing'' (U.S. Department of the Navy, 2024).

Regarding how avoidance of loud sources is considered in the take estimation, NAEMO does not simulate horizontal animat movement during an event. However, NAEMO approximates marine mammal avoidance of high sound levels due to exposure to sonars in a one-dimensional calculation that scales how far an animat would be from a sound source based on sensitivity to disturbance, swim speed, and avoidance duration. This process reduces the sound exposure level (SEL), defined as the accumulation for a given animat (*i.e.,* a virtual animal), by reducing the received sound pressure levels (SPL) of individual exposures based on a spherical spreading calculation from sources on each unique platform in an event. The onset of avoidance was based on the BRFs. Avoidance speeds and durations were informed by a review of available exposure and baseline data. This method captures a more accurate representation of avoidance by using the received sound levels, distance to platform, and species-specific criteria to calculate potential avoidance for each animat than the approach used in Phase III. However, this avoidance method may underestimate avoidance of long-duration sources with lower sound levels because it triggers avoidance calculations based on the highest modeled SPL received level exceeding p(0.5) on the BRF, rather than on cumulative exposure. This is because initiation of the avoidance calculation is based on the highest modeled SPL received level over p(0.5) on the BRF. Please see section 4.4.2.2 of the technical report titled ''Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing'' (U.S. Department of the Navy, 2024).

Regarding the consideration of mitigation effectiveness in the take estimation, during military readiness activities, there is typically at least one, if not numerous, support personnel involved in the activity (*e.g.,* range support personnel aboard a torpedo retrieval boat or support aircraft). In addition to the Lookout posted for the purpose of mitigation, these additional personnel observe and disseminate marine species sighting information amongst the units participating in the activity whenever possible as they conduct their primary mission responsibilities. However, the quantitative analysis does not reduce model-estimated impacts to account for activity-based mitigation, as was done in previous phases of AFTT. While the activity-based mitigation is not quantitatively included in the take estimates, table 2.3–1 of appendix A of the application indicates the percentage of the instances of take where an animal's closest point of approach was within a mitigation zone and, therefore, AUD INJ could potentially be mitigated. Note that these percentages do not account for other factors, such as the sightability of a given species or viewing conditions.

Unlike activity-based mitigation, in some cases, implementation of the proposed geographic mitigation areas are incorporated into the quantitative analysis. The extent to which the mitigation areas reduce impacts on the affected species is addressed in the Preliminary Analysis and Negligible Impact Determination section.

For additional information on the quantitative analysis process, refer to the technical report titled ''Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing'' (U.S. Department of the Navy, 2024) and sections 6 and 11 of the application.

As a general matter, NMFS does not prescribe the methods for estimating take for any applicant, but we review and ensure that applicants use the best available science, and methodologies that are logical and technically sound. Applicants may use different methods of calculating take (especially when using models) and still get to a result that is representative of the best available science and that allows for a rigorous and accurate evaluation of the effects on the affected populations. There are multiple pieces of the Navy's take estimation methods—propagation models, animat movement models, and behavioral thresholds, for example. NMFS evaluates the acceptability of these pieces as they evolve and are used in different rules and impact analyses. Some of the pieces of the Action Proponents' take estimation process have been used in Navy incidental take rules since 2009 and undergone multiple public comment processes; all of them have undergone extensive internal Navy review, and all of them have undergone comprehensive review by NMFS, which has sometimes resulted in modifications to methods or models.

The Navy uses rigorous review processes (verification, validation, and accreditation processes; peer and public review) to ensure the data and methodology it uses represent the best available science. For instance, NAEMO is the result of a NMFS-led Center for Independent Experts (CIE) review of the components used in earlier models. The acoustic propagation component of NAEMO (CASS/GRAB) is accredited by the Oceanographic and Atmospheric Master Library (OAML), and many of the environmental variables used in NAEMO come from approved OAML databases and are based on in-situ data collection. The animal density components of NAEMO are base products of the NMSDD, which includes animal density components that have been validated and reviewed by a variety of scientists from NMFS Science Centers and academic institutions. Several components of the model, for example the Duke University habitat-based density models, have been published in peer reviewed literature. Additionally, NAEMO simulation components underwent quality assurance and quality control (QA/QC) review and validation for model parts such as the scenario builder, acoustic builder, scenario simulator, *etc.,* conducted by qualified statisticians and modelers to ensure accuracy. Other models and methodologies have gone through similar review processes.

In summary, we believe the Action Proponents' methods, including the method for incorporating avoidance, are the most appropriate methods for predicting AUD INJ, non-auditory injury, TTS, and behavioral disturbance. But even with the consideration of avoidance, given some of the more conservative components of the methodology (*e.g.,* the thresholds do not consider ear recovery between pulses), we would describe the application of these methods as identifying the maximum number of instances in which marine mammals would be reasonably expected to be taken through AUD INJ, non-auditory injury, TTS, or behavioral disturbance.

Based on the methods discussed in the previous sections and NAEMO, the Action Proponents provided their take estimate and request for authorization of takes incidental to the use of acoustic and explosive sources for military readiness activities annually (based on the maximum number of activities that could occur per 12-month period) and over the 7-year period, as well as the Navy's take request for ship shock trials, covered by the application. The following species/stocks present in the AFTT Study Area were modeled by the Navy and estimated to have 0 takes of any type from any activity source: Central Georgia Estuarine System stock of bottlenose dolphin, Northern South Carolina Estuarine System stock of bottlenose dolphin, and the Puerto Rico and U.S. Virgin Islands stock of sperm whale. NMFS has reviewed the Action Proponents' data, methodology, and analysis and determined that it is complete and accurate. NMFS agrees that the estimates for incidental takes by harassment from all sources requested for authorization are the maximum number of instances in which marine mammals are reasonably expected to be taken and that the takes by mortality requested for authorization are for the maximum number of instances mortality or serious injury could occur, as in the case of ship shock trials and vessel strikes.

Table 35, table 36, and table 37 summarize the maximum annual and 7-year total amount and type of Level A harassment and Level B harassment that NMFS concurs is reasonably expected to occur by species and stock for Navy training activities, Navy testing activities, and Coast Guard training activities, respectively.

TABLE 35—INCIDENTAL TAKE ESTIMATE BY STOCK DUE TO ACOUSTIC AND EXPLOSIVE SOURCES DURING NAVY TRAINING ACTIVITIES

Species	Stock	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	7-Year total Level B harassment	7-Year total Level A harassment	7-Year total mortality
North Atlantic right whale	Western	97	1	0	642	2	0
Blue whale	Western North Atlantic	40	0	0	265	0	0
Bryde's whale	Primary	10	0	0	69	0	0
Fin whale	Western North Atlantic	1,089	6	0	7,585	38	0
Humpback whale	Gulf of Maine	341	7	0	2,351	41	0
Minke whale	Canadian East Coast	2,606	18	0	17,676	120	0
Rice's whale	Northern Gulf of America	8	1	0	49	1	0
Sei whale	Nova Scotia	356	3	0	2,430	17	0
Sperm whale	North Atlantic	7,189	3	0	50,266	5	0
Sperm whale	Northern Gulf of America	38	0	0	254	0	0
Dwarf sperm whale	Northern Gulf of America	14	1	0	87	1	0
Pygmy sperm whale	Northern Gulf of America	15	2	0	96	2	0
Dwarf sperm whale	Western North Atlantic	3,678	32	0	25,551	221	0
Pygmy sperm whale	Western North Atlantic	3,625	34	0	25,175	231	0
Blainville's beaked whale	Northern Gulf of America	12	0	0	79	0	0
Goose-beaked whale	Northern Gulf of America	41	0	0	281	0	0
Gervais' beaked whale	Northern Gulf of America	14	0	0	90	0	0
Blainville's beaked whale	Western North Atlantic	15,267	1	0	106,751	1	0
Goose-beaked whale	Western North Atlantic	66,011	1	0	461,356	3	0
Gervais' beaked whale	Western North Atlantic	15,761	0	0	110,198	0	0
Northern bottlenose whale	Western North Atlantic	828	0	0	5,789	0	0
Sowerby's beaked whale	Western North Atlantic	15,846	0	0	110,804	0	0
True's beaked whale	Western North Atlantic	15,892	0	0	111,111	0	0
Atlantic spotted dolphin	Northern Gulf of America	792	1	0	5,515	4	0
Bottlenose dolphin	Gulf of America Eastern Coastal	29	0	0	126	0	0
Bottlenose dolphin	Gulf of America Northern Coastal	2,094	1	0	14,645	2	0
Bottlenose dolphin	Gulf of America Oceanic	517	1	0	3,611	1	0
Bottlenose dolphin	Gulf of America Western Coastal	791	0	0	2,372	0	0
Bottlenose dolphin	Mississippi Sound, Lake Borgne, and Bay Boudreau.	1,564	0	0	10,944	0	0
Bottlenose dolphin	Northern Gulf of America Continental Shelf.	4,665	3	0	31,959	13	0
Bottlenose dolphin	Nueces and Corpus Christi Bays	4	0	0	11	0	0
Bottlenose dolphin	Sabine Lake	1	0	0	2	0	0
Bottlenose dolphin	St. Andrew Bay	14	0	0	92	0	0
Bottlenose dolphin	St. Joseph Bay	7	0	0	47	0	0
Bottlenose dolphin	Tampa Bay	350	0	0	1,050	0	0
Clymene dolphin	Northern Gulf of America	66	0	0	459	0	0
False killer whale	Northern Gulf of America	24	0	0	160	0	0
Fraser's dolphin	Northern Gulf of America	25	0	0	159	0	0
Killer whale	Northern Gulf of America	13	0	0	82	0	0
Melon-headed whale	Northern Gulf of America	81	0	0	561	0	0
Pygmy killer whale	Northern Gulf of America	29	0	0	198	0	0
Risso's dolphin	Northern Gulf of America	23	0	0	155	0	0
Rough-toothed dolphin	Northern Gulf of America	128	0	0	866	0	0
Short-finned pilot whale	Northern Gulf of America	88	0	0	611	0	0
Striped dolphin	Northern Gulf of America	244	1	0	1,696	1	0
Pantropical spotted dolphin	Northern Gulf of America	720	3	0	5,036	5	0
Spinner dolphin	Northern Gulf of America	20	0	0	135	0	0
Atlantic white-sided dolphin	Western North Atlantic	3,233	4	0	22,590	18	0
Common dolphin	Western North Atlantic	165,863	39	0	1,160,553	261	0
Atlantic spotted dolphin	Western North Atlantic	74,649	27	0	508,116	179	0
Bottlenose dolphin	Indian River Lagoon Estuarine System	1,422	0	0	9,601	0	0
Bottlenose dolphin	Jacksonville Estuarine System	348	0	0	2,408	0	0
Bottlenose dolphin	Northern Georgia/Southern South Carolina Estuarine System.	2	0	0	6	0	0
Bottlenose dolphin	Northern North Carolina Estuarine System.	9,181	3	0	63,391	20	0
Bottlenose dolphin	Southern Georgia Estuarine System	122	1	0	710	1	0
Bottlenose dolphin	Southern North Carolina Estuarine System.	162	0	0	535	0	0
Tamanend's bottlenose dolphin.	Western North Atlantic Central Florida Coastal.	7,692	2	0	49,736	6	0
Tamanend's bottlenose dolphin.	Western North Atlantic Northern Florida Coastal.	17,003	2	0	116,702	4	0
Bottlenose dolphin	Western North Atlantic Northern Migratory Coastal.	64,712	34	0	450,293	227	0
Bottlenose dolphin	Western North Atlantic Offshore	120,151	27	1	818,458	173	1
Tamanend's bottlenose dolphin.	Western North Atlantic South Carolina/Georgia Coastal.	3,867	3	1	24,408	11	1

TABLE 35—INCIDENTAL TAKE ESTIMATE BY STOCK DUE TO ACOUSTIC AND EXPLOSIVE SOURCES DURING NAVY TRAINING ACTIVITIES—Continued

Species	Stock	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	7-Year total Level B harassment	7-Year total Level A harassment	7-Year total mortality
Bottlenose dolphin	Western North Atlantic Southern Migratory Coastal.	8,868	7	0	56,933	44	0
Clymene dolphin	Western North Atlantic	69,460	15	1	486,205	94	3
False killer whale	Western North Atlantic	406	0	0	2,821	0	0
Fraser's dolphin	Western North Atlantic	1,904	2	0	12,826	8	0
Killer whale	Western North Atlantic	110	0	0	759	0	0
Long-finned pilot whale	Western North Atlantic	13,501	5	0	94,499	18	0
Melon-headed whale	Western North Atlantic	3,517	1	0	23,968	2	0
Pantropical spotted dolphin	Western North Atlantic	10,976	3	0	75,620	12	0
Pygmy killer whale	Western North Atlantic	368	1	0	2,512	1	0
Risso's dolphin	Western North Atlantic	22,128	5	0	150,830	24	0
Rough-toothed dolphin	Western North Atlantic	3,365	3	0	22,647	10	0
Short-finned pilot whale	Western North Atlantic	21,745	3	0	149,080	18	0
Spinner dolphin	Western North Atlantic	4,185	1	0	28,962	3	0
Striped dolphin	Western North Atlantic	121,279	26	0	848,940	178	0
White-beaked dolphin	Western North Atlantic	4	0	0	27	0	0
Harbor porpoise	Gulf of Maine/Bay of Fundy	36,396	73	0	253,899	505	0
Gray seal	Western North Atlantic	7,862	14	0	54,598	93	0
Harbor seal	Western North Atlantic	11,207	18	0	77,914	125	0
Harp seal	Western North Atlantic	14,632	2	0	102,365	12	0
Hooded seal	Western North Atlantic	460	1	0	3,205	1	0

TABLE 36—INCIDENTAL TAKE ESTIMATE BY STOCK DUE TO ACOUSTIC AND EXPLOSIVE SOURCE DURING NAVY TESTING ACTIVITIES

Species	Stock	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	7-Year total Level B harassment	7-Year total Level A harassment	7-Year total mortality
North Atlantic right whale	Western	316	1	0	2,036	6	0
Blue whale	Western North Atlantic	31	1	0	199	2	0
Bryde's whale	Primary	1	0	0	1	0	0
Fin whale	Western North Atlantic	1,524	15	0	9,710	93	0
Humpback whale	Gulf of Maine	500	5	0	3,186	33	0
Minke whale	Canadian East Coast	2,032	38	0	13,316	257	0
Rice's whale	Northern Gulf of America	294	2	0	1,997	5	0
Sei whale	Nova Scotia	389	4	0	2,549	27	0
Sperm whale	North Atlantic	5,395	4	0	34,373	16	0
Sperm whale	Northern Gulf of America	237	0	0	1,399	0	0
Dwarf sperm whale	Northern Gulf of America	173	21	0	1,023	72	0
Pygmy sperm whale	Northern Gulf of America	158	20	0	919	63	0
Dwarf sperm whale	Western North Atlantic	2,640	147	0	16,951	962	0
Pygmy sperm whale	Western North Atlantic	2,663	141	0	17,096	925	0
Blainville's beaked whale	Northern Gulf of America	114	0	0	733	0	0
Goose-beaked whale	Northern Gulf of America	419	0	0	2,681	0	0
Gervais' beaked whale	Northern Gulf of America	111	0	0	710	0	0
Blainville's beaked whale	Western North Atlantic	10,431	0	0	65,790	0	0
Goose-beaked whale	Western North Atlantic	46,017	1	0	290,954	2	0
Gervais' beaked whale	Western North Atlantic	9,678	1	0	62,096	1	0
Northern bottlenose whale	Western North Atlantic	823	1	0	5,090	1	0
Sowerby's beaked whale	Western North Atlantic	9,770	1	0	62,705	1	0
True's beaked whale	Western North Atlantic	9,684	0	0	62,151	0	0
Atlantic spotted dolphin	Northern Gulf of America	11,976	19	0	78,071	119	0
Bottlenose dolphin	Gulf of America Eastern Coastal	51	0	0	329	0	0
Bottlenose dolphin	Gulf of America Northern Coastal	5,052	16	0	35,305	112	0
Bottlenose dolphin	Gulf of America Oceanic	5,755	3	0	36,970	10	0
Bottlenose dolphin	Gulf of America Western Coastal	2,540	1	0	15,751	1	0
Bottlenose dolphin	Mississippi Sound, Lake Borgne, and Bay Boudreau.	194	1	0	1,070	1	0
Bottlenose dolphin	Northern Gulf of America Continental Shelf.	66,581	25	0	448,847	151	0
Bottlenose dolphin	St. Andrew Bay	32	0	0	211	0	0
Bottlenose dolphin	St. Joseph Bay	35	0	0	240	0	0
Clymene dolphin	Northern Gulf of America	533	3	0	3,118	4	0
False killer whale	Northern Gulf of America	206	0	0	1,263	0	0
Fraser's dolphin	Northern Gulf of America	216	0	0	1,328	0	0
Killer whale	Northern Gulf of America	97	0	0	598	0	0
Melon-headed whale	Northern Gulf of America	690	1	0	4,245	1	0
Pygmy killer whale	Northern Gulf of America	256	0	0	1,575	0	0
Risso's dolphin	Northern Gulf of America	180	0	0	1,097	0	0
Rough-toothed dolphin	Northern Gulf of America	1,510	3	0	9,920	5	0
Short-finned pilot whale	Northern Gulf of America	933	3	0	5,572	13	0
Striped dolphin	Northern Gulf of America	2,132	6	1	13,718	14	2
Pantropical spotted dolphin	Northern Gulf of America	5,596	6	2	34,923	23	5
Spinner dolphin	Northern Gulf of America	636	0	0	4,324	0	0

TABLE 36—INCIDENTAL TAKE ESTIMATE BY STOCK DUE TO ACOUSTIC AND EXPLOSIVE SOURCE DURING NAVY TESTING ACTIVITIES—Continued

Species	Stock	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	7-Year total Level B harassment	7-Year total Level A harassment	7-Year total mortality
Atlantic white-sided dolphin	Western North Atlantic	7,662	5	0	49,052	25	0
Common dolphin	Western North Atlantic	103,523	121	0	659,876	753	0
Atlantic spotted dolphin	Western North Atlantic	46,117	60	0	288,483	398	0
Bottlenose dolphin	Indian River Lagoon Estuarine System	154	0	0	1,074	0	0
Bottlenose dolphin	Jacksonville Estuarine System	12	0	0	69	0	0
Bottlenose dolphin	Northern North Carolina Estuarine System.	851	3	0	5,151	17	0
Bottlenose dolphin	Southern Georgia Estuarine System	1	0	0	1	0	0
Tamanend's bottlenose dolphin.	Western North Atlantic Central Florida Coastal.	2,797	1	0	16,626	4	0
Tamanend's bottlenose dolphin.	Western North Atlantic Northern Florida Coastal.	4,382	3	0	26,243	9	0
Bottlenose dolphin	Western North Atlantic Northern Migratory Coastal.	6,236	26	0	37,917	148	0
Bottlenose dolphin	Western North Atlantic Offshore	66,789	76	1	427,270	504	1
Tamanend's bottlenose dolphin.	Western North Atlantic South Carolina/Georgia Coastal.	1,092	3	0	6,372	11	0
Bottlenose dolphin	Western North Atlantic Southern Migratory Coastal.	1,015	2	0	5,874	8	0
Clymene dolphin	Western North Atlantic	63,262	89	0	416,118	604	0
False killer whale	Western North Atlantic	165	1	0	1,050	1	0
Fraser's dolphin	Western North Atlantic	1,000	1	0	6,602	6	0
Killer whale	Western North Atlantic	69	1	0	435	1	0
Long-finned pilot whale	Western North Atlantic	8,177	7	0	51,507	45	0
Melon-headed whale	Western North Atlantic	1,078	2	0	7,099	10	0
Pantropical spotted dolphin	Western North Atlantic	2,087	2	0	13,525	13	0
Pygmy killer whale	Western North Atlantic	108	0	0	712	0	0
Risso's dolphin	Western North Atlantic	15,103	20	0	95,004	119	0
Rough-toothed dolphin	Western North Atlantic	1,386	3	0	8,901	15	0
Short-finned pilot whale	Western North Atlantic	11,275	12	0	72,834	73	0
Spinner dolphin	Western North Atlantic	1,168	1	0	7,536	7	0
Striped dolphin	Western North Atlantic	87,521	137	0	548,894	931	0
White-beaked dolphin	Western North Atlantic	12	0	0	76	0	0
Harbor porpoise	Gulf of Maine/Bay of Fundy	50,625	70	0	332,156	421	0
Gray seal	Western North Atlantic	7,813	10	0	50,645	58	0
Harbor seal	Western North Atlantic	10,813	13	0	70,072	78	0
Harp seal	Western North Atlantic	11,156	3	0	72,257	15	0
Hooded seal	Western North Atlantic	1,264	1	0	7,777	4	0

Note: All Navy Testing estimated mortalities are due to ship shock trials without consideration of extensive mitigation measures

TABLE 37—INCIDENTAL TAKE ESTIMATE BY STOCK DUE TO ACOUSTIC AND EXPLOSIVE SOURCES DURING COAST GUARD TRAINING ACTIVITIES

Species	Stock	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	7-Year total Level B harassment	7-Year total Level A harassment	7-Year total mortality
North Atlantic right whale	Western	1	0	0	4	0	0
Fin whale	Western North Atlantic	3	0	0	3	0	0
Humpback whale	Gulf of Maine	3	0	0	7	0	0
Minke whale	Canadian East Coast	5	0	0	14	0	0
Rice's whale	Northern Gulf of America	1	0	0	1	0	0
Sei whale	Nova Scotia	2	0	0	2	0	0
Sperm whale	North Atlantic	6	0	0	36	0	0
Dwarf sperm whale	Northern Gulf of America	2	0	0	2	0	0
Pygmy sperm whale	Northern Gulf of America	2	0	0	2	0	0
Dwarf sperm whale	Western North Atlantic	8	1	0	45	1	0
Pygmy sperm whale	Western North Atlantic	6	1	0	31	1	0
Blainville's beaked whale	Western North Atlantic	7	0	0	46	0	0
Goose-beaked whale	Western North Atlantic	42	0	0	277	0	0
Gervais' beaked whale	Western North Atlantic	7	0	0	45	0	0
Sowerby's beaked whale	Western North Atlantic	6	0	0	37	0	0
True's beaked whale	Western North Atlantic	6	0	0	39	0	0
Atlantic spotted dolphin	Northern Gulf of America	36	0	0	241	0	0
Bottlenose dolphin	Gulf of America Oceanic	2	0	0	3	0	0
Bottlenose dolphin	Northern Gulf of America Continental Shelf.	85	1	0	585	1	0
Rough-toothed dolphin	Northern Gulf of America	4	0	0	22	0	0
Atlantic white-sided dolphin	Western North Atlantic	6	0	0	27	0	0
Common dolphin	Western North Atlantic	19	1	0	127	1	0
Atlantic spotted dolphin	Western North Atlantic	32	0	0	205	0	0
Bottlenose dolphin	Northern North Carolina Estuarine System.	500	0	0	3,494	0	0
Tamanend's bottlenose dolphin.	Western North Atlantic Central Florida Coastal.	5	0	0	30	0	0

TABLE 37—INCIDENTAL TAKE ESTIMATE BY STOCK DUE TO ACOUSTIC AND EXPLOSIVE SOURCES DURING COAST GUARD TRAINING ACTIVITIES—Continued

Species	Stock	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	7-Year total Level B harassment	7-Year total Level A harassment	7-Year total mortality
Bottlenose dolphin	Western North Atlantic Northern Migratory Coastal.	2,772	0	0	19,400	0	0
Bottlenose dolphin	Western North Atlantic Offshore	106	0	0	723	0	0
Tamanend's bottlenose dolphin.	Western North Atlantic South Carolina/Georgia Coastal.	1	0	0	1	0	0
Bottlenose dolphin	Western North Atlantic Southern Migratory Coastal.	297	0	0	2,076	0	0
Clymene dolphin	Western North Atlantic	1	0	0	1	0	0
False killer whale	Western North Atlantic	1	0	0	1	0	0
Fraser's dolphin	Western North Atlantic	1	0	0	7	0	0
Killer whale	Western North Atlantic	1	0	0	1	0	0
Long-finned pilot whale	Western North Atlantic	2	0	0	3	0	0
Melon-headed whale	Western North Atlantic	3	0	0	19	0	0
Pantropical spotted dolphin	Western North Atlantic	5	0	0	29	0	0
Pygmy killer whale	Western North Atlantic	1	0	0	2	0	0
Risso's dolphin	Western North Atlantic	8	0	0	43	0	0
Rough-toothed dolphin	Western North Atlantic	2	0	0	14	0	0
Short-finned pilot whale	Western North Atlantic	15	0	0	93	0	0
Spinner dolphin	Western North Atlantic	3	0	0	15	0	0
Striped dolphin	Western North Atlantic	2	0	0	4	0	0
Harbor porpoise	Gulf of Maine/Bay of Fundy	98	4	0	677	28	0
Gray seal	Western North Atlantic	49	0	0	342	0	0
Harbor seal	Western North Atlantic	74	1	0	500	1	0
Harp seal	Western North Atlantic	4	1	0	27	1	0
Hooded seal	Western North Atlantic	2	0	0	3	0	0

Estimated Take From Sonar and Other Transducers

Table 38, table 39, and table 40 provide estimated effects from sonar and other transducers, including the comparative amounts of TTS and behavioral disturbance for each species and stock annually, noting that if a modeled marine mammal was ''taken'' through exposure to both TTS and behavioral disturbance in the model, it was recorded as a TTS. Of note, a higher proportion of the takes by Level B harassment of mysticetes include the potential for TTS (as compared to other taxa and prior rules) due to a combination of the fact that mysticetes are relatively less sensitive to behavioral disturbance and the number of auditory impacts from sonar (both TTS and AUD INJ) have increased for some species since the Phase III analysis (84 FR 70712, December 23, 2019) largely due to changes in how avoidance was modeled; for some stocks, changes in densities in areas that overlap activities have also contributed to increased or decreased impacts compared to those modeled in Phase III.

Additionally, although the Navy proposes to use substantially fewer hours of hull-mounted sonars in this action compared to the Phase III analysis, the updated HF cetacean criteria reflect greater susceptibility to auditory effects at low and mid-frequencies than previously analyzed. Consequently, the predicted auditory effects due to sources under 10 kHz, including but not limited to MF1 hull-mounted sonar and other anti-submarine warfare sonars, are substantially higher for this auditory group than in prior analyses of the same activities. Thus, for activities with sonars, some modeled exposures that would previously have been categorized as significant behavioral responses may now instead be counted as auditory effects (TTS and AUD INJ). Similarly, the updated HF cetacean criteria reflect greater susceptibility to auditory effects at low and mid-frequencies in impulsive sounds. For VHF cetaceans, susceptibility to auditory effects has not changed substantially since the prior analysis.

TABLE 38—ANNUAL AND 7-YEAR ESTIMATED TAKE OF MARINE MAMMAL STOCKS FROM SONAR AND OTHER ACTIVE TRANSDUCERS DURING NAVY TRAINING ACTIVITIES

Species	Stock	Maximum annual behavioral	Maximum annual TTS	Maximum annual AUD INJ	Maximum 7-year behavioral	Maximum 7-year TTS	Maximum 7-year AUD INJ
North Atlantic right whale	Western	17	56	1	113	370	2
Blue whale	Western North Atlantic	6	32	0	42	220	0
Bryde's whale	Primary	1	9	-	6	63	-
Fin whale	Western North Atlantic	218	833	6	1,520	5,810	38
Humpback whale	Gulf of Maine	56	264	6	387	1,827	40
Minke whale	Canadian East Coast	239	2,332	17	1,665	15,771	113
Rice's whale	Northern Gulf of America	1	6	1	7	41	1
Sei whale	Nova Scotia	38	313	3	264	2,136	17
Sperm whale	North Atlantic	5,692	1,487	1	39,824	10,380	1
Sperm whale	Northern Gulf of America	32	4	-	224	28	-
Dwarf sperm whale	Northern Gulf of America	2	8	0	14	55	0
Pygmy sperm whale	Northern Gulf of America	2	9	1	14	61	1
Dwarf sperm whale	Western North Atlantic	743	2,875	25	5,191	19,945	174
Pygmy sperm whale	Western North Atlantic	774	2,792	25	5,409	19,359	171
Blainville's beaked whale	Northern Gulf of America	12	0	-	79	0	-
Goose-beaked whale	Northern Gulf of America	40	1	-	280	1	-
Gervais' beaked whale	Northern Gulf of America	13	1	-	89	1	-

TABLE 38—ANNUAL AND 7-YEAR ESTIMATED TAKE OF MARINE MAMMAL STOCKS FROM SONAR AND OTHER ACTIVE TRANSDUCERS DURING NAVY TRAINING ACTIVITIES—Continued

Species	Stock	Maximum annual behavioral	Maximum annual TTS	Maximum annual AUD INJ	Maximum 7-year behavioral	Maximum 7-year TTS	Maximum 7-year AUD INJ
Blainville's beaked whale	Western North Atlantic	15,211	53	-	106,367	371	-
Goose-beaked whale	Western North Atlantic	65,767	234	-	459,656	1,636	-
Gervais' beaked whale	Western North Atlantic	15,616	143	-	109,195	999	-
Northern bottlenose whale	Western North Atlantic	824	4	-	5,765	24	-
Sowerby's beaked whale	Western North Atlantic	15,679	165	-	109,639	1,153	-
True's beaked whale	Western North Atlantic	15,721	169	-	109,931	1,178	-
Atlantic spotted dolphin	Northern Gulf of America	508	280	0	3,544	1,948	0
Bottlenose dolphin	Gulf of America Eastern Coastal	27	-	-	115	-	-
Bottlenose dolphin	Gulf of America Northern Coastal	197	-	-	1,379	-	-
Bottlenose dolphin	Gulf of America Oceanic	432	83	1	3,024	580	1
Bottlenose dolphin	Gulf of America Western Coastal	359	432	-	1,076	1,296	-
Bottlenose dolphin	Northern Gulf of America Continental Shelf	4,268	364	0	29,367	2,365	0
Bottlenose dolphin	Nueces and Corpus Christi Bays	4	-	-	11	-	-
Bottlenose dolphin	Sabine Lake	1	-	-	2	-	-
Bottlenose dolphin	St. Andrew Bay	14	-	-	92	-	-
Bottlenose dolphin	St. Joseph Bay	7	-	-	47	-	-
Bottlenose dolphin	Tampa Bay	163	187	-	490	560	-
Clymene dolphin	Northern Gulf of America	35	31	0	242	217	0
False killer whale	Northern Gulf of America	15	9	-	99	61	-
Fraser's dolphin	Northern Gulf of America	17	6	-	119	38	-
Killer whale	Northern Gulf of America	8	5	-	51	31	-
Melon-headed whale	Northern Gulf of America	53	28	-	366	195	-
Pygmy killer whale	Northern Gulf of America	18	11	-	125	73	-
Risso's dolphin	Northern Gulf of America	16	7	0	109	46	0
Rough-toothed dolphin	Northern Gulf of America	89	37	-	617	245	-
Short-finned pilot whale	Northern Gulf of America	54	33	0	377	231	0
Striped dolphin	Northern Gulf of America	186	57	0	1,300	394	0
Pantropical spotted dolphin	Northern Gulf of America	498	220	1	3,486	1,538	1
Spinner dolphin	Northern Gulf of America	12	8	0	80	55	0
Atlantic white-sided dolphin	Western North Atlantic	2,051	1,172	2	14,333	8,190	8
Common dolphin	Western North Atlantic	83,926	81,845	33	587,262	572,658	228
Atlantic spotted dolphin	Western North Atlantic	34,866	39,711	22	241,359	266,255	151
Bottlenose dolphin	Indian River Lagoon Estuarine System	1,421	1	0	9,598	3	0
Bottlenose dolphin	Jacksonville Estuarine System	264	84	-	1,825	583	-
Bottlenose dolphin	Northern Georgia/Southern South Carolina Estuarine System.	2	-	-	6	-	-
Bottlenose dolphin	Northern North Carolina Estuarine System	7,653	1,527	3	53,027	10,363	20
Bottlenose dolphin	Southern Georgia Estuarine System	84	38	1	498	212	1
Bottlenose dolphin	Southern North Carolina Estuarine System	81	80	-	255	279	-
Tamanend's bottlenose dolphin	Western North Atlantic Central Florida Coastal	6,517	1,157	0	44,348	5,270	0
Tamanend's bottlenose dolphin	Western North Atlantic Northern Florida Coastal.	15,287	1,711	1	106,216	10,461	3
Bottlenose dolphin	Western North Atlantic Northern Migratory Coastal.	52,040	12,610	28	363,648	86,215	196
Bottlenose dolphin	Western North Atlantic Offshore	62,316	57,732	20	431,069	386,677	131
Tamanend's bottlenose dolphin	Western North Atlantic South Carolina/Georgia Coastal.	1,172	2,685	2	7,399	16,942	8
Bottlenose dolphin	Western North Atlantic Southern Migratory Coastal.	2,345	6,475	2	15,085	41,513	14
Clymene dolphin	Western North Atlantic	39,694	29,729	8	277,855	208,097	54
False killer whale	Western North Atlantic	236	170	-	1,647	1,174	-
Fraser's dolphin	Western North Atlantic	1,000	902	1	6,872	5,948	6
Killer whale	Western North Atlantic	68	42	0	476	283	0
Long-finned pilot whale	Western North Atlantic	8,540	4,954	2	59,774	34,676	8
Melon-headed whale	Western North Atlantic	1,684	1,833	1	11,682	12,286	2
Pantropical spotted dolphin	Western North Atlantic	5,641	5,332	2	39,262	36,344	11
Pygmy killer whale	Western North Atlantic	185	183	0	1,283	1,229	0
Risso's dolphin	Western North Atlantic	12,425	9,694	3	86,042	64,728	21
Rough-toothed dolphin	Western North Atlantic	1,444	1,917	2	9,949	12,681	9
Short-finned pilot whale	Western North Atlantic	12,319	9,414	2	85,503	63,500	11
Spinner dolphin	Western North Atlantic	2,193	1,991	1	15,284	13,673	3
Striped dolphin	Western North Atlantic	69,973	51,282	22	489,808	358,968	153
White-beaked dolphin	Western North Atlantic	3	1	-	20	7	-
Harbor porpoise	Gulf of Maine/Bay of Fundy	34,065	2,022	6	237,737	14,003	41
Gray seal	Western North Atlantic	5,241	2,531	11	36,379	17,593	73
Harbor seal	Western North Atlantic	7,331	3,737	14	51,139	25,808	97
Harp seal	Western North Atlantic	7,813	6,819	2	54,673	47,692	12
Hooded seal	Western North Atlantic	343	117	1	2,397	808	1

Note: Zero (0) impacts indicate total less than 0.5 and a dash (-) is a true zero. In some cases where the estimated take within a cell is equal to 1, that value has been rounded up from a value that is less than 0.5 to avoid underestimating potential impacts to a species or stock based on the 7-year rounding rules discussed in Section 2.4 of Appendix E (Acoustic and Explosive Impacts Analysis) of the 2024 AFTT Draft Supplemental EIS/OEIS.

TABLE 39—ANNUAL AND 7-YEAR ESTIMATED TAKE OF MARINE MAMMAL STOCKS FROM SONAR AND OTHER ACTIVE TRANSDUCERS DURING NAVY TESTING ACTIVITIES

Species	Stock	Maximum annual behavioral	Maximum annual TTS	Maximum annual AUD INJ	Maximum 7-year behavioral	Maximum 7-year TTS	Maximum 7-year AUD INJ
North Atlantic right whale	Western	71	236	1	471	1,511	6
Blue whale	Western North Atlantic	4	25	1	27	167	2
Bryde's whale	Primary	1	-	-	1	-	-
Fin whale	Western North Atlantic	328	1,010	12	2,128	6,469	76
Humpback whale	Gulf of Maine	127	353	5	836	2,227	33
Minke whale	Canadian East Coast	401	1,575	37	2,631	10,399	253
Rice's whale	Northern Gulf of America	79	204	1	536	1,387	4
Sei whale	Nova Scotia	75	305	4	489	2,003	27
Sperm whale	North Atlantic	3,174	2,218	3	19,302	15,058	15
Sperm whale	Northern Gulf of America	214	21	-	1,281	116	-
Dwarf sperm whale	Northern Gulf of America	19	124	5	112	820	32
Pygmy sperm whale	Northern Gulf of America	20	106	4	122	693	23
Dwarf sperm whale	Western North Atlantic	521	2,076	139	3,205	13,540	937
Pygmy sperm whale	Western North Atlantic	525	2,095	132	3,226	13,665	892
Blainville's beaked whale	Northern Gulf of America	114	0	-	733	0	-
Goose-beaked whale	Northern Gulf of America	417	1	-	2,679	1	-
Gervais' beaked whale	Northern Gulf of America	110	0	-	709	0	-
Blainville's beaked whale	Western North Atlantic	10,331	98	0	65,116	672	0
Goose-beaked whale	Western North Atlantic	45,642	373	0	288,385	2,556	0
Gervais' beaked whale	Western North Atlantic	9,485	191	-	60,788	1,306	-
Northern bottlenose whale	Western North Atlantic	817	5	-	5,056	33	-
Sowerby's beaked whale	Western North Atlantic	9,570	198	-	61,349	1,351	-
True's beaked whale	Western North Atlantic	9,488	194	-	60,825	1,324	-
Atlantic spotted dolphin	Northern Gulf of America	6,523	5,425	18	42,782	35,096	113
Bottlenose dolphin	Gulf of America Eastern Coastal	47	3	-	314	14	-
Bottlenose dolphin	Gulf of America Northern Coastal	4,346	503	-	30,370	3,519	-
Bottlenose dolphin	Gulf of America Oceanic	4,326	1,425	2	27,878	9,070	8
Bottlenose dolphin	Gulf of America Western Coastal	1,412	1,125	-	8,760	6,977	-
Bottlenose dolphin	Mississippi Sound, Lake Borgne, and Bay Boudreau.	151	43	1	832	238	1
Bottlenose dolphin	Northern Gulf of America Continental Shelf	42,067	23,967	21	288,739	156,296	132
Bottlenose dolphin	St. Andrew Bay	30	0	0	209	0	0
Bottlenose dolphin	St. Joseph Bay	35	-	-	240	-	-
Clymene dolphin	Northern Gulf of America	354	177	1	2,062	1,049	2
False killer whale	Northern Gulf of America	152	52	0	936	325	0
Fraser's dolphin	Northern Gulf of America	150	66	0	911	417	0
Killer whale	Northern Gulf of America	76	21	0	470	128	0
Melon-headed whale	Northern Gulf of America	525	163	1	3,233	1,008	1
Pygmy killer whale	Northern Gulf of America	185	69	0	1,137	436	0
Risso's dolphin	Northern Gulf of America	138	40	0	857	238	0
Rough-toothed dolphin	Northern Gulf of America	888	612	1	5,852	4,008	3
Short-finned pilot whale	Northern Gulf of America	574	357	2	3,391	2,176	12
Striped dolphin	Northern Gulf of America	1,541	580	0	9,961	3,725	0
Pantropical spotted dolphin	Northern Gulf of America	4,088	1,495	2	25,521	9,358	12
Spinner dolphin	Northern Gulf of America	466	169	-	3,161	1,162	-
Atlantic white-sided dolphin	Western North Atlantic	5,106	2,547	4	32,124	16,876	24
Common dolphin	Western North Atlantic	52,543	50,344	100	334,319	321,736	634
Atlantic spotted dolphin	Western North Atlantic	16,870	29,186	56	101,954	186,189	381
Bottlenose dolphin	Indian River Lagoon Estuarine System	17	137	0	119	955	0
Bottlenose dolphin	Jacksonville Estuarine System	5	7	0	30	39	0
Bottlenose dolphin	Northern North Carolina Estuarine System	436	415	3	2,607	2,544	17
Bottlenose dolphin	Southern Georgia Estuarine System	1	-	-	1	-	-
Tamanend's bottlenose dolphin	Western North Atlantic Central Florida Coastal	1,377	1,403	0	8,277	8,253	0
Tamanend's bottlenose dolphin	Western North Atlantic Northern Florida Coastal.	1,761	2,616	2	10,598	15,617	8
Bottlenose dolphin	Western North Atlantic Northern Migratory Coastal.	2,442	3,790	25	14,480	23,416	147
Bottlenose dolphin	Western North Atlantic Offshore	28,717	37,950	69	176,788	249,785	470
Tamanend's bottlenose dolphin	Western North Atlantic South Carolina/Georgia Coastal.	239	841	2	1,483	4,817	8
Bottlenose dolphin	Western North Atlantic Southern Migratory Coastal.	269	734	1	1,664	4,137	6
Clymene dolphin	Western North Atlantic	20,507	42,746	87	125,318	290,746	599
False killer whale	Western North Atlantic	80	84	1	495	554	1
Fraser's dolphin	Western North Atlantic	359	638	1	2,249	4,345	6
Killer whale	Western North Atlantic	30	37	1	180	252	1
Long-finned pilot whale	Western North Atlantic	4,220	3,929	6	25,633	25,706	41
Melon-headed whale	Western North Atlantic	305	772	2	1,841	5,257	10
Pantropical spotted dolphin	Western North Atlantic	788	1,299	2	4,970	8,555	13
Pygmy killer whale	Western North Atlantic	30	77	0	186	525	0
Risso's dolphin	Western North Atlantic	7,772	7,293	16	46,827	47,956	103
Rough-toothed dolphin	Western North Atlantic	425	959	3	2,546	6,351	15
Short-finned pilot whale	Western North Atlantic	4,625	6,626	10	28,176	44,522	64
Spinner dolphin	Western North Atlantic	410	757	1	2,487	5,047	7
Striped dolphin	Western North Atlantic	37,593	49,900	134	218,185	330,534	918
White-beaked dolphin	Western North Atlantic	7	5	-	44	32	-
Harbor porpoise	Gulf of Maine/Bay of Fundy	46,821	3,627	48	307,933	23,099	297
Gray seal	Western North Atlantic	4,438	3,318	8	29,334	20,924	48

TABLE 39—ANNUAL AND 7-YEAR ESTIMATED TAKE OF MARINE MAMMAL STOCKS FROM SONAR AND OTHER ACTIVE TRANSDUCERS DURING NAVY TESTING ACTIVITIES—Continued

Species	Stock	Maximum annual behavioral	Maximum annual TTS	Maximum annual AUD INJ	Maximum 7-year behavioral	Maximum 7-year TTS	Maximum 7-year AUD INJ
Harbor seal	Western North Atlantic	5,878	4,858	11	38,909	30,640	67
Harp seal	Western North Atlantic	8,808	2,327	2	56,816	15,303	11
Hooded seal	Western North Atlantic	735	527	1	4,337	3,432	4

Note: Zero (0) impacts indicate total less than 0.5 and a dash (-) is a true zero. In some cases where the estimated take within a cell is equal to 1, that value has been rounded up from a value that is less than 0.5 to avoid underestimating potential impacts to a species or stock based on the 7-year rounding rules discussed in Section 2.4 of Appendix E (Acoustic and Explosive Impacts Analysis) of the 2024 AFTT Draft Supplemental EIS/OEIS.

TABLE 40—ANNUAL AND 7-YEAR ESTIMATED TAKE OF MARINE MAMMAL STOCKS FROM SONAR AND OTHER ACTIVE TRANSDUCERS DURING COAST GUARD TRAINING ACTIVITIES

Species	Stock	Maximum annual behavioral	Maximum annual TTS	Maximum annual AUD INJ	Maximum 7-year behavioral	Maximum 7-year TTS	Maximum 7-year AUD INJ
North Atlantic right whale	Western	1	-	-	4	-	-
Fin whale	Western North Atlantic	1	-	-	1	-	-
Humpback whale	Gulf of Maine	1	-	-	4	-	-
Minke whale	Canadian East Coast	2	1	-	11	1	-
Rice's whale	Northern Gulf of America	1	-	-	1	-	-
Sei whale	Nova Scotia	1	-	-	1	-	-
Sperm whale	North Atlantic	5	-	-	35	-	-
Dwarf sperm whale	Western North Atlantic	2	4	-	10	23	-
Pygmy sperm whale	Western North Atlantic	2	2	-	10	11	-
Blainville's beaked whale	Western North Atlantic	7	-	-	46	-	-
Goose-beaked whale	Western North Atlantic	40	-	-	275	-	-
Gervais' beaked whale	Western North Atlantic	7	-	-	45	-	-
Sowerby's beaked whale	Western North Atlantic	6	-	-	37	-	-
True's beaked whale	Western North Atlantic	6	-	-	39	-	-
Atlantic spotted dolphin	Northern Gulf of America	35	-	-	239	-	-
Bottlenose dolphin	Gulf of America Oceanic	1	-	-	2	-	-
Bottlenose dolphin	Northern Gulf of America Continental Shelf	78	-	-	542	-	-
Rough-toothed dolphin	Northern Gulf of America	4	-	-	22	-	-
Atlantic white-sided dolphin	Western North Atlantic	3	-	-	16	-	-
Common dolphin	Western North Atlantic	13	-	-	91	-	-
Atlantic spotted dolphin	Western North Atlantic	29	1	-	200	2	-
Bottlenose dolphin	Northern North Carolina Estuarine System	489	11	-	3,423	71	-
Tamanend's bottlenose dolphin	Western North Atlantic Central Florida Coastal	5	-	-	30	-	-
Bottlenose dolphin	Western North Atlantic Northern Migratory Coastal.	2,712	60	-	18,984	416	-
Bottlenose dolphin	Western North Atlantic Offshore	103	1	-	716	1	-
Tamanend's bottlenose dolphin	Western North Atlantic South Carolina/Georgia Coastal.	1	-	-	1	-	-
Bottlenose dolphin	Western North Atlantic Southern Migratory Coastal.	294	3	-	2,056	20	-
Clymene dolphin	Western North Atlantic	1	-	-	1	-	-
False killer whale	Western North Atlantic	1	-	-	1	-	-
Fraser's dolphin	Western North Atlantic	1	-	-	7	-	-
Killer whale	Western North Atlantic	1	-	-	1	-	-
Melon-headed whale	Western North Atlantic	3	-	-	19	-	-
Pantropical spotted dolphin	Western North Atlantic	5	-	-	29	-	-
Pygmy killer whale	Western North Atlantic	1	-	-	2	-	-
Risso's dolphin	Western North Atlantic	6	-	-	41	-	-
Rough-toothed dolphin	Western North Atlantic	2	-	-	14	-	-
Short-finned pilot whale	Western North Atlantic	13	0	-	91	0	-
Spinner dolphin	Western North Atlantic	3	-	-	15	-	-
Harbor porpoise	Gulf of Maine/Bay of Fundy	46	6	-	321	40	-
Gray seal	Western North Atlantic	46	1	-	322	7	-
Harbor seal	Western North Atlantic	68	2	-	474	8	-

Note: Zero (0) impacts indicate total less than 0.5 and a dash (-) is a true zero. In some cases where the estimated take within a cell is equal to 1, that value has been rounded up from a value that is less than 0.5 to avoid underestimating potential impacts to a species or stock based on the 7-year rounding rules discussed in Section 2.4 of Appendix E (Acoustic and Explosive Impacts Analysis) of the 2024 AFTT Draft Supplemental EIS/OEIS.

Estimated Take From Air Guns and Pile Driving

Table 41 provides estimated effects from air guns, including the comparative amounts of TTS and behavioral disturbance for each species and stock annually, noting that if a modeled marine mammal was ''taken'' through exposure to both TTS and behavioral disturbance in the model, it was recorded as a TTS.

TABLE 41—ANNUAL AND 7-YEAR ESTIMATED TAKE OF MARINE MAMMAL STOCKS FROM AIR GUNS DURING NAVY TESTING ACTIVITIES

Species	Stock	Maximum annual behavioral	Maximum annual TTS	Maximum annual AUD INJ	Maximum 7-year behavioral	Maximum 7-year TTS	Maximum 7-year AUD INJ
Fin whale	Western North Atlantic	1	-	-	1	-	-
Dwarf sperm whale	Northern Gulf of America	1	-	-	1	-	-
Dwarf sperm whale	Western North Atlantic	1	1	0	3	2	0
Pygmy sperm whale	Western North Atlantic	1	1	-	2	4	-
Bottlenose dolphin	Northern Gulf of America Continental Shelf	1	0	-	1	0	-
Common dolphin	Western North Atlantic	1	-	-	4	-	-
Bottlenose dolphin	Western North Atlantic Offshore	1	-	-	1	-	-
Striped dolphin	Western North Atlantic	1	-	-	2	-	-
Harbor porpoise	Gulf of Maine/Bay of Fundy	2	3	1	12	15	1
Gray seal	Western North Atlantic	1	0	-	7	0	-
Harbor seal	Western North Atlantic	1	0	-	5	0	-

Note: Zero (0) impacts indicate total less than 0.5 and a dash (-) is a true zero. In some cases where the estimated take within a cell is equal to 1, that value has been rounded up from a value that is less than 0.5 to avoid underestimating potential impacts to a species or stock based on the 7-year rounding rules discussed in Section 2.4 of Appendix E (Acoustic and Explosive Impacts Analysis) of the 2024 AFTT Draft Supplemental EIS/OEIS.

Table 42 provides the estimated effects from pile driving and extraction, including the comparative amounts of TTS and behavioral disturbance for each species and stock annually, noting that if a modeled marine mammal was ''taken'' through exposure to both TTS and behavioral disturbance in the model, it was recorded as a TTS.

TABLE 42—ANNUAL AND 7-YEAR ESTIMATED TAKE OF MARINE MAMMAL STOCKS FROM PILE DRIVING DURING NAVY TRAINING ACTIVITIES

Species	Stock	Maximum annual behavioral	Maximum annual TTS	Maximum annual AUD INJ	Maximum 7-year behavioral	Maximum 7-year TTS	Maximum 7-year AUD INJ
Bottlenose dolphin	Gulf of America Northern Coastal	1,894	0	-	13,255	0	-
Bottlenose dolphin	Mississippi Sound, Lake Borgne, and Bay Boudreau.	1,564	0	-	10,944	0	-

Note: Zero (0) impacts indicate total less than 0.5 and a dash (-) is a true zero.

Estimated Take From Explosives

Table 43 provides estimated effects from explosives during Navy training activities and table 44 provides estimated effects from explosives including small ship shock trials from Navy testing activities. Table 45 provides estimated effects from small ship shock trials over a maximum year (two events) of Navy testing activities, which is a subset of the information included in table 44. Table 46 provides estimated effects from explosives during Coast Guard training activities.

TABLE 43—ANNUAL AND 7-YEAR ESTIMATED TAKE OF MARINE MAMMAL STOCKS FROM EXPLOSIVES DURING NAVY TRAINING ACTIVITIES

Species	Stock	Maximum annual behavioral	Maximum annual TTS	Maximum annual AUD INJ	Maximum annual non-auditory injury	Maximum annual mortality	Maximum 7-year behavioral	Maximum 7-year TTS	Maximum 7-year AUD INJ	Maximum 7-year non-auditory injury	Maximum 7-year mortality
North Atlantic right whale	Western	14	10	0	-	-	93	66	0	-	-
Blue whale	Western North Atlantic	1	1	-	-	-	2	1	-	-	-
Fin whale	Western North Atlantic	30	8	0	-	-	205	50	0	-	-
Humpback whale	Gulf of Maine	14	7	1	-	-	94	43	1	-	-
Minke whale	Canadian East Coast	24	11	1	-	-	167	73	7	-	-
Rice's whale	Northern Gulf of America	0	1	-	-	-	0	1	-	-	-
Sei whale	Nova Scotia	4	1	0	-	-	27	3	0	-	-
Sperm whale	North Atlantic	4	6	1	1	-	26	36	3	1	-
Sperm whale	Northern Gulf of America	1	1	0	-	-	1	1	0	-	-
Dwarf sperm whale	Northern Gulf of America	2	2	1	0	-	8	10	1	0	-
Pygmy sperm whale	Northern Gulf of America	2	2	1	-	-	9	12	1	-	-
Dwarf sperm whale	Western North Atlantic	27	33	7	-	-	188	227	47	-	-
Pygmy sperm whale	Western North Atlantic	26	33	9	-	-	182	225	60	-	-
Blainville's beaked whale	Western North Atlantic	1	2	1	-	-	5	8	1	-	-
Goose-beaked whale	Western North Atlantic	6	4	1	-	-	36	28	3	-	-
Gervais' beaked whale	Western North Atlantic	1	1	-	-	-	1	3	-	-	-
Sowerby's beaked whale	Western North Atlantic	1	1	0	-	-	7	5	0	-	-
True's beaked whale	Western North Atlantic	1	1	0	-	-	1	1	0	-	-
Atlantic spotted dolphin	Northern Gulf of America	1	3	1	0	-	4	19	4	0	-
Bottlenose dolphin	Gulf of America Eastern Coastal	1	1	-	-	-	4	7	-	-	-
Bottlenose dolphin	Gulf of America Northern Coastal	1	2	1	-	-	3	8	2	-	-
Bottlenose dolphin	Gulf of America Oceanic	1	1	0	-	-	3	4	0	-	-
Bottlenose dolphin	Northern Gulf of America Continental Shelf	14	19	2	1	0	95	132	12	1	0
Fraser's dolphin	Northern Gulf of America	1	1	0	-	-	1	1	0	-	-
Rough-toothed dolphin	Northern Gulf of America	1	1	0	-	-	1	3	0	-	-
Short-finned pilot whale	Northern Gulf of America	0	1	-	-	-	0	3	-	-	-
Striped dolphin	Northern Gulf of America	0	1	1	0	-	0	2	1	0	-
Pantropical spotted dolphin	Northern Gulf of America	1	1	1	1	0	5	7	2	2	0
Atlantic white-sided dolphin	Western North Atlantic	4	6	1	1	-	26	41	7	3	-
Common dolphin	Western North Atlantic	50	42	5	1	-	345	288	29	4	-
Atlantic spotted dolphin	Western North Atlantic	35	37	4	1	0	245	257	23	5	0
Bottlenose dolphin	Northern North Carolina Estuarine System	1	-	-	-	-	1	-	-	-	-
Bottlenose dolphin	Southern North Carolina Estuarine System	1	-	-	-	-	1	-	-	-	-
Tamanend's bottlenose dolphin	Western North Atlantic Central Florida Coastal	10	8	1	1	-	65	53	4	2	-
Tamanend's bottlenose dolphin	Western North Atlantic Northern Florida Coastal	2	3	1	0	-	8	17	1	0	-
Bottlenose dolphin	Western North Atlantic Northern Migratory Coastal.	21	41	5	1	0	147	283	30	1	0
Bottlenose dolphin	Western North Atlantic Offshore	50	53	6	1	1	347	365	39	3	1
Tamanend's bottlenose dolphin	Western North Atlantic South Carolina/Georgia Coastal.	5	5	1	0	1	32	35	3	0	1
Bottlenose dolphin	Western North Atlantic Southern Migratory Coastal.	19	29	4	1	0	133	202	26	4	0
Clymene dolphin	Western North Atlantic	16	21	6	1	1	112	141	37	3	3
Fraser's dolphin	Western North Atlantic	1	1	1	0	-	4	2	2	0	-
Long-finned pilot whale	Western North Atlantic	4	3	2	1	-	28	21	9	1	-
Pantropical spotted dolphin	Western North Atlantic	2	1	1	0	0	8	6	1	0	0
Pygmy killer whale	Western North Atlantic	0	-	1	0	-	0	-	1	0	-
Risso's dolphin	Western North Atlantic	4	5	1	1	0	28	32	2	1	0
Rough-toothed dolphin	Western North Atlantic	2	2	1	0	-	8	9	1	0	-
Short-finned pilot whale	Western North Atlantic	7	5	1	0	0	45	32	7	0	0
Spinner dolphin	Western North Atlantic	0	1	0	-	-	0	5	0	-	-
Striped dolphin	Western North Atlantic	11	13	3	1	0	77	87	20	5	0
Harbor porpoise	Gulf of Maine/Bay of Fundy	74	235	67	0	-	515	1,644	464	0	-
Gray seal	Western North Atlantic	46	44	3	0	-	322	304	20	0	-
Harbor seal	Western North Atlantic	72	67	4	0	-	499	468	28	0	-

Note: Zero (0) impacts indicate total less than 0.5 and a dash (-) is a true zero. In some cases where the estimated take within a cell is equal to 1, that value has been rounded up from a value that is less than 0.5 to avoid underestimating potential impacts to a species or stock based on the 7-year rounding rules discussed in Section 2.4 of Appendix E (Acoustic and Explosive Impacts Analysis) of the 2024 AFTT Draft Supplemental EIS/OEIS.

TABLE 44—ANNUAL AND 7-YEAR ESTIMATED TAKE OF MARINE MAMMAL STOCKS FROM EXPLOSIVES DURING NAVY TRAINING ACTIVITIES

[Includes small ship shock trials]

Species	Stock	Maximum annual behavioral	Maximum annual TTS	Maximum annual AUD INJ	Maximum annual non-auditory injury	Maximum annual mortality	Maximum 7-year behavioral	Maximum 7-year TTS	Maximum 7-year AUD INJ	Maximum 7-year non-auditory injury	Maximum 7-year mortality
North Atlantic right whale	Western	6	3	0	-	-	34	20	0	-	-
Blue whale	Western North Atlantic	1	1	-	-	-	2	3	-	-	-
Fin whale	Western North Atlantic	110	75	3	-	-	670	442	17	-	-
Humpback whale	Gulf of Maine	13	7	0	-	-	81	42	0	-	-
Minke whale	Canadian East Coast	26	30	1	-	-	162	124	4	-	-
Rice's whale	Northern Gulf of America	7	4	1	-	-	49	25	1	-	-
Sei whale	Nova Scotia	6	3	0	-	-	40	17	0	-	-
Sperm whale	North Atlantic	2	1	1	-	-	8	5	1	-	-
Sperm whale	Northern Gulf of America	1	1	0	0	0	1	1	0	0	0
Dwarf sperm whale	Northern Gulf of America	2	27	16	-	-	12	78	40	-	-
Dwarf sperm whale	Western North Atlantic	13	28	8	0	0	82	119	25	0	0
Pygmy sperm whale	Northern Gulf of America	3	29	16	-	-	17	87	40	-	-
Pygmy sperm whale	Western North Atlantic	12	29	9	0	-	73	126	33	0	-
Blainville's beaked whale	Western North Atlantic	1	1	0	0	-	1	1	0	0	-
Goose-beaked whale	Northern Gulf of America	0	1	0	-	-	0	1	0	-	-
Gervais' beaked whale	Northern Gulf of America	0	1	-	-	-	0	1	-	-	-
Goose-beaked whale	Western North Atlantic	1	1	1	0	0	7	6	2	0	0
Gervais' beaked whale	Western North Atlantic	1	1	1	-	-	1	1	1	-	-
Northern bottlenose whale	Western North Atlantic	1	0	1	-	-	1	0	1	-	-
Sowerby's beaked whale	Western North Atlantic	1	1	1	-	-	1	4	1	-	-
True's beaked whale	Western North Atlantic	1	1	0	-	-	1	1	0	-	-
Atlantic spotted dolphin	Northern Gulf of America	17	11	1	0	0	119	74	6	0	0
Bottlenose dolphin	Gulf of America Eastern Coastal	-	1	0	-	-	-	1	0	-	-
Bottlenose dolphin	Gulf of America Northern Coastal	86	117	16	-	-	601	815	112	-	-
Bottlenose dolphin	Gulf of America Oceanic	3	1	1	0	0	15	7	2	0	0
Bottlenose dolphin	Gulf of America Western Coastal	2	1	1	0	-	10	4	1	0	-
Bottlenose dolphin	Northern Gulf of America Continental Shelf	369	177	3	1	0	2,577	1,234	18	1	0
Bottlenose dolphin	St. Andrew Bay	1	1	-	-	-	1	1	-	-	-
Clymene dolphin	Northern Gulf of America	1	1	1	1	0	4	3	1	1	0
False killer whale	Northern Gulf of America	1	1	0	-	-	1	1	0	-	-
Fraser's dolphin	Northern Gulf of America	0	0	0	0	-	0	0	0	0	-
Melon-headed whale	Northern Gulf of America	1	1	0	0	0	1	3	0	0	0
Pygmy killer whale	Northern Gulf of America	1	1	0	0	0	1	1	0	0	0
Risso's dolphin	Northern Gulf of America	1	1	0	0	0	1	1	0	0	0
Rough-toothed dolphin	Northern Gulf of America	6	4	1	1	0	39	21	1	1	0
Short-finned pilot whale	Northern Gulf of America	1	1	1	0	0	3	2	1	0	0
Striped dolphin	Northern Gulf of America	1	10	4	2	1	5	27	9	5	2
Pantropical spotted dolphin	Northern Gulf of America	2	11	2	2	2	13	31	5	6	5
Spinner dolphin	Northern Gulf of America	0	1	0	0	-	0	1	0	0	-
Atlantic white-sided dolphin	Western North Atlantic	6	3	1	0	0	37	15	1	0	0
Common dolphin	Western North Atlantic	384	251	20	1	0	2,320	1,497	118	1	0
Atlantic spotted dolphin	Western North Atlantic	39	22	3	1	0	221	119	16	1	0
Tamanend's bottlenose dolphin	Western North Atlantic Central Florida Coastal	12	5	1	0	0	67	29	4	0	0
Tamanend's bottlenose dolphin	Western North Atlantic Northern Florida Coastal	4	1	1	-	-	21	7	1	-	-
Bottlenose dolphin	Western North Atlantic Northern Migratory Coastal.	2	2	1	-	-	10	11	1	-	-
Bottlenose dolphin	Western North Atlantic Offshore	67	54	6	1	1	396	300	31	3	1
Tamanend's bottlenose dolphin	Western North Atlantic South Carolina/Georgia Coastal.	9	3	1	0	0	55	17	3	0	0
Bottlenose dolphin	Western North Atlantic Southern Migratory Coastal.	9	3	1	0	-	55	18	2	0	-
Clymene dolphin	Western North Atlantic	5	4	1	1	0	30	24	4	1	0
False killer whale	Western North Atlantic	-	1	-	-	-	-	1	-	-	-
Fraser's dolphin	Western North Atlantic	1	2	0	0	-	3	5	0	0	-
Killer whale	Western North Atlantic	1	1	0	-	0	2	1	0	-	0
Long-finned pilot whale	Western North Atlantic	18	10	1	0	0	108	60	4	0	0
Melon-headed whale	Western North Atlantic	1	0	0	0	0	1	0	0	0	0

Pantropical spotted dolphin	Western North Atlantic	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	Western North Atlantic	0	1	0	-	-	0	1	0	-	-
Risso's dolphin	Western North Atlantic	18	20	3	1	0	116	105	15	1	0
Rough-toothed dolphin	Western North Atlantic	1	1	0	0	-	2	2	0	0	-
Short-finned pilot whale	Western North Atlantic	13	11	2	0	0	78	58	9	0	0
Spinner dolphin	Western North Atlantic	1	0	0	0	-	2	0	0	0	-
Striped dolphin	Western North Atlantic	17	10	2	1	0	109	64	12	1	0
Harbor porpoise	Gulf of Maine/Bay of Fundy	75	97	21	0	0	493	604	123	0	0
Gray seal	Western North Atlantic	38	18	2	0	-	262	118	10	0	-
Harbor seal	Western North Atlantic	54	22	2	0	0	370	148	11	0	0
Harp seal	Western North Atlantic	13	8	1	0	-	88	50	4	0	-
Hooded seal	Western North Atlantic	1	1	0	-	-	4	4	0	-	-

Note: Zero (0) impacts indicate total less than 0.5 and a dash (-) is a true zero. In some cases where the estimated take within a cell is equal to 1, that value has been rounded up from a value that is less than 0.5 to avoid underestimating potential impacts to a species or stock based on the 7-year rounding rules discussed in Section 2.4 of Appendix E (Acoustic and Explosive Impacts Analysis) of the 2024 AFTT Draft Supplemental EIS/OEIS.

TABLE 45—ANNUAL ESTIMATED EFFECTS TO MARINE MAMMAL STOCKS FROM SMALL SHIP SHOCK TRIALS OVER A MAXIMUM YEAR OF NAVY TESTING

[Two events]

Species	Stock	Maximum annual TTS	Maximum annual AUD INJ	Maximum annual non-auditory injury	Maximum annual mortality
North Atlantic right whale	Western	1	-	-	-
Blue whale	Western North Atlantic	1	-	-	-
Fin whale	Western North Atlantic	2	0	-	-
Humpback whale	Gulf of Maine	1	-	-	-
Minke whale	Canadian East Coast	17	1	-	-
Sei whale	Nova Scotia	1	0	-	-
Dwarf sperm whale	Northern Gulf of America	24	15	-	-
Pygmy sperm whale	Northern Gulf of America	26	15	-	-
Dwarf sperm whale	Western North Atlantic	14	5	-	-
Pygmy sperm whale	Western North Atlantic	14	6	-	-
Goose-beaked whale	Northern Gulf of America	1	0	-	-
Gervais' beaked whale	Northern Gulf of America	1	-	-	-
Melon-headed whale	Northern Gulf of America	1	0	0	0
Pantropical spotted dolphin	Northern Gulf of America	9	1	2	2
Rough-toothed dolphin	Northern Gulf of America	1	0	1	0
Short-finned pilot whale	Northern Gulf of America	1	1	0	0
Striped dolphin	Northern Gulf of America	10	3	2	1
Atlantic spotted dolphin	Western North Atlantic	1	-	1	-
Bottlenose dolphin	Western North Atlantic Offshore	5	1	1	1
Fraser's dolphin	Western North Atlantic	2	0	0	-
Pygmy killer whale	Western North Atlantic	1	-	-	-
Risso's dolphin	Western North Atlantic	4	1	1	0
Rough-toothed dolphin	Western North Atlantic	1	-	0	-
Short-finned pilot whale	Western North Atlantic	1	1	0	0

Note: Zero (0) impacts indicate total less than 0.5 and a dash (-) is a true zero. In some cases where the estimated take within a cell is equal to 1, that value has been rounded up from a value that is less than 0.5 to avoid underestimating potential impacts to a species or stock based on the 7-year rounding rules discussed in Section 2.4 of Appendix E (Acoustic and Explosive Impacts Analysis) of the 2024 AFTT Draft Supplemental EIS/OEIS.

TABLE 46—ANNUAL AND 7-YEAR ESTIMATED TAKE OF MARINE MAMMAL STOCKS FROM EXPLOSIVES DURING COAST GUARD TRAINING ACTIVITIES

Species	Stock	Maximum annual behavioral	Maximum annual TTS	Maximum annual AUD INJ	Maximum annual non-auditory injury	Maximum annual mortality	Maximum 7-year behavioral	Maximum 7-year TTS	Maximum 7-year AUD INJ	Maximum 7-year non-auditory injury	Maximum 7-year mortality
Fin whale	Western North Atlantic	1	1	0	-	-	1	1	0	-	-
Humpback whale	Gulf of Maine	1	1	0	-	-	2	1	0	-	-
Minke whale	Canadian East Coast	1	1	0	-	-	1	1	0	-	-
Sei whale	Nova Scotia	1	0	-	-	-	1	0	-	-	-
Sperm whale	North Atlantic	1	0	-	-	-	1	0	-	-	-
Dwarf sperm whale	Northern Gulf of America	1	1	-	-	-	1	1	-	-	-
Pygmy sperm whale	Northern Gulf of America	1	1	-	-	-	1	1	-	-	-
Dwarf sperm whale	Western North Atlantic	1	1	1	-	-	7	5	1	-	-
Pygmy sperm whale	Western North Atlantic	1	1	1	-	-	5	5	1	-	-
Goose-beaked whale	Western North Atlantic	1	1	-	-	-	1	1	-	-	-
Atlantic spotted dolphin	Northern Gulf of America	1	0	-	-	-	2	0	-	-	-
Bottlenose dolphin	Gulf of America Oceanic	1	0	-	-	-	1	0	-	-	-
Bottlenose dolphin	Northern Gulf of America Continental Shelf	4	3	1	-	-	25	18	1	-	-
Atlantic white-sided dolphin	Western North Atlantic	2	1	0	-	-	8	3	0	-	-
Common dolphin	Western North Atlantic	3	3	1	-	-	21	15	1	-	-
Atlantic spotted dolphin	Western North Atlantic	1	1	-	-	-	2	1	-	-	-
Bottlenose dolphin	Western North Atlantic Offshore	1	1	-	0	-	4	2	-	0	-
Long-finned pilot whale	Western North Atlantic	1	1	0	-	-	2	1	0	-	-
Risso's dolphin	Western North Atlantic	1	1	0	-	-	1	1	0	-	-
Short-finned pilot whale	Western North Atlantic	1	1	0	-	-	1	1	0	-	-
Striped dolphin	Western North Atlantic	1	1	0	-	-	3	1	0	-	-
Harbor porpoise	Gulf of Maine/Bay of Fundy	22	24	4	-	-	150	166	28	-	-
Gray seal	Western North Atlantic	1	1	0	-	-	7	6	0	-	-
Harbor seal	Western North Atlantic	2	2	1	-	-	10	8	1	-	-
Harp seal	Western North Atlantic	2	2	1	-	-	14	13	1	-	-
Hooded seal	Western North Atlantic	1	1	0	-	-	2	1	0	-	-

Note: Zero (0) impacts indicate total less than 0.5 and a dash (-) is a true zero. In some cases where the estimated take within a cell is equal to 1, that value has been rounded up from a value that is less than 0.5 to avoid underestimating potential impacts to a species or stock based on the 7-year rounding rules discussed in Section 2.4 of Appendix E (Acoustic and Explosive Impacts Analysis) of the 2024 AFTT Draft Supplemental EIS/OEIS.

Estimated Take From Vessel Strike by Serious Injury or Mortality

Vessel strikes from commercial, recreational, and military vessels are known to affect large whales and have resulted in serious injury and fatalities to cetaceans (Abramson *et al.,* 2011; Berman-Kowalewski *et al.,* 2010a; Calambokidis, 2012; Douglas *et al.,* 2008; Laggner, 2009; Lammers *et al.,* 2003; Van der Hoop *et al.,* 2013; Van der Hoop *et al.,* 2012). Records of vessel strikes of large whales date back to the early 17th century, and the worldwide number of vessel strikes of large whales appears to have increased steadily during recent decades (Laist *et al.,* 2001; Ritter 2012).

Numerous studies of interactions between surface vessels and marine mammals have demonstrated that free-ranging marine mammals often, but not always (*e.g.,* McKenna *et al.,* 2015), engage in avoidance behavior when surface vessels move toward them. It is not clear whether these responses are caused by the physical presence of a surface vessel, the underwater noise generated by the vessel, or an interaction between the two (Amaral and Carlson, 2005; Au and Green, 2000; Bain *et al.,* 2006; Bauer 1986; Bejder *et al.,* 1999; Bejder and Lusseau, 2008; Bejder *et al.,* 2009; Bryant *et al.,* 1984; Corkeron, 1995; Erbe, 2002; Félix, 2001; Goodwin and Cotton, 2004; Greig *et al.,* 2020; Guilpin *et al.,* 2020; Keen *et al.,* 2019; Lemon *et al.,* 2006; Lusseau, 2003; Lusseau, 2006; Magalhaes *et al.,* 2002; Nowacek *et al.,* 2001; Redfern *et al.,* 2020; Richter *et al.,* 2003; Scheidat *et al.,* 2004; Simmonds, 2005; Szesciorka *et al.,* 2019; Watkins, 1986; Williams *et al.,* 2002; Wursig *et al.,* 1998). Several authors suggest that the noise generated during motion is probably an important factor (Blane and Jaakson, 1994; Evans *et al.,* 1992; Evans *et al.,* 1994). These studies suggest that the behavioral responses of marine mammals to surface vessels are similar to their behavioral responses to predators. Avoidance behavior is expected to be even stronger in the subset of instances during which the Action Proponents are conducting military readiness activities using active sonar or explosives.

The marine mammals most vulnerable to vessel strikes are those that spend extended periods of time at the surface in order to restore oxygen levels within their tissues after deep dives (*e.g.,* sperm whales). In addition, some baleen whales seem generally unresponsive to vessel sound, making them more susceptible to vessel strikes (Nowacek *et al.,* 2004). These species are primarily large, slow moving whales. There are nine species (15 stocks) of large whales that are known to occur within the AFTT Study Area (table 14): blue whale, Bryde's whale, fin whale, humpback whale, minke whale, NARW, Rice's whale, sei whale, and sperm whale.

Some researchers have suggested the relative risk of a vessel strike can be assessed as a function of animal density and the magnitude of vessel traffic (*e.g.,* Fonnesbeck *et al.,* 2008; Vanderlaan *et al.,* 2008). Differences among vessel types also influence the probability of a vessel strike. The ability of any vessel to detect a marine mammal and avoid a collision depends on a variety of factors, including environmental conditions, vessel design, size, speed, and ability and number of personnel observing, as well as the behavior of the animal. Vessel speed, size, and mass are all important factors in determining if injury or death of a marine mammal is likely due to a vessel strike. For large vessels, speed and angle of approach can influence the severity of a strike. Large whales also do not have to be at the water's surface to be struck. Silber *et al.* (2010) found that when a whale is below the surface (about one to two times the vessel draft), under certain circumstances (vessel speed and location of the whale relative to the ship's centerline), there is likely to be a pronounced propeller suction effect. This suction effect may draw the whale into the hull of the ship, increasing the probability of propeller strikes.

There are some key differences between the operation of military and non-military vessels which make the likelihood of a military vessel striking a whale lower than some other vessels (*e.g.,* commercial merchant vessels). Key differences include:

- Military vessels have personnel assigned to stand watch at all times, day and night, when moving through the water (*i.e.,* when the vessel is underway). Watch personnel undertake extensive training and are certified to stand watch only after demonstrating competency in all necessary skills. While on watch, personnel employ visual search and reporting procedures in accordance with the U.S. Navy Lookout Training Handbook, the Coast Guard's Shipboard Lookout Manual, or civilian equivalent.
- The bridges of many military vessels are positioned closer to the bow, offering better visibility ahead of the vessel (compared to a commercial merchant vessel);
- Military readiness activities often involve aircraft (which can serve as part of the Lookout team), that can more readily detect cetaceans in the vicinity of a vessel or ahead of a vessel's present course, often before crew on the vessel would be able to detect them;
- Military vessels are generally more maneuverable than commercial merchant vessels, and are therefore capable of changing course more quickly in the event cetaceans are spotted in the vessel's path;
- Military vessels operate at the slowest speed practical consistent with operational requirements. While minimum speed is intended as a fuel conservation measure particular to a certain ship class, secondary benefits include a better ability to detect and avoid objects in the water, including marine mammals;
- Military ships often operate within a defined area for a period of time, in contrast to point-to-point commercial shipping over greater distances;
- The crew size on military vessels is generally larger than merchant vessels, allowing for stationing more trained Lookouts on the bridge. At all times when the Action Proponents' vessels are underway, trained Lookouts and bridge navigation teams are used to detect objects on the surface of the water ahead of the ship, including cetaceans. Some events may have additional personnel (beyond the minimum number of required Lookouts) who are already standing watch in or on the platform conducting the event or additional participating platforms and would have eyes on the water for all or part of an event. These additional personnel serve as members of the Lookout team; and
- When submerged, submarines are generally slow moving (to avoid detection); as a result, marine mammals at depth with a submarine are likely able to avoid collision with the submarine. When a submarine is transiting on the surface, the Navy posts Lookouts serving the same function as they do on surface vessels.

Vessel strike to marine mammals is not associated with any specific military readiness activity. Rather, vessel strike is a limited and sporadic, but possible, accidental result of military vessel movement within the AFTT Study Area or while in transit.

Prior to 2009, there is limited information on vessel strikes from military readiness activities in the AFTT Study Area. One known incident of vessel strike in the AFTT Study Area occurred in 2001, when a 505 ft (154 m) Navy vessel struck and killed a sperm whale 20 mi (32.2 km) south of Puerto Rico (Jensen and Silber, 2004). (Of note, at the time of the strike, the Navy still used the Vieques Naval Training Range; activities in this area ceased in 2003, and since then, vessel traffic has significantly decreased, and there are currently no plans to increase activity in that area.) A second known incident of vessel strike occurred in VACAPES on May 15, 2005, when a Navy vessel was involved in a strike with ''reasonable potential'' to have been a sperm whale.

Since 2009, there have been six recorded vessel strikes of large whales by the Action Proponents in the AFTT Study Area: three by the Navy and three by the Coast Guard. The Navy struck one whale in 2011 (species unknown), two whales in 2012 (species unknown), and has not struck a large whale in the AFTT Study Area since 2012. All strikes during this timeframe occurred in the VACAPES OPAREA: one strike in the VACAPES Range Complex in 2011, one strike in the VACAPES Range Complex in 2012, and one strike in the Lower Chesapeake Bay in 2012. The Coast Guard struck two whales in 2009 (both reported as NARW), and one whale in May 2024 (species unknown). On December 14, 2009, an 87 ft (26.5 m) Coast Guard patrol boat traveling at a speed of 9.2 kn (17 km/hr) struck two whales (reported as NARW) at the same time near Cape Henry, Virginia, and observed the animals swimming away without apparent injuries, though it is important to note that not all injuries are evident when a whale is struck and the fate of these two NARW is unknown. It is also important to note that not all whale strikes result in mortality, however, given the potential for non-visible injuries, NMFS conservatively assumes that these strikes resulted in mortality of both whales.

In light of the key differences between the operation of military and non-military vessels discussed above, it is highly unlikely that a military vessel would strike any type of marine mammal without detecting it. Specifically, Lookouts posted on or near the ship's bow can visually detect a strike in the absence of other indications that a strike has occurred. The Action Proponents' internal procedures and mitigation requirements include reporting of any vessel strikes of marine mammals, and the Action Proponents' discipline, extensive training (not only for detecting marine mammals, but for detecting and reporting any potential navigational obstruction), and strict chain of command give NMFS a high level of confidence that all strikes are reported. Accordingly, NMFS is confident that the Navy and Coast Guard's reported strikes are accurate and appropriate for use in the analysis.

When generally compared to mysticetes, odontocetes are more capable of physically avoiding a vessel strike and since some species occur in large groups, they are more easily seen when they are closer to the water surface. The smaller size and maneuverability of dolphins, small whales (not including large whale calves), porpoises, and pinnipeds generally make vessel strike very unlikely. For as long as records have been kept, neither the Navy nor the Coast Guard have any record of any small whales or pinnipeds being struck by a vessel as a result of military readiness activities. Over the same time period, NMFS, the Navy, and the Coast Guard have only one record of a dolphin being struck by a vessel as a result of Navy or Coast Guard activities. The dolphin was accidentally struck by a Navy small boat in fall 2021 in Saint Andrew's Pass, Florida. Other than this one reported strike of a dolphin in 2021, NMFS has never received any reports from other LOA or Incidental Harassment Authorization holders indicating that these species have been struck by vessels. Worldwide vessel strike records show little evidence of strikes of these groups or marine mammals from the shipping sector and larger vessels (though for many species, records do exist, *e.g.,* West *et al.* 2024, Waerebeek *et al.,* 2007, Van Waerebeek *et al.,* 2007), and the majority of the Action Proponents' activities involving faster-moving vessels (that could be considered more likely to hit a marine mammal) are located in offshore areas where smaller delphinid, porpoise, and pinniped densities are lower.

In order to account for the accidental nature of vessel strike to large whales in general, and the potential risk from vessel movement within the AFTT Study Area within the 7-year period of this proposed authorization, the Action Proponents requested incidental takes based on probabilities derived from a Poisson distribution. A Poisson distribution is often used to describe random occurrences when the probability of an occurrence is small. Count data, such as cetacean sighting data, or in this case strike data, are often described as a Poisson or over-dispersed Poisson distribution. The Poisson distribution was calculated using vessel strike data between 2009–2024 in the AFTT Study Area, historical at-sea days in the AFTT Study Area for the Navy and the Coast Guard (described in detail in section 6 of the application), and estimated potential at-sea days for both Action Proponents during the 7-year period from 2025–2032 covered by the requested regulations. The Navy evaluated data beginning in 2009 as that was the start of the Navy's Marine Species Awareness Training and adoption of additional mitigation measures to address vessel strike, which will remain in place along with additional and modified mitigation measures during the 7 years of this rulemaking. Navy vessel strike data only accounts for vessels larger than 65 ft (19.8 m) and does not include USVs/UUVs as the Navy does not yet have data on their use in the AFTT Study Area. The Poisson vessel strike calculations do not include any specific number of at-sea days for USVs. Historically, the USVs used in the AFTT Study Area were equivalent to small boats. While it is anticipated that larger USVs will begin testing in the AFTT Study Area during the 7-year period, it was assessed that the addition of any at-sea days associated with the limited number of medium or large USVs being tested in AFTT would not be large enough to change the results of the analysis. In addition, there is no historical strike data for USVs. The analysis for the period of 2025 to 2032 is described in detail below and in section 6.3.2 (Probability of Vessel Strike of Large Whale Species) of the application.

Between 2009 and early 2024, there were a total of 42,748 Navy at-sea days and 26,756 Coast Guard at-sea days in the AFTT Study Area. During that same time, there were three Navy vessel strikes of large whales and three Coast Guard vessel strikes of large whales. From 2025 through 2032, the Navy anticipates 18,702 at-sea days, and the Coast Guard anticipates 11,706 at-sea days.

To calculate a vessel strike rate for each Action Proponent for the period of 2009 through 2024, the Action Proponents used the respective number of past vessel strikes of large whales and the respective number of at-sea days. Navy at-sea days (for vessels greater than 65 ft (19.8 m)) from 2009 through 2024 was estimated to be 42,748 days. Dividing the three known Navy strikes during that period by the at-sea days (*i.e.,* 3 strikes/42,748 at-sea days) results in a strike rate of 0.000070 strikes per at-sea day. Coast Guard at-sea days (for vessels greater than 65 ft (19.8 m)) from 2009 through 2024 was estimated to be 26,756 days. Dividing the three known Coast Guard strikes during that period by the at-sea days (*i.e.,* 3 strikes/26,756 at-sea days) results in a strike rate of 0.000112 strikes per day.

Based on the average annual at-sea days from 2009 to early 2024, the Action Proponents estimated that 18,702 Navy and 11,706 Coast Guard at-sea days would occur over the 7-year period associated with the requested authorization. Given a strike rate of

0.000070 Navy strikes per at-sea day, and 0.000112 Coast Guard strikes per at-sea day, the predicted number of vessel strikes over a 7-year period would be 1.31 strikes by the Navy and 1.31 strikes by the Coast Guard.

Using this predicted number of strikes, the Poisson distribution predicted the probabilities of a specific number of strikes (n = 0, 1, 2, *etc.*) from 2025 through 2032. The probability analysis concluded that, for each Action Proponent, there is a 27 percent chance that zero whales would be struck by the Action Proponents' vessels over the 7-year period, and a 35, 23, 10, and 4 percent chance that one, two, three, or four whales, respectively, would be struck by each Action Proponent over the 7-year period (with a 73 percent chance that at least one whale would be struck by each Action Proponent over the entire 7-year period). Based on this analysis, the Navy is requesting authorization to take three large whales by serious injury or mortality by vessel strike incidental to Navy training and testing activities, and the Coast Guard is requesting authorization to take three large whales by serious injury or mortality by vessel strike incidental to Coast Guard training activities. NMFS concurs that take by serious injury or mortality by vessel strike of up to three large whales by each action proponent (six whales total) could occur over the 7-year regulations and, based on the information provided earlier in this section, NMFS concurs with the Action Proponents' assessment and recognizes the potential for incidental take by vessel strike of large whales only (*i.e.,* no dolphins, small whales (not including large whale calves), porpoises, or pinnipeds) over the course of the 7-year regulations from military readiness activities.

While the Poisson distribution allows the Action Proponents and NMFS to determine the likelihood of vessel strike of all large whales, it does not indicate the likelihood of each strike occurring to a particular species or stock. As described above, the Action Proponents have not always been able to identify the species of large whale struck during previous known vessel strikes. Therefore, the Action Proponents requested authorization for take by serious injury or mortality by vessel strike of any combination of the following stocks in the AFTT Study Area, with no more than two takes total from any single stock: humpback whale (Gulf of Maine stock), fin whale (Western North Atlantic stock), sei whale (Nova Scotia stock), minke whale (Canadian East Coast stock), blue whale (Western North Atlantic stock), and sperm whale (North Atlantic stock).

After concurring that take of up to six large whales could occur (three takes by each Action Proponent), and in consideration of the Navy's request, NMFS considered which species could be among the six large whales struck. NMFS conducted an analysis that considered several factors: (1) The relative likelihood of striking one stock versus another based on available strike data from all vessel types as denoted in the SARs, (2) whether each Action Proponent has ever struck an individual from a particular species or stock in the AFTT Study Area, and if so, how many times, and (3) whether implementation of the proposed mitigation measures (*i.e.,* specific measures to reduce the potential for vessel strike) would be expected to successfully prevent vessel strikes of certain species or stocks (noting that, for all stocks, activity-based mitigation would reduce the potential of vessel strike).

To address number (1) above, NMFS compiled information from the SARs (Hayes *et al.,* 2024) on detected annual rates of large whale M/SI from vessel strike (table 47). The annual rates of large whale serious injury or mortality from vessel strike reported in the SARs help inform the relative susceptibility of large whale species to vessel strike in AFTT Study Area as recorded systematically over the five-year period used for the SARs. We summed the annual rates of serious injury or mortality from vessel strikes as reported in the SARs and then divided each species' annual rate by this sum to get the percentage of total annual strikes for each species/stock (table 47).

To inform the likelihood of a single action proponent striking a particular species of large whale, we multiplied the percent of total annual strikes for a given species in table 47 by the total percent likelihood of a single action proponent striking at least one whale (*i.e.,* 73 percent, as described by the probability analysis above). We also calculated the percent likelihood of a single action proponent striking a particular species of large whale two or three times by squaring or cubing, respectively, the value estimated for the probability of striking a particular species of whale once (*i.e.,* to calculate the probability of an event occurring twice, multiply the probability of the first event by the second). The results of these calculations are reflected in the last two columns of table 47. We note that these probabilities vary from year to year as the average annual mortality changes depending on the specific range of time considered; however, over the years and through updated data in the SARs, stocks tend to consistently maintain a relatively higher or relatively lower likelihood of being struck.

TABLE 47—ANNUAL RATES OF MORTALITY AND SERIOUS INJURY FROM VESSEL COLLISIONS AND PERCENT LIKELIHOOD OF EACH ACTION PROPONENT STRIKING A LARGE WHALE SPECIES IN THE AFTT STUDY AREA OVER A 7-YEAR PERIOD

Species	Stock	Annual rate of M/SI from vessel strike [a]	Percentage of total annual strikes	Percent likelihood of 1 strike over 7 years	Percent likelihood of 2 strikes over 7 years	Percent likelihood of 3 strikes over 7 years
Blue whale	Western North Atlantic	0	0	0	0	0
Fin whale	Western North Atlantic	0.6	8.2	6	0.36	0.02
Humpback whale	Gulf of Maine	4.4	60.3	44	19.36	8.52
Minke whale	Canadian East Coast	0.8	11	8	0.64	0.05
North Atlantic right whale [b]	Western	1.5	20.5	15	2.25	0.34
Rice's whale	Northern Gulf of America	0	0	0	0	0
Sei whale	Nova Scotia	0	0	0	0	0
Sperm whale	North Atlantic	0	0	0	0	0
Sperm whale	Northern Gulf of America	0	0	0	0	0

[a] Values are from the most recent stock assessment report (Hayes *et al.,* 2024).

[b] While these percentages suggest that NARW has a quantitatively higher likelihood of vessel strike in comparison with other stocks, this proposed rulemaking includes extensive mitigation measures for NARW that would minimize the risk of vessel strike such that vessel strike of this stock is not anticipated to occur. Please see the discussion in this section and the Proposed Mitigation Measures section for additional detail.

The percent likelihood calculated (as described above) are then considered in combination with the information indicating the known species that the Navy or Coast Guard has struck in the AFTT Study Area since 2000 (table 48). We note that for the lethal take of species specifically denoted in table 48 below, most of those struck by the Navy or Coast Guard remained unidentified. However, given the information on known stocks struck, the analysis below remains appropriate.

TABLE 48—NUMBER OF KNOWN VESSEL STRIKES BY EACH ACTION PROPONENT IN THE AFTT STUDY AREA BY YEAR

Year	U.S. Navy strikes (species/stock)	Coast Guard strikes (species/stock)
2000	1 (unknown)	0.
2001	4 (3 unknown, one probable Puerto Rico/U.S. Virgin Islands stock sperm whale).	
2004	3 (unknown).	
2005	2 (1 unknown, 1 probable sperm whale).	
2009		2 (NARW).
2011	1 (unknown, probable humpback whale).	
2012	2 (1 unknown, 1 probable humpback).	
2021	1 (dolphin).	
2024		1 (unknown, probable humpback whale).

Accordingly, stocks that have no record of ever having been struck by any vessel are considered to have a zero percent likelihood of being struck by the Navy in the 7-year period of the rule. While the Western North Atlantic stock of blue whales, Northern Gulf of America stock of Rice's whale, Nova Scotia stock of sei whales, and North Atlantic stock of sperm whales have a reported annual rate of M/SI from vessel strike of 0, each of these stocks have records of strikes prior to the period reported in the SAR (Hayes *et al.* 2024). There is record of a vessel strike in 1996 of a Western North Atlantic blue whale (Hayes *et al.* 2024), two records of vessel strike of Rice's whale (one in 2009 and one in 2019), several records of vessel strikes in the 1990s and early 2000s of North Atlantic sperm whales, and a record of a probable sperm whale (Northern Gulf of America stock) strike in 1990. For the Nova Scotia stock of sei whale, several sei whale strandings during the time period analyzed for the SAR (*i.e.,* 2017–2021) had an undetermined cause of death (Garron, 2022), and M/SI by vessel strike for sei whales along the U.S. East Coast were a more common occurrence in previous SAR 5-year periods (*i.e.,* four from 2012–2016, three from 2007–2011, and two from 2002–2006). Therefore, NMFS included each of these stocks for further analysis, and considered the historical strikes, but lack of recent strikes to inform the relative likelihood that the Navy or Coast Guard would strike these stocks.

While Bryde's whales in the Atlantic are not a NMFS-managed stock, the low number of estimated takes by harassment (11 takes by Level B harassment) indicate very low overlap of this stock with the Action Proponents' activities. As such, and given that there are no records of either action proponent having struck Bryde's whale in the Atlantic in the past, NMFS neither anticipates, nor proposes to authorize, serious injury or mortality by vessel strike of Bryde's whale.

To address number (2) above, the percent likelihoods of a certain number of strikes of each stock are then considered in combination with the information indicating the species that the Action Proponents have definitively struck in the AFTT Study Area since 2009. As noted above, since 2009, the U.S. Navy and Coast Guard have each struck three whales in the AFTT Study Area. The Navy struck one unidentified species in June 2011, one unidentified species (thought to likely be a humpback) in February 2012, and one unidentified species in October 2012. The Coast Guard struck two whales (reported as NARW) in December 2009, and one unidentified large whale (thought to likely be a humpback) in 2024.

Stocks that have never been struck by the Navy, have rarely been struck by other vessels, and have a low percent likelihood based on the historical vessel strike calculation are also considered to have a zero percent likelihood to be struck by the Navy during the 7-year rule. As noted in table 48, in 2001, the Navy struck an unidentified whale in the Gulf of America, and given the stocks that occur there, that this strike was of either a sperm whale or Rice's whale. Given the relative abundance of these two stocks, NMFS expects that this strike was likely of a sperm whale (Northern Gulf of America stock). Therefore, this step in the analysis rules out take by vessel strike of blue whale and Rice's whale. Even if the 2001 strike had been of a Rice's whale, consideration of the proposed geographic mitigation for Rice's whale (see Proposed Mitigation Measures section below) and the low stock abundance further supports the conclusion that vessel strike of Rice's whale is unlikely. This leaves the following stocks for further analysis: fin whale (Western North Atlantic stock), humpback whale (Gulf of Maine stock), minke whale (Canadian Eastern Coastal stock), NARW (Western stock), sei whale (Nova Scotia stock), and sperm whale (North Atlantic and Northern Gulf of America stocks).

Based on the information summarized in table 47, and the fact that there is potential for up to six large whales to be struck over the 7-year duration of this rulemaking, NMFS anticipates that each action proponent could strike one of each of the following stocks (two total per stock across both action proponents): fin whales (Western North Atlantic stock), minke whales (Canadian Eastern Coastal stock), sei whales (Nova Scotia stock), and sperm whales (North Atlantic stock). NMFS also anticipates that the Navy may strike up to one sperm whale (Northern Gulf of America stock) given the 2001 likely sperm whale strike. Given the already lower likelihood of striking this stock given the relatively lower vessel activity in the Gulf of America portion of the AFTT Study Area, and the relatively lower Coast Guard vessel traffic compared to Navy vessel traffic, NMFS neither anticipates, nor proposes to authorize, a Coast Guard strike of this stock. NMFS anticipates that each Action Proponent could strike up to two humpback whales (Gulf of Maine stock) given the higher relative strike likelihood indicated in table 47, and the Action

Proponents' conclusion that several previous Navy and Coast Guard strikes of unidentified species were likely humpback whales.

Following the conclusion for the stocks above, NARW is the only remaining stock. NARW are known to be particularly susceptible to vessel strike, and vessel strike is one of the greatest threats to this stock. NMFS' quantitative analysis (table 47) indicates a 15 percent likelihood of one strike of NARW over the 7-year duration of this proposed rulemaking. However, for the reasons described below, NMFS does not anticipate vessel strike of NARW by either action proponent. As stated previously, in 2009, the Coast Guard struck two whales (reported as NARW). Since 2009, the Navy has had no known strikes of NARW, and it has been implementing extensive mitigation measures to avoid vessel strike of NARW. The lack of known strikes of NARWs indicates that the mitigation used by the Navy since 2009 and included here for the Action Proponents has likely been successful. Given that the Navy will continue to implement this mitigation for NARW, and the Coast Guard will begin implementing it also, (*e.g.,* funding of and communication with sightings systems, awareness of slow zones and dynamic management areas for NARW) we neither anticipate nor propose to authorize take by serious injury or mortality by vessel strike of NARW. Please see the Proposed Mitigation Measures section of this proposed rulemaking and section 11 of the application for additional detail.

In conclusion, although it is generally unlikely that any whales will be struck in a year, based on the information and analysis above, NMFS anticipates that no more than six takes of large whales by serious injury or mortality could occur over the 7-year period of the rule, with no more than three by each Action Proponent. Of those six whales over the 7 years, no more than four may come from the Gulf of Maine stock of humpback whale; no more than two may come from the Western North Atlantic stock of fin whale, the Canadian East Coast stock of minke whale, the Nova Scotia stock of sei whale, and the North Atlantic stock of sperm whale; no more than one strike by the Navy may come from the Northern Gulf of America stock of sperm whale. Accordingly, NMFS has evaluated under the negligible impact standard the M/SI of 0.14, 0.29 or 0.57 whales annually from each of these species or stocks (*i.e.,* 1, 2 or 4 takes, respectively, divided by 7 years to get the annual value), along with the expected incidental takes by harassment.

Summary of Requested Take From Military Readiness Activities

Table 49 and table 50 summarize the Action Proponents' take proposed by harassment type and effect type, respectively.

TABLE 49—TOTAL ANNUAL AND 7-YEAR INCIDENTAL TAKE PROPOSED BY STOCK DURING ALL ACTIVITIES BY HARASSMENT TYPE

Species	Stock	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	7-Year total Level B harassment	7-Year total Level A harassment	7-Year total mortality
North Atlantic right whale	Western	414	2	0	2,682	8	0
Blue whale	Western North Atlantic	71	1	0	464	2	0
Bryde's whale	Primary	11	0	0	70	0	0
Fin whale	Western North Atlantic	2,616	21	0.29	17,298	131	2
Humpback whale	Gulf of Maine	844	12	0.57	5,544	74	4
Minke whale	Canadian East Coast	4,643	56	0.29	31,006	377	2
Rice's whale	Northern Gulf of America	303	3	0	2,047	6	0
Sei whale	Nova Scotia	747	7	0.29	4,981	44	2
Sperm whale	North Atlantic	12,590	7	0.29	84,675	21	2
Sperm whale	Northern Gulf of America	275	0	0.29	1,653	0	1
Dwarf sperm whale	Northern Gulf of America	189	22	0	1,112	73	0
Pygmy sperm whale	Northern Gulf of America	175	22	0	1,017	65	0
Dwarf sperm whale	Western North Atlantic	6,326	180	0	42,547	1,184	0
Pygmy sperm whale	Western North Atlantic	6,294	176	0	42,302	1,157	0
Blainville's beaked whale	Northern Gulf of America	126	0	0	812	0	0
Goose-beaked whale	Northern Gulf of America	460	0	0	2,962	0	0
Gervais' beaked whale	Northern Gulf of America	125	0	0	800	0	0
Blainville's beaked whale	Western North Atlantic	25,705	1	0	172,587	1	0
Goose-beaked whale	Western North Atlantic	112,070	2	0	752,587	5	0
Gervais' beaked whale	Western North Atlantic	25,446	1	0	172,339	1	0
Northern bottlenose whale	Western North Atlantic	1651	1	0	10,879	1	0
Sowerby's beaked whale	Western North Atlantic	25,622	1	0	173,546	1	0
True's beaked whale	Western North Atlantic	25,582	0	0	173,301	0	0
Atlantic spotted dolphin	Northern Gulf of America	12,804	20	0	83,827	123	0
Bottlenose dolphin	Gulf of America Eastern Coastal	80	0	0	455	0	0
Bottlenose dolphin	Gulf of America Northern Coastal	7,146	17	0	49,950	114	0
Bottlenose dolphin	Gulf of America, Oceanic	6,274	4	0	40,584	11	0
Bottlenose dolphin	Gulf of America Western Coastal	3,331	1	0	18,123	1	0
Bottlenose dolphin	Mississippi Sound, Lake Borgne, and Bay Boudreau.	1,758	1	0	12,014	1	0
Bottlenose dolphin	Northern Gulf of America Continental Shelf.	71,331	29	0	481,391	165	0
Bottlenose dolphin	Nueces and Corpus Christi Bays	4	0	0	11	0	0
Bottlenose dolphin	Sabine Lake	1	0	0	2	0	0
Bottlenose dolphin	St. Andrew Bay	46	0	0	303	0	0
Bottlenose dolphin	St. Joseph Bay	42	0	0	287	0	0
Bottlenose dolphin	Tampa Bay	350	0	0	1,050	0	0
Clymene dolphin	Northern Gulf of America	599	3	0	3,577	4	0
False killer whale	Northern Gulf of America	230	0	0	1,423	0	0
Fraser's dolphin	Northern Gulf of America	241	0	0	1,487	0	0
Killer whale	Northern Gulf of America	110	0	0	680	0	0
Melon-headed whale	Northern Gulf of America	771	1	0	4,806	1	0
Pygmy killer whale	Northern Gulf of America	285	0	0	1,773	0	0
Risso's dolphin	Northern Gulf of America	203	0	0	1,252	0	0

TABLE 49—TOTAL ANNUAL AND 7-YEAR INCIDENTAL TAKE PROPOSED BY STOCK DURING ALL ACTIVITIES BY HARASSMENT TYPE—Continued

Species	Stock	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	7-Year total Level B harassment	7-Year total Level A harassment	7-Year total mortality
Rough-toothed dolphin	Northern Gulf of America	1,642	3	0	10,808	5	0
Short-finned pilot whale	Northern Gulf of America	1,021	3	0	6,183	13	0
Striped dolphin	Northern Gulf of America	2,376	7	0.29	15,414	15	2
Pantropical spotted dolphin	Northern Gulf of America	6,316	9	0.71	39,959	28	5
Spinner dolphin	Northern Gulf of America	656	0	0	4,459	0	0
Atlantic white-sided dolphin	Western North Atlantic	10,901	9	0	71,669	43	0
Common dolphin	Western North Atlantic	269,405	161	0	1,820,556	1,015	0
Atlantic spotted dolphin	Western North Atlantic	120,798	87	0	796,804	577	0
Bottlenose dolphin	Indian River Lagoon Estuarine System	1,576	0	0	10,675	0	0
Bottlenose dolphin	Jacksonville Estuarine System	360	0	0	2,477	0	0
Bottlenose dolphin	Northern Georgia/Southern South Carolina Estuarine System.	2	0	0	6	0	0
Bottlenose dolphin	Northern North Carolina Estuarine System.	10,532	6	0	72,036	37	0
Bottlenose dolphin	Southern Georgia Estuarine System	123	1	0	711	1	0
Bottlenose dolphin	Southern North Carolina Estuarine System.	162	0	0	535	0	0
Tamanend's bottlenose dolphin.	Western North Atlantic Central Florida Coastal.	10,494	3	0	66,392	10	0
Tamanend's bottlenose dolphin.	Western North Atlantic Northern Florida Coastal.	21,385	5	0	142,945	13	0
Bottlenose dolphin	Western North Atlantic Northern Migratory Coastal.	73,720	60	0	507,610	375	0
Bottlenose dolphin	Western North Atlantic Offshore	187,046	103	0.29	1,246,451	677	2
Tamanend's Bottlenose dolphin.	Western North Atlantic South Carolina/Georgia Coastal.	4,960	6	0.14	30,781	22	1
Bottlenose dolphin	Western North Atlantic Southern Migratory Coastal.	10,180	9	0	64,883	52	0
Clymene dolphin	Western North Atlantic	132,723	104	0.43	902,324	698	3
False killer whale	Western North Atlantic	572	1	0	3,872	1	0
Fraser's dolphin	Western North Atlantic	2,905	3	0	19,435	14	0
Killer whale	Western North Atlantic	180	1	0	1,195	1	0
Long-finned pilot whale	Western North Atlantic	21,680	12	0	146,009	63	0
Melon-headed whale	Western North Atlantic	4,598	3	0	31,086	12	0
Pantropical spotted dolphin	Western North Atlantic	13,068	5	0	89,174	25	0
Pygmy killer whale	Western North Atlantic	477	1	0	3,226	1	0
Risso's dolphin	Western North Atlantic	37,239	25	0	245,877	143	0
Rough-toothed dolphin	Western North Atlantic	4,753	6	0	31,562	25	0
Short-finned pilot whale	Western North Atlantic	33,035	15	0	222,007	91	0
Spinner dolphin	Western North Atlantic	5,356	2	0	36,513	10	0
Striped dolphin	Western North Atlantic	208,802	163	0	1,397,838	1,109	0
White-beaked dolphin	Western North Atlantic	16	0	0	103	0	0
Harbor porpoise	Gulf of Maine/Bay of Fundy	87,119	147	0	586,732	954	0
Gray seal	Western North Atlantic	15,724	24	0	105,585	151	0
Harbor seal	Western North Atlantic	22,094	32	0	148,486	204	0
Harp seal	Western North Atlantic	25,792	6	0	174,649	28	0
Hooded seal	Western North Atlantic	1,726	2	0	10,985	5	0

TABLE 50—TOTAL ANNUAL AND 7-YEAR INCIDENTAL TAKE PROPOSED BY STOCK DURING ALL ACTIVITIES BY EFFECT TYPE

Species	Stock	Maximum annual behavioral	Maximum annual TTS	Maximum annual AUD INJ	Maximum annual non-auditory injury	Maximum annual mortality	Maximum 7-year behavioral	Maximum 7-year TTS	Maximum 7-year AUD INJ	Maximum 7-year non-auditory injury	Maximum 7-year mortality
North Atlantic right whale	Western	109	305	2	0	0	715	1,967	8	0	0
Blue whale	Western North Atlantic	12	59	1	0	0	73	391	2	0	0
Bryde's whale	Primary	2	9	0	0	0	7	63	0	0	0
Fin whale	Western North Atlantic	689	1,927	21	0	0.29	4,526	12,772	131	0	2
Humpback whale	Gulf of Maine	212	632	12	0	0.57	1,404	4,140	74	0	4
Minke whale	Canadian East Coast	693	3,950	56	0	0.29	4,637	26,369	377	0	2
Rice's whale	Northern Gulf of America	88	215	3	0	0	593	1,454	6	0	0
Sei whale	Nova Scotia	125	622	7	0	0.29	822	4,159	44	0	2
Sperm whale	North Atlantic	8,878	3,712	6	1	0.29	59,196	25,479	20	1	2
Sperm whale	Northern Gulf of America	248	27	0	0	0.29	1,507	146	0	0	1
Dwarf sperm whale	Northern Gulf of America	27	162	22	0	0	148	964	73	0	0
Pygmy sperm whale	Northern Gulf of America	28	147	22	0	0	163	854	65	0	0
Dwarf sperm whale	Western North Atlantic	1,308	5,018	180	0	0	8,686	33,861	1,184	0	0
Pygmy sperm whale	Western North Atlantic	1,341	4,953	176	0	0	8,907	33,395	1,157	0	0
Blainville's beaked whale	Northern Gulf of America	126	0	0	0	0	812	0	0	0	0
Blainville's beaked whale	Western North Atlantic	25,551	154	1	0	0	171,535	1,052	1	0	0
Goose-beaked whale	Northern Gulf of America	457	3	0	0	0	2,959	3	0	0	0
Goose-beaked whale	Western North Atlantic	111,457	613	2	0	0	748,360	4,227	5	0	0
Gervais' beaked whale	Northern Gulf of America	123	2	0	0	0	798	2	0	0	0
Gervais' beaked whale	Western North Atlantic	25,110	336	1	0	0	170,030	2,309	1	0	0
Northern bottlenose whale	Western North Atlantic	1,642	9	1	0	0	10,822	57	1	0	0
Sowerby's beaked whale	Western North Atlantic	25,257	365	1	0	0	171,033	2,513	1	0	0
True's beaked whale	Western North Atlantic	25,217	365	0	0	0	170,797	2,504	0	0	0
Atlantic spotted dolphin	Northern Gulf of America	7,085	5,719	20	0	0	46,690	37,137	123	0	0
Bottlenose dolphin	Gulf of America Eastern Coastal	75	5	0	0	0	433	22	0	0	0
Bottlenose dolphin	Gulf of America Northern Coastal	6,524	622	17	0	0	45,608	4,342	114	0	0
Bottlenose dolphin	Gulf of America Oceanic	4,764	1,510	4	0	0	30,923	9,661	11	0	0
Bottlenose dolphin	Gulf of America Western Coastal	1,773	1,558	1	0	0	9,846	8,277	1	0	0
Bottlenose dolphin	Mississippi Sound, Lake Borgne, and Bay Boudreau.	1,715	43	1	0	0	11,776	238	1	0	0
Bottlenose dolphin	Northern Gulf of America Continental Shelf	46,801	24,530	27	2	0	321,346	160,045	163	2	0
Bottlenose dolphin	Nueces and Corpus Christi Bays	4	0	0	0	0	11	0	0	0	0
Bottlenose dolphin	Sabine Lake	1	0	0	0	0	2	0	0	0	0
Bottlenose dolphin	St. Andrew Bay	45	1	0	0	0	302	1	0	0	0
Bottlenose dolphin	St. Joseph Bay	42	0	0	0	0	287	0	0	0	0
Bottlenose dolphin	Tampa Bay	163	187	0	0	0	490	560	0	0	0
Clymene dolphin	Northern Gulf of America	390	209	2	1	0	2,308	1,269	3	1	0
False killer whale	Northern Gulf of America	168	62	0	0	0	1,036	387	0	0	0
Fraser's dolphin	Northern Gulf of America	168	73	0	0	0	1,031	456	0	0	0
Killer whale	Northern Gulf of America	84	26	0	0	0	521	159	0	0	0
Melon-headed whale	Northern Gulf of America	579	192	1	0	0	3,600	1,206	1	0	0
Pygmy killer whale	Northern Gulf of America	204	81	0	0	0	1,263	510	0	0	0
Risso's dolphin	Northern Gulf of America	155	48	0	0	0	967	285	0	0	0
Rough-toothed dolphin	Northern Gulf of America	988	654	2	1	0	6,531	4,277	4	1	0
Short-finned pilot whale	Northern Gulf of America	629	392	3	0	0	3,771	2,412	13	0	0
Striped dolphin	Northern Gulf of America	1,728	648	5	2	0.29	11,266	4,148	10	5	2
Pantropical spotted dolphin	Northern Gulf of America	4,589	1,727	6	3	0.71	29,025	10,934	20	8	5
Spinner dolphin	Northern Gulf of America	478	178	0	0	0	3,241	1,218	0	0	0
Atlantic white-sided dolphin	Western North Atlantic	7,172	3,729	8	1	0	46,544	25,125	40	3	0
Common dolphin	Western North Atlantic	136,920	132,485	159	2	0	924,362	896,194	1,010	5	0
Atlantic spotted dolphin	Western North Atlantic	51,840	68,958	85	2	0	343,981	452,823	571	6	0
Bottlenose dolphin	Indian River Lagoon Estuarine System	1,438	138	0	0	0	9,717	958	0	0	0
Bottlenose dolphin	Jacksonville Estuarine System	269	91	0	0	0	1,855	622	0	0	0
Bottlenose dolphin	Northern Georgia/Southern South Carolina Estuarine System.	2	0	0	0	0	6	0	0	0	0
Bottlenose dolphin	Northern North Carolina Estuarine System	8,579	1,953	6	0	0	59,058	12,978	37	0	0
Bottlenose dolphin	Southern Georgia Estuarine System	85	38	1	0	0	499	212	1	0	0
Bottlenose dolphin	Southern North Carolina Estuarine System	82	80	0	0	0	256	279	0	0	0

Tamanend's bottlenose dolphin	Western North Atlantic Central Florida Coastal	7,921	2,573	2	1	0	52,787	13,605	8	2	0
Tamanend's bottlenose dolphin	Western North Atlantic Northern Florida Coastal.	17,054	4,331	5	0	0	116,843	26,102	13	0	0
Bottlenose dolphin	Western North Atlantic Northern Migratory Coastal.	57,217	16,503	59	1	0	397,269	110,341	374	1	0
Bottlenose dolphin	Western North Atlantic Offshore	91,255	95,791	101	2	0.29	609,321	637,130	671	6	2
Tamanend's bottlenose dolphin	Western North Atlantic South Carolina/Georgia Coastal.	1,426	3,534	6	0	0.14	8,970	21,811	22	0	1
Bottlenose dolphin	Western North Atlantic Southern Migratory Coastal.	2,936	7,244	8	1	0	18,993	45,890	48	4	0
Clymene dolphin	Western North Atlantic	60,223	72,500	102	2	0.43	403,316	499,008	694	4	3
False killer whale	Western North Atlantic	317	255	1	0	0	2,143	1,729	1	0	0
Fraser's dolphin	Western North Atlantic	1,362	1,543	3	0	0	9,135	10,300	14	0	0
Killer whale	Western North Atlantic	100	80	1	0	0	659	536	1	0	0
Long-finned pilot whale	Western North Atlantic	12,783	8,897	11	1	0	85,545	60,464	62	1	0
Melon-headed whale	Western North Atlantic	1,993	2,605	3	0	0	13,543	17,543	12	0	0
Pantropical spotted dolphin	Western North Atlantic	6,436	6,632	5	0	0	44,269	44,905	25	0	0
Pygmy killer whale	Western North Atlantic	216	261	1	0	0	1,471	1,755	1	0	0
Risso's dolphin	Western North Atlantic	20,226	17,013	23	2	0	133,055	112,822	141	2	0
Rough-toothed dolphin	Western North Atlantic	1,874	2,879	6	0	0	12,519	19,043	25	0	0
Short-finned pilot whale	Western North Atlantic	16,978	16,057	15	0	0	113,894	108,113	91	0	0
Spinner dolphin	Western North Atlantic	2,607	2,749	2	0	0	17,788	18,725	10	0	0
Striped dolphin	Western North Atlantic	107,596	101,206	161	2	0	708,184	689,654	1,103	6	0
White-beaked dolphin	Western North Atlantic	10	6	0	0	0	64	39	0	0	0
Harbor porpoise	Gulf of Maine/Bay of Fundy	81,105	6,014	147	0	0	547,161	39,571	954	0	0
Gray seal	Western North Atlantic	9,811	5,913	24	0	0	66,633	38,952	151	0	0
Harbor seal	Western North Atlantic	13,406	8,688	32	0	0	91,406	57,080	204	0	0
Harp seal	Western North Atlantic	16,636	9,156	6	0	0	111,591	63,058	28	0	0
Hooded seal	Western North Atlantic	1,080	646	2	0	0	6,740	4,245	5	0	0

Note: This includes effects from sonar and other transducers, air guns, pile driving, explosives (including small ship shock trials), and vessel strike.

Proposed Mitigation Measures

Under section 101(a)(5)(A) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of effecting the least practicable adverse impact on the species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for subsistence uses (''least practicable adverse impact''). NMFS does not have a regulatory definition for least practicable adverse impact. The 2004 NDAA amended the MMPA as it relates to military readiness activities and the incidental take authorization process such that a determination of ''least practicable adverse impact'' shall include consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity. For additional discussion of NMFS' interpretation of the least practicable adverse impact standard, see the Mitigation Measures section of the Gulf of Alaska Study Area final rule (88 FR 604, January 4, 2023).

Implementation of Least Practicable Adverse Impact Standard

Here, we discuss how we determine whether a measure or set of measures meets the ''least practicable adverse impact'' standard. Our separate analysis of whether the take anticipated to result from the Action Proponents' activities meets the ''negligible impact'' standard appears in the Preliminary Analysis and Negligible Impact Determination section below.

Our evaluation of potential mitigation measures includes consideration of two primary factors: (1) The manner in which, and the degree to which, implementation of the potential measure(s) is expected to reduce adverse impacts to marine mammal species or stocks, their habitat, or their availability for subsistence uses (where relevant). This analysis considers such things as the nature of the potential adverse impact (such as likelihood, scope, and range), the likelihood that the measure will be effective if implemented, and the likelihood of successful implementation; and (2) The practicability of the measure(s) for applicant implementation. Practicability of implementation may consider such things as cost, impact on activities, and, in the case of a military readiness activity, specifically considers personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

While the language of the least practicable adverse impact standard calls for minimizing impacts to affected species or stocks, we recognize that the reduction of impacts to those species or stocks accrues through the application of mitigation measures that limit impacts to individual animals. Accordingly, NMFS' analysis focuses on measures that are designed to avoid or minimize impacts on individual marine mammals that are more likely to increase the probability or severity of population-level effects.

While direct evidence of impacts to species or stocks from a specified activity is rarely available, and additional study is still needed to understand how specific disturbance events affect the fitness of individuals of certain species, there have been improvements in understanding the process by which disturbance effects are translated to the population. With recent scientific advancements (both marine mammal energetic research and the development of energetic frameworks), the relative likelihood or degree of impacts on species or stocks may often be inferred given a detailed understanding of the activity, the environment, and the affected species or stocks—and the best available science has been used here. This same information is used in the development of mitigation measures and helps us understand how mitigation measures contribute to lessening effects (or the risk thereof) to species or stocks. We also acknowledge that there is always the potential that new information, or a new recommendation, could become available in the future and necessitate reevaluation of mitigation measures (which may be addressed through adaptive management) to see if further reductions of population impacts are possible and practicable.

In the evaluation of specific measures, the details of the specified activity will necessarily inform each of the two primary factors discussed above (expected reduction of impacts and practicability), and are carefully considered to determine the types of mitigation that are appropriate under the least practicable adverse impact standard. Analysis of how a potential mitigation measure may reduce adverse impacts on a marine mammal stock or species, consideration of personnel safety, practicality of implementation, and consideration of the impact on effectiveness of military readiness activities are not issues that can be meaningfully evaluated through a yes/no lens. The manner in which, and the degree to which, implementation of a measure is expected to reduce impacts, as well as its practicability in terms of these considerations, can vary widely. For example, a time/area restriction could be of very high value for decreasing population-level impacts (*e.g.,* avoiding disturbance of feeding females in an area of established biological importance) or it could be of lower value (*e.g.,* decreased disturbance in an area of high productivity but of less biological importance). Regarding practicability, a measure might involve restrictions in an area or time that impede the Navy's ability to certify a strike group (higher impact on mission effectiveness), or it could mean delaying a small in-port training event by 30 minutes to avoid exposure of a marine mammal to injurious levels of sound (lower impact). A responsible evaluation of ''least practicable adverse impact'' will consider the factors along these realistic scales. Accordingly, the greater the likelihood that a measure will contribute to reducing the probability or severity of adverse impacts to the species or stock or its habitat, the greater the weight that measure is given when considered in combination with practicability to determine the appropriateness of the mitigation measure, and vice versa. We discuss consideration of these factors in greater detail below.

1. *Reduction of adverse impacts to marine mammal species or stocks and their habitat.* The emphasis given to a measure's ability to reduce the impacts on a species or stock considers the degree, likelihood, and context of the anticipated reduction of impacts to individuals (and how many individuals) as well as the status of the species or stock.

The ultimate impact on any individual from a disturbance event (which informs the likelihood of adverse species- or stock-level effects) is dependent on the circumstances and associated contextual factors, such as duration of exposure to stressors. Though any proposed mitigation needs to be evaluated in the context of the specific activity and the species or stocks affected, measures with the following types of effects have greater value in reducing the likelihood or severity of adverse species- or stock-level impacts: avoiding or minimizing injury or mortality; limiting interruption of known feeding, breeding, mother/young, or resting behaviors; minimizing the abandonment of important habitat (temporally and spatially); minimizing the number of individuals subjected to these types of disruptions; and limiting degradation of habitat. Mitigating these types of effects is intended to reduce the likelihood that the activity will result in energetic or other types of impacts that are more likely to result in reduced reproductive success or survivorship. It is also important to consider the degree of impacts that are expected in the absence of mitigation in order to assess the added value of any potential measures. Finally, because the least practicable adverse impact standard gives NMFS discretion to weigh a variety of factors when determining appropriate mitigation measures and because the focus of the standard is on reducing impacts at the species or stock level, the least practicable adverse impact standard does not compel mitigation for every kind of take, or every individual taken, if that mitigation is unlikely to meaningfully contribute to the reduction of adverse impacts on the species or stock and its habitat, even when practicable for implementation by the applicant.

The status of the species or stock is also relevant in evaluating the appropriateness of potential mitigation measures in the context of least practicable adverse impact. The following are examples of factors that may (either alone, or in combination) result in greater emphasis on the importance of a mitigation measure in reducing impacts on a species or stock: the stock is known to be decreasing or status is unknown, but believed to be declining; the known annual mortality (from any source) is approaching or exceeding the potential biological removal (PBR) level (as defined in MMPA section 3(20)); the affected species or stock is a small, resident population; or the stock is involved in a UME or has other known vulnerabilities, such as recovering from an oil spill.

Habitat mitigation, particularly as it relates to rookeries, mating grounds, and areas of similar significance, is also relevant to achieving the standard and can include measures such as reducing impacts of the activity on known prey utilized in the activity area or reducing impacts on physical habitat. As with species- or stock-related mitigation, the emphasis given to a measure's ability to reduce impacts on a species or stock's habitat considers the degree, likelihood, and context of the anticipated reduction of impacts to habitat. Because habitat value is informed by marine mammal presence and use, in some cases there may be overlap in measures for the species or stock and for use of habitat. We consider available information indicating the likelihood of any measure to accomplish its objective. If evidence shows that a measure has not typically been effective nor successful, then either that measure should be modified or the potential value of the measure to reduce effects should be lowered.

2. *Practicability.* Factors considered may include cost, impact on activities, and, in the case of a military readiness activity, will include personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity (see MMPA section 101(a)(5)(A)(ii)).

Assessment of Mitigation Measures for the AFTT Study Area

NMFS has fully reviewed the specified activities and the mitigation measures included in the application and the 2024 AFTT Draft Supplemental EIS/OEIS to determine if the mitigation measures would result in the least practicable adverse impact on marine mammals and their habitat. NMFS worked with the Action Proponents in the development of their initially proposed measures, which are informed by years of implementation and monitoring. A complete discussion of the Action Proponents' evaluation process used to develop, assess, and select mitigation measures, which was informed by input from NMFS, can be found in chapter 5 (Mitigation) of the 2024 AFTT Draft Supplemental EIS/OEIS. The process described in chapter 5 (Mitigation) and appendix A (Activity Descriptions) of the 2024 AFTT Draft Supplemental EIS/OEIS robustly supported NMFS' independent evaluation of whether the mitigation measures would meet the least practicable adverse impact standard. The Action Proponents would be required to implement the mitigation measures identified in this rule for the full 7 years to avoid or reduce potential impacts from acoustic, explosive, and physical disturbance and strike stressors.

As a general matter, where an applicant proposes measures that are likely to reduce impacts to marine mammals, the fact that they are included in the application indicates that the measures are practicable, and it is not necessary for NMFS to conduct a detailed analysis of the measures the applicant proposed (rather, they are simply included). However, it is still necessary for NMFS to consider whether there are additional practicable measures that would meaningfully reduce the probability or severity of impacts that could affect reproductive success or survivorship.

Overall the Action Proponents have agreed to mitigation measures that would reduce the probability and/or severity of impacts expected to result from acute exposure to acoustic sources or explosives, vessel strike, and impacts to marine mammal habitat. Specifically, the Action Proponents would use a combination of delayed starts, powerdowns, and shutdowns to avoid mortality or serious injury, minimize the likelihood or severity of AUD INJ or non-auditory injury, and reduce instances of TTS or more severe behavioral disturbance caused by acoustic sources or explosives. The Action Proponents would also implement multiple time/area restrictions that would reduce take of marine mammals in areas or at times where they are known to engage in important behaviors, such as calving, where the disruption of those behaviors would have a higher probability of resulting in impacts on reproduction or survival of individuals that could lead to population-level impacts.

The Action Proponents assessed the practicability of the proposed measures in the context of personnel safety, practicality of implementation, and their impacts on the Action Proponents' ability to meet their Congressionally mandated requirements and found that the measures are supportable. As described in more detail below, NMFS has independently evaluated the measures the Action Proponents proposed in the manner described earlier in this section (*i.e.,* in consideration of their ability to reduce adverse impacts on marine mammal species and their habitat and their practicability for implementation). We have determined that the measures would significantly reduce impacts on the affected marine mammal species and stocks and their habitat and, further, be practicable for implementation by the Action Proponents. We have preliminarily determined that the mitigation measures assure that the Action Proponents' activities would have the least practicable adverse impact on the species or stocks and their habitat.

The Action Proponents also evaluated numerous measures in the 2024 AFTT Draft Supplemental EIS/OEIS that were not included in the application, and NMFS independently reviewed and preliminarily concurs with the Action Proponents' analysis that their inclusion was not appropriate under the least practicable adverse impact standard based on our assessment. The Action Proponents considered these additional potential mitigation measures in the context of the potential benefits to marine mammals and whether they are practical or impractical.

Section 5.9 (Measures Considered but Eliminated) of chapter 5 (Mitigation) of the 2024 AFTT Draft Supplemental EIS/OEIS, includes an analysis of an array of different types of mitigation that have been recommended over the years by non-governmental organizations or the public, through scoping or public comment on environmental compliance documents. These recommendations generally fall into three categories, discussed below: reduction of activity, activity-based operational measures, and time/area limitations.

As described in section 5.9 (Measures Considered but Eliminated) of the 2024 AFTT Draft Supplemental EIS/OEIS, the Action Proponents considered reducing the overall amount of training, reducing explosive use, modifying sound sources, completely replacing live training with computer simulation, and including time of day restrictions. Many of these mitigation measures could potentially reduce the number of marine mammals taken via direct reduction of the activities or amount of sound energy put in the water. However, as described in chapter 5 (Mitigation) of the 2024 AFTT Draft Supplemental EIS/OEIS, the Action Proponents need to train in the conditions in which they fight—and these types of modifications fundamentally change the activity in a manner that would not support the purpose and need for the training (*i.e.,* are entirely impracticable) and therefore are not considered further. NMFS finds the Action Proponents' explanation of why adoption of these recommendations would unacceptably undermine the purpose of the training persuasive. After independent review, NMFS finds the Action Proponents' judgment on the impacts of these potential mitigation measures to personnel safety, practicality of implementation, and the effectiveness of training persuasive, and for these reasons, NMFS finds that these measures do not meet the least practicable adverse impact standard because they are not practicable.

Also in chapter 5 (Mitigation) of the 2024 AFTT Draft Supplemental EIS/OEIS, the Action Proponents evaluated additional potential activity-based mitigation measures, including increased mitigation zones, ramp-up measures, additional passive acoustic and visual monitoring, and decreased vessel speeds. Some of these measures have the potential to incrementally reduce take to some degree in certain circumstances, though the degree to which this would occur is typically low or uncertain. However, as described in the Action Proponents' analysis, the measures would have significant direct negative effects on mission effectiveness and are considered impracticable (see chapter 5 of the 2024 AFTT Draft Supplemental EIS/OEIS). NMFS independently reviewed the Action Proponents' evaluation and concurs with this assessment, which supports NMFS' preliminary findings that the impracticability of this additional mitigation would greatly outweigh any potential minor reduction in marine mammal impacts that might result; therefore, these additional mitigation measures are not warranted.

Last, chapter 5 (Mitigation) of the 2024 AFTT Draft Supplemental EIS/OEIS also describes a comprehensive analysis of potential geographic mitigation that includes consideration of both a biological assessment of how the potential time/area limitation would benefit the species and its habitat (*e.g.,* is a key area of biological importance or would result in avoidance or reduction of impacts) in the context of the stressors of concern in the specific area and an operational assessment of the practicability of implementation (*e.g.,* including an assessment of the specific importance of an area for training, considering proximity to training ranges and emergency landing fields and other issues). In some cases potential benefits to marine mammals were non-existent, while in others the consequences on mission effectiveness were too great.

NMFS has reviewed the Action Proponents' analysis in chapter 5 (Mitigation) and appendix A (Activity Descriptions) of the 2024 AFTT Draft Supplemental EIS/OEIS, which consider the same factors that NMFS considers to satisfy the least practicable adverse impact standard, and concurs with the analysis and conclusions. Therefore, NMFS is not proposing to include any of the measures that the Action Proponents ruled out in the 2024 AFTT Draft Supplemental EIS/OEIS. Below are the mitigation measures that NMFS has preliminarily determined would ensure the least practicable adverse impact on all affected species and their habitat, including the specific considerations for military readiness activities. Table 51 describes the information designed to aid Lookouts and other applicable personnel with their observation, environmental compliance, and reporting responsibilities. The following sections describe the mitigation measures that would be implemented in association with the activities analyzed in this document. The mitigation measures are organized into two categories: activity-based mitigation and geographic mitigation areas.

Of note, according to the U.S. Navy, consistent with customary international law, when a foreign military vessel participates in a U.S. Navy exercise within the U.S. territorial sea (*i.e.,* 0 to 12 nmi (0 to 22.2 km) from shore), the U.S. Navy will request that the foreign vessel follow the U.S. Navy's mitigation measures for that particular event. When a foreign military vessel participates in a U.S. Navy exercise beyond the U.S. territorial sea but within the U.S. Exclusive Economic Zone, the U.S. Navy will encourage the foreign vessel to follow the U.S. Navy's mitigation measures for that particular event (Navy 2022a; Navy 2022b). In either scenario (*i.e.,* both within and beyond the territorial sea), U.S. Navy personnel will provide the foreign vessels participating with a description of the mitigation measures to follow.

TABLE 51—ENVIRONMENTAL AWARENESS AND EDUCATION

Stressor or Activity: All training and testing activities, as applicable.
Requirements: Navy personnel (including civilian personnel) involved in mitigation and training or testing activity reporting under the specified activities must complete one or more modules of the U.S. Navy Afloat Environmental Compliance Training Series, as identified in their career path training plan. Modules include: • Introduction to Afloat Environmental Compliance Training Series. The introductory module provides information on environmental laws (*e.g.,* ESA, MMPA) and the corresponding responsibilities that are relevant to military readiness activities. The material explains why environmental compliance is important in supporting the Action Proponents' commitment to environmental stewardship. • Marine Species Awareness Training. All bridge watch personnel, Commanding Officers, Executive Officers, maritime patrol aircraft aircrews, anti-submarine warfare and mine warfare rotary-wing aircrews, Lookouts, and equivalent civilian personnel must successfully complete the Marine Species Awareness Training prior to standing watch or serving as a Lookout. The Marine Species Awareness Training provides information on sighting cues, visual observation tools and techniques, and sighting notification procedures. Navy biologists developed Marine Species Awareness Training to improve the effectiveness of visual observations for biological resources, focusing on marine mammals and sea turtles, and including floating vegetation, jellyfish aggregations, and flocks of seabirds.

TABLE 51—ENVIRONMENTAL AWARENESS AND EDUCATION—Continued

• Protective Measures Assessment Protocol. This module provides the necessary instruction for accessing mitigation requirements during the event planning phase using the Protective Measures Assessment Protocol (PMAP) software tool. • Sonar Positional Reporting System and Marine Mammal Incident Reporting. This module provides instruction on the procedures and activity reporting requirements for the Sonar Positional Reporting System and marine mammal incident reporting.

Activity-Based Mitigation

Activity-based mitigation is mitigation that the Action Proponents would implement whenever and wherever an applicable military readiness activity takes place within the AFTT Study Area. Previously referred to as ''Procedural Mitigation,'' the primary objective of activity-based mitigation is to reduce overlap of marine mammals with stressors that have the potential to cause injury or mortality in real time. Activity-based mitigations are fundamentally consistent across stressor activity, although specific variations account for differences in platform configuration, event characteristics, and stressor types. The Action Proponents customize mitigation for each applicable activity category or stressor. Activity-based mitigation generally involves: (1) The use of one or more trained Lookouts to diligently observe for marine mammals and other specific biological resources (*e.g.,* indicator species like floating vegetation, jelly aggregations, large schools of fish, and flocks of seabirds) within a mitigation zone, (2) requirements for Lookouts to immediately communicate sightings of marine mammals and other specific biological resources to the appropriate watch station for information dissemination, and (3) requirements for the watch station to implement mitigation (*e.g.,* halt an activity) until certain recommencement conditions have been met. The remainder of the mitigation measures are activity-based mitigation measures (table 52 through table 70) organized by stressor type and activity category and include acoustic stressors (*i.e.,* active sonar, air guns, pile driving, weapons firing noise), explosive stressors (*i.e.,* sonobuoys, torpedoes, medium-caliber and large-caliber projectiles, missiles and rockets, bombs, SINKEX, mine counter-measure and neutralization activities, mine neutralization involving Navy divers, line charge testing, ship shock trials), and physical disturbance and strike stressors (*i.e.,* vessel movement, towed in-water devices, small-, medium-, and large-caliber non-explosive practice munitions, non-explosive missiles and rockets, non-explosive bombs, mine shapes).

The Action Proponents must implement the proposed mitigation measures described in table 52 through table 70, as appropriate, in response to an applicable sighting within, or entering into, the relevant mitigation zone for acoustic stressors, explosives, and non-explosive munitions. Each table describes the activities that the requirements apply to, the required mitigation zones in which the action proponents must take a mitigation action, the required number of Lookouts and observation platform, the required mitigation actions that the action proponents must take before, during, and/or after an activity, and a required wait period prior to commencing or recommencing an activity after a delay, power down, or shutdown of an activity.

The Action Proponents proposed wait periods because events cannot be delayed or ceased indefinitely for the purpose of mitigation due to impacts on safety, sustainability, and the ability to meet mission requirements. Wait periods are designed to allow animals the maximum amount of time practical to resurface (*i.e.,* become available to be observed) before activities resume. The action proponents factored in an assumption that mitigation may need to be implemented more than once when developing wait period durations. Wait periods are 10 minutes, 15 minutes, or 30 minutes depending on the fuel constraints of the platform and feasibility of implementation. NMFS concurs with these proposed wait periods.

If an applicable species (identified in relevant mitigation table) is observed within a required mitigation zone prior to the initial start of the activity, the Action Proponents must: (1) relocate the event to a location where applicable species are not observed, or (2) delay the initial start of the event (or stressor use) until one of the ''Mitigation Zone All-Clear Conditions'' (defined below) has been met. If an applicable stressor is observed within a required mitigation zone during the event (*i.e.,* during use of the indicated source) the Action Proponents must take the action described in the ''Mitigation Zones'' section of the table until one of the Mitigation Zone All-Clear Conditions has been met.

For all activities, an activity may not commence or recommence until one of the following ''Mitigation Zone All-Clear Conditions'' have been met: (1) a Lookout observes the applicable species exiting the mitigation zone, (2) a Lookout determines the applicable species has exited the mitigation zone based on its observed course and speed relative to the mitigation zone, (3) a Lookout affirms the mitigation zone has been clear from additional sightings for a designated ''wait period,'' or (4) for mobile events, the stressor has transited a distance equal to double the mitigation zone size beyond the location of the last sighting.

Activity-Based Mitigation for Active Acoustic Stressors

Mitigation measures for acoustic stressors are provided below and include active acoustic sources (table 52), pile driving and extraction (table 53), and weapons firing noise (table 54). Activity-based mitigation for acoustic stressors does not apply to:

(i) sources not operated under positive control (*i.e.,* sources not actively controlled by a crewmember, *e.g.,* unmanned platforms performing predetermined operations);

(ii) sources used for safety of navigation;

(iii) sources used or deployed by aircraft operating at high altitudes;

(iv) sources used, deployed, or towed by unmanned platforms except when escort vessels are already participating in the event and have positive control over the source;

(v) sources used by submerged submarines;

(vi) *de minimis* sources;

(vii) long-duration sources, including those used for acoustic and oceanographic research; and

(viii) vessel-based, unmanned vehicle-based, or towed in-water sources when marine mammals (*e.g.,* dolphins) are determined to be intentionally swimming at the bow or alongside or directly behind the vessel, vehicle, or device (*e.g.,* to bow-ride or wake-ride).

TABLE 52—MITIGATION FOR ACTIVE ACOUSTIC SOURCES

Stressor or Activity: Active acoustic sources with power down and shut down capabilities:
- Low-frequency active sonar ≥200 dB.
- Mid-frequency active sonar sources that are hull mounted on a surface ship (including surfaced submarines).
- Broadband and other active acoustic sources >200 dB.

- Mitigation Zones:
  - 1,000 yd (914.4 m) from active acoustic sources (power down of 6 dB total).
  - 500 yd (457.2 m) from active acoustic sources (power down of 10 dB total).
  - 200 yd (182.9 m) from active acoustic sources (shut down).
- Mitigation Requirements:
  - One Lookout in/on one of the following:
    - Aircraft.
    - Pierside, moored, or anchored vessel.
    - Underway vessel with space/crew restrictions (including small boats).
    - Underway vessel already participating in the event that is escorting (and has positive control over sources used, deployed, or towed by) an unmanned platform.
  - Two Lookouts on an underway vessel without space/crew restrictions.
  - Lookouts would use information from passive acoustic detections to inform visual observations when passive acoustic devices are already being used in the event.
- Mitigation Requirement Timing:
  - Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of using active acoustic sources (*e.g.,* while maneuvering on station).
  - Action Proponent personnel must observe the applicable mitigation zone for marine mammals during use of active acoustic sources.
- Wait Period:
  - 10 or 30 minutes (depending on fuel constraints of the platform).

Stressor or Activity: Active acoustic sources with shut down (but not power down) capabilities:
- Low-frequency active sonar <200 dB.
- Mid-frequency active sonar sources that are not hull mounted on a surface ship (*e.g.,* dipping sonar, towed arrays).
- High-frequency active sonar.
- Air guns.
- Broadband and other active acoustic sources <200 dB.

- Mitigation Zone:
  - 200 yd (182.9 m) from active acoustic sources (shut down).
- Mitigation Requirements:
  - One Lookout in/on one of the following:
    - Aircraft.
    - Pierside, moored, or anchored vessel.
    - Underway vessel with space/crew restrictions (including small boats).
    - Underway vessel already participating in the event that is escorting (and has positive control over sources used, deployed, or towed by) an unmanned platform.
  - Two Lookouts on an underway vessel without space/crew restrictions.
  - Lookouts would use information from passive acoustic detections to inform visual observations when passive acoustic devices are already being used in the event.
- Mitigation Requirement Timing:
  - Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of using active acoustic sources (*e.g.,* while maneuvering on station).
  - Action Proponent personnel must observe the mitigation zone for marine mammals during use of active acoustic sources.
- Wait Period:
  - 10 or 30 minutes (depending on fuel constraints of the platform).

TABLE 53—MITIGATION FOR PILE DRIVING AND EXTRACTION

Stressor or Activity: Vibratory and impact pile driving and extraction.

- Mitigation Zone:
  - 100 yd (91.4 m) from piles being driven or extracted (cease pile driving or extraction).
- Mitigation Requirements
  - One Lookout on one of the following:
    - Shore.
    - Pier.
    - Small boat.
- Mitigation Requirement Timing:
  - Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation for 15 minutes prior to the initial start of pile driving or pile extraction.
  - Action Proponent personnel must observe the mitigation zone for marine mammals during pile driving or extraction.
- Wait Period:
  - 15 minutes.

TABLE 54—MITIGATION FOR WEAPONS FIRING NOISE

Stressor or Activity: Explosive and non-explosive large-caliber gunnery firing noise (surface-to-surface and surface-to-air).

- Mitigation Zone:
  - 30 degrees on either side of the firing line out to 70 yd (64 m) from the gun muzzle (cease fire).
- Mitigation Requirements:
  - One Lookout on a vessel.
- Mitigation Requirement Timing:
  - Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of large-caliber gun firing (*e.g.,* during target deployment).
  - Action Proponent personnel must observe the mitigation zone for marine mammals during large-caliber gun firing.
- Wait Period:
  - 30 minutes.

Activity-Based Mitigation for Explosive Stressors

Mitigation measures for explosive stressors are provided below and include explosive bombs (table 55), explosive gunnery (table 56), explosive line charges (table 57), explosive mine countermeasure and neutralization without divers (table 58), explosive mine neutralization with divers (table 59), explosive missiles and rockets (table 60), explosive sonobuoys and research-based sub-surface explosives (table 61), explosive torpedoes (table 62), ship shock trials (table 63), and SINKEX (table 64). After the event, the Action Proponents must observe the area for marine mammals. Post-event observations are intended to aid incident reporting requirements for marine mammals. Practicality and the duration of post-event observations will be determined on site by fuel restrictions and mission-essential follow-on commitments. For example, it is more challenging to remain on-site for extended periods of time for some activities due to factors such as range from the target or altitude of an aircraft. Activity-based mitigation for explosive stressors does not apply to explosives:

(i) deployed by aircraft operating at high altitudes;

(ii) deployed by submerged submarines, except for explosive torpedoes;

(iii) deployed against aerial targets;

(iv) during vessel-launched missile or rocket events;

(v) used at or below the *de minimis* threshold; and

(vi) deployed by unmanned platforms except when escort vessels are already participating in the event and have positive control over the explosive.

TABLE 55—MITIGATION FOR EXPLOSIVE BOMBS

Stressor or Activity: Any NEW.

- Mitigation Zone:
  - ○ 2,500 yd (2,286 m) from the intended target (cease fire).
- Mitigation Requirements:
  - ○ One Lookout in an aircraft.
- Mitigation Requirement Timing:
  - ○ Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of bomb delivery (*e.g.,* when arriving on station).
  - ○ Action Proponent personnel must observe the applicable mitigation zone for marine mammals during bomb delivery.
  - ○ After the event, when practical, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.
- Wait Period:
  - ○ 10 minutes.

TABLE 56—MITIGATION FOR EXPLOSIVE GUNNERY

Stressor or Activity: Air-to-surface medium-caliber, surface-to-surface medium-caliber, surface-to-surface large-caliber.

- Mitigation Zones:
  - ○ Air-to-surface medium-caliber:
    - ▪ 200 yd (182.9 m) from the intended impact location (cease fire).
  - ○ Surface-to-surface medium-caliber:
    - ▪ 600 yd (548.6 m) from the intended impact location (cease fire).
  - ○ Surface-to-surface large-caliber:
    - ▪ 1,000 yd (914.4 m) from the intended impact location (cease fire).
- Mitigation Requirements:
  - ○ One Lookout on a vessel or in an aircraft.
- Mitigation Requirement Timing:
  - ○ Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of gun firing (*e.g.,* while maneuvering on station).
  - ○ Action Proponent personnel must observe the applicable mitigation zone for marine mammals during gunnery fire.
  - ○ After the event, when practical, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.
- Wait Period:

TABLE 56—MITIGATION FOR EXPLOSIVE GUNNERY—Continued

- ○ 10 or 30 minutes (depending on fuel constraints of the platform).

TABLE 57—MITIGATION FOR EXPLOSIVE LINE CHARGES

Stressor or Activity: Any NEW.

- Mitigation Zone:
  - ○ 900 yd (823 m) from the detonation site (cease fire).
- Mitigation Requirements:
  - ○ One Lookout on a vessel.
- Mitigation Requirement Timing:
  - ○ Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of detonations (*e.g.,* while maneuvering on station).
  - ○ Action Proponent personnel must observe the mitigation zone for marine mammals during detonations.
  - ○ After the event, when practical, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.
- Wait Period:
  - ○ 30 minutes.

TABLE 58—MITIGATION FOR EXPLOSIVE MINE COUNTERMEASURE AND NEUTRALIZATION (NO DIVERS)

Stressor or Activity: 0.1–5 lb (0.05–2.3 kg) NEW, >5 lb (2.3 kg) NEW.

- Mitigation Zones:
  - ○ 0.1–5 lb (0.05–2.3 kg) NEW:
    - ▪ 600 yd (548.6 m) from the detonation site (cease fire).
  - ○ >5 lb (2.3 kg) NEW:
    - ▪ 2,100 yd (1,920.2 m) from the detonation site (cease fire).
- Mitigation Requirements:
  - ○ 0.1–5 lb (0.05–2.3 kg) NEW:
    - ▪ One Lookout on a vessel or in an aircraft.
  - ○ >5 lb (2.3 kg) NEW:
    - ▪ Two Lookouts: one on a small boat and one in an aircraft.
- Mitigation Requirement Timing:
  - ○ Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of detonations (*e.g.,* while maneuvering on station; typically, 10 or 30 minutes depending on fuel constraints).
  - ○ Action Proponent personnel must observe the applicable mitigation zone for marine mammals during detonations or fuse initiation.
  - ○ After the event, when practical, Action Proponent personnel must observe the detonation vicinity for 10 or 30 minutes (depending on fuel constraints) for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.
- Wait Period:
  - ○ 10 or 30 minutes (depending on fuel constraints of the platform).

TABLE 59—MITIGATION FOR EXPLOSIVE MINE NEUTRALIZATION (WITH DIVERS)

Stressor or Activity: 0.1–20 lb (0.05–9.1 kg) NEW (positive control), 0.1–20 lb (0.05–9.1 kg) NEW (time-delay), >20–60 lb (9.1–27.2 kg) NEW (positive control).

- Mitigation Zones:
  - ○ 0.1–20 lb (0.05–9.1 kg) NEW (positive control):
    - ▪ 500 yd (457.2 m) from the detonation site (cease fire).
  - ○ 0.1–20 lb (0.05–9.1 kg) NEW (time-delay), >20–60 lb (9.1–27.2 kg) NEW (positive control):
    - ▪ 1,000 yd (914.4 m) from the detonation site (cease fire).
- Mitigation Requirements:
  - ○ 0.1–20 lb (0.05–9.1 kg) NEW (positive control):
    - ▪ Two Lookouts in two small boats (one Lookout per boat) or one small boat and one rotary-wing aircraft (with one Lookout each).
  - ○ 0.1–20 lb (0.05–9.1 kg) NEW (time-delay), >20–60 lb (9.1–27.2 kg) NEW (positive control):
    - ▪ Four Lookouts in two small boats (two Lookouts per boat), and one additional Lookout in an aircraft if used in the event.
- Mitigation Requirement Timing:
  - ○ Time-delay devices must be set not to exceed 10 minutes.
  - ○ Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of detonations or fuse initiation for positive control events (*e.g.,* while maneuvering on station) or for 30 minutes prior for time-delay events.
  - ○ Action Proponent personnel must observe the applicable mitigation zone for marine mammals during detonations or fuse initiation.
  - ○ When practical based on mission, safety, and environmental conditions:
    - ▪ Boats must observe from the mitigation zone radius mid-point.
    - ▪ When two boats are used, boats must observe from opposite sides of the mine location.
    - ▪ Platforms must travel a circular pattern around the mine location.
    - ▪ Boats must have one Lookout observe inward toward the mine location and one Lookout observe outward toward the mitigation zone perimeter.

TABLE 59—MITIGATION FOR EXPLOSIVE MINE NEUTRALIZATION (WITH DIVERS)—Continued

    - Divers must be part of the Lookout Team.
  - After the event, when practical, Action Proponent personnel must observe the detonation vicinity for 30 minutes for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.
- Wait Period:
  - 10 or 30 minutes (depending on fuel constraints of the platform).

TABLE 60—MITIGATION FOR EXPLOSIVE MISSILES AND ROCKETS

Stressor or Activity: 0.6–20 lb (0.3–9.1 kg) NEW (air-to-surface), >20–500 lb (9.1–226.8 kg) NEW (air-to-surface).

- Mitigation Zones:
  - 0.6–20 lb (0.3–9.1 kg) NEW (air-to-surface):
    - 900 yd (823 m) from the intended impact location (cease fire).
  - >20–500 lb (9.1–226.8 kg) NEW (air-to-surface):
    - 2,000 yd (1,828.8 m) from the intended impact location (cease fire).
- Mitigation Requirements:
  - One Lookout in an aircraft.
- Mitigation Requirement Timing:
  - Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of missile or rocket delivery (*e.g.,* during a fly-over of the mitigation zone).
  - Action Proponent personnel must observe the applicable mitigation zone for marine mammals during missile or rocket delivery.
  - After the event, when practical, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.
- Wait Period:
  - 10 or 30 minutes (depending on fuel constraints of the platform).

TABLE 61—MITIGATION FOR EXPLOSIVE SONOBUOYS AND RESEARCH-BASED SUB-SURFACE EXPLOSIVES

Stressor or Activity: Any NEW of sonobuoys, 0.1–5 lb (0.05–2.3 kg) NEW for other types of sub-surface explosives used in research applications.

- Mitigation Zones:
  - 600 yd (548.6 m) from the device or detonation sites (cease fire).
- Mitigation Requirements:
  - One Lookout on a small boat or in an aircraft.
  - Conduct passive acoustic monitoring for marine mammals; use information from detections to assist visual observations.
- Mitigation Requirement Timing:
  - Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of detonations (*e.g.,* during sonobuoy deployment, which typically lasts 20–30 minutes).
  - Action Proponent personnel must observe the mitigation zone for marine mammals during detonations.
  - After the event, when practical, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.
- Wait Period:
  - 10 or 30 minutes (depending on fuel constraints of the platform).

TABLE 62—MITIGATION FOR EXPLOSIVE TORPEDOES

Stressor or Activity: Any NEW.

- Mitigation Zone:
  - 2,100 yd (1,920.2 m) from the intended impact location (cease fire).
- Mitigation Requirements:
  - One Lookout in an aircraft.
  - Conduct passive acoustic monitoring for marine mammals; use information from detections to assist visual observations.
- Mitigation Requirement Timing:
  - Action Proponent personnel must observe the mitigation zone for marine mammals, floating vegetation, and jellyfish aggregations immediately prior to the initial start of detonations (*e.g.,* during target deployment).
  - Action Proponent personnel must observe the mitigation zone for marine mammals and jellyfish aggregations during torpedo launches.
  - After the event, when practical, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.
- Wait Period:
  - 10 or 30 minutes (depending on fuel constraints of the platform).

TABLE 63—MITIGATION FOR SHIP SHOCK TRIALS

Stressor or Activity: Any NEW.

- Mitigation Zone:
  - 3.5 nmi (6.5 km) from the target ship hull (cease fire).
- Mitigation Requirements:
  - On the day of the event, 10 observers (Lookouts and third-party observers combined), spread between aircraft or multiple vessels as specified in the event-specific mitigation plan.
- Mitigation Requirement Timing:
  - Action Proponent personnel must develop a detailed, event-specific monitoring and mitigation plan in the year prior to the event and provide it to NMFS for review.
  - Beginning at first light on days of detonation, until the moment of detonation (as allowed by safety measures) Action Proponent personnel must observe the mitigation zone for marine mammals, floating vegetation, jellyfish aggregations, large schools of fish, and flocks of seabirds.
  - If any dead or injured marine mammals are observed after an individual detonation, Action Proponent personnel must follow established incident reporting procedures and halt any remaining detonations until Action Proponent personnel or third-party observers can consult with NMFS and review or adapt the event-specific mitigation plan, if necessary.
  - During the 2 days following the event (minimum) and up to 7 days following the event (maximum), and as specified in the event-specific mitigation plan, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals.
- Wait Period:
  - 30 minutes.

TABLE 64—MITIGATION FOR SINKING EXERCISES (SINKEX)

Stressor or Activity: Any NEW.

- Mitigation Zone:
  - 2.5 nmi (4.6 km) from the target ship hull (cease fire).
- Mitigation Requirements:
  - Two Lookouts: one on a vessel and one in an aircraft.
  - Conduct passive acoustic monitoring for marine mammals; use information from detections to assist visual observations.
- Mitigation Requirement Timing:
  - During aerial observations for 90 minutes prior to the initial start of weapon firing, Action Proponent personnel must observe the mitigation zone for marine mammals, floating vegetation, and jellyfish aggregations.
  - From the vessel during weapon firing, and from the aircraft and vessel immediately after planned or unplanned breaks in weapon firing of more than 2 hours, Action Proponent personnel must observe the mitigation zone for marine mammals.
  - Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals for 2 hours after sinking the vessel or until sunset, whichever comes first. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.
- Wait Period:
  - 30 minutes.

Activity-Based Mitigation for Non-Explosive Ordnance

Mitigation measures for non-explosive ordnance are provided below and include non-explosive aerial-deployed mines and bombs (table 65), non-explosive gunnery (table 66), and non-explosive missiles and rockets (table 67). Explosive aerial-deployed mines do not detonate upon contact with the water surface and are therefore considered non-explosive when mitigating the potential for a mine shape to strike a marine mammal at the water surface. Activity-based mitigation for non-explosive ordnance does not apply to non-explosive ordnance deployed:

(i) by aircraft operating at high altitudes;

(ii) against aerial targets;

(iii) during vessel-launched missile or rocket events; and

(iv) by unmanned platforms except when escort vessels are already participating in the event and have positive control over ordnance deployment.

TABLE 65—MITIGATION FOR NON-EXPLOSIVE AERIAL-DEPLOYED MINES AND BOMBS

Stressor or Activity: Non-explosive aerial-deployed mines and non-explosive bombs.

- Mitigation Zone:
  - 1,000 yd (914.4 m) from the intended target (cease fire).
- Mitigation Requirements:
  - One Lookout in an aircraft.
- Mitigation Requirement Timing:
  - Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of mine or bomb delivery (*e.g.,* when arriving on station).
  - Action Proponent personnel must observe the mitigation zone for marine mammals during mine or bomb delivery.
- Wait Period:
  - 10 minutes.

TABLE 66—MITIGATION FOR NON-EXPLOSIVE GUNNERY

Stressor or Activity: Non-explosive surface-to-surface large-caliber ordnance, non-explosive surface-to-surface and air-to-surface medium-caliber ordnance, non-explosive surface-to-surface and air-to-surface small-caliber ordnance.

- Mitigation Zone:
  - 200 yd (182.9 m) from the intended impact location (cease fire).
- Mitigation Requirements:
  - One Lookout on a vessel or in an aircraft.
- Mitigation Requirement Timing:
  - Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the start of gun firing (*e.g.,* while maneuvering on station).
  - Action Proponent personnel must observe the mitigation zone for marine mammals during gunnery firing.
- Wait Period:
  - 10 or 30 minutes (depending on fuel constraints of the platform).

TABLE 67—MITIGATION FOR NON-EXPLOSIVE MISSILES AND ROCKETS

Stressor or Activity: Non-explosives (air-to-surface).

- Mitigation Zone:
  - 900 yd (823 m) from the intended impact location (cease fire).
- Mitigation Requirements:
  - One Lookout in an aircraft.
- Mitigation Requirement Timing:
  - Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the start of missile or rocket delivery (*e.g.,* during a fly-over of the mitigation zone).
  - Action Proponent personnel must observe the mitigation zone for marine mammals during missile or rocket delivery.
- Wait Period:
  - 10 or 30 minutes (depending on fuel constraints of the platform).

Activity-Based Mitigation for Physical Disturbance and Strike Stressors

Mitigation measures for physical disturbance and strike stressors are provided below and include manned surface vessels (table 68), unmanned vehicles (table 69), and towed in-water devices (table 70).

TABLE 68—MITIGATION FOR MANNED SURFACE VESSELS

Stressor or Activity: Manned surface vessels, including surfaced submarines.

- Mitigation Zones:
  - Underway manned surface vessels must maneuver themselves (which may include reducing speed) to maintain the following distances as mission and circumstances allow:
    - 500 yd (457.2 m) from whales.
    - 200 yd (182.9 m) from other marine mammals.
- Mitigation Requirements:
  - One or more Lookouts on manned underway surface vessels in accordance with the most recent navigation safety instruction.
- Mitigation Requirement Timing:
  - Action Proponent personnel must observe the mitigation zone for marine mammals immediately prior to manned surface vessels getting underway and while underway.

TABLE 69—MITIGATION FOR UNMANNED VEHICLES

Stressor or Activity: Unmanned Surface Vehicles and Unmanned Underwater Vehicles already being escorted (and operated under positive control) by a manned surface support vessel.

- Mitigation Zones:
  - A surface support vessel that is already participating in the event, and has positive control over the unmanned vehicle, must maneuver the unmanned vehicle (which may include reducing its speed) to ensure it maintains the following distances as mission and circumstances allow:
    - 500 yd (457.2 m) from whales.
    - 200 yd (182.9 m) from other marine mammals.
- Mitigation Requirements:
  - One Lookout on a surface support vessel that is already participating in the event, and has positive control over the unmanned vehicle.
- Mitigation Requirement Timing:
  - Action Proponent personnel must observe the mitigation zone for marine mammals immediately prior to unmanned vehicles getting underway and while underway, the Lookout must observe.

TABLE 70—MITIGATION FOR TOWED IN-WATER DEVICES

Stressor or Activity: In-water devices towed by an aircraft, a manned surface vessel, or an Unmanned Surface Vehicle or Unmanned Underwater Vehicle already being escorted (and operated under positive control) by a manned surface vessel.
• Mitigation Zone: ○ Manned towing platforms, or surface support vessels already participating in the event that have positive control over an unmanned vehicle that is towing an in-water device, must maneuver itself or the unmanned vehicle (which may include reducing speed) to ensure towed in-water devices maintain the following distances as mission and circumstances allow: ▪ 250 yd (228.6 m) from marine mammals. • Mitigation Requirements: ○ One Lookout on the manned towing vessel, or on a surface support vessel that is already participating in the event and has positive control over an unmanned vehicle that is towing an in-water device. • Mitigation Requirement Timing: ○ Action Proponent personnel must observe the mitigation zone for marine mammals immediately prior to and while in-water devices are being towed.

Geographic Mitigation Areas

In addition to activity-based mitigation, the Action Proponents would implement mitigation measures within mitigation areas to avoid or minimize potential impacts on marine mammals (see figure 11.6–1 of the application). A full technical analysis of the mitigation areas that the Action Proponents considered for marine mammals is provided in section 5.7 (Geographic Mitigation) of the 2024 AFTT Draft Supplemental EIS/OEIS. The Action Proponents took into account public comments received on the 2018 AFTT Draft EIS/OEIS, the best available science, and the practicability of implementing additional mitigation measures and has enhanced its mitigation areas and mitigation measures beyond those that were included in the 2018–2025 regulations to further reduce impacts to marine mammals.

Information on the mitigation measures that the Action Proponents propose to implement within mitigation areas are provided in table 71 through table 78. The mitigation applies year-round unless specified otherwise in the tables.

NMFS conducted an independent analysis of the mitigation areas that the Action Proponent proposed, which are described below. NMFS preliminarily concurs with the Action Proponents' analysis, which indicates that the measures in these mitigation areas are both practicable and will reduce the likelihood, magnitude, or severity of adverse impacts to marine mammals or their habitat in the manner described in the Action Proponents' analysis and this rule. NMFS is heavily reliant on the Action Proponents' description of operational practicability, since the Action Proponents are best equipped to describe the degree to which a given mitigation measure affects personnel safety or mission effectiveness, and is practical to implement. The Action Proponents consider the measures in this proposed rule to be practicable, and NMFS concurs. We further discuss the manner in which the Geographic Mitigation Areas in the proposed rule will reduce the likelihood, magnitude, or severity of adverse impacts to marine mammal species or their habitat in the Preliminary Analysis and Negligible Impact Determination section.

Table 71 details geographic mitigation related to ship shock trials, which involve the use of explosives. Ship shock trials are conducted only within established ship shock trial boxes within the Gulf of America and overlapping the Jacksonville OPAREA. The boundaries of the mitigation areas match the boundaries of each ship shock trial box. Mitigation is a continuation of existing measures, except for new mitigation related to the location of the northern Gulf of America ship shock trial box as described in table 71.

TABLE 71—SHIP SHOCK TRIAL MITIGATION AREA

Category	Mitigation requirements	Mitigation benefits
Explosives	Navy personnel must not conduct ship shock trials within the portion of the ship shock trial box that overlaps the Jacksonville OPAREA from November 15 through April 15. Pre-event planning for ship shock trials must include the selection of one primary and two secondary sites (within one of the ship shock trial boxes) where marine mammal abundance is expected to be the lowest during an event, with the primary and secondary locations located more than 2 nmi (3.7 km) from the western boundary of the Gulf Stream for events planned within the portion of the ship shock trial box that overlaps the Jacksonville OPAREA. If Navy personnel determine during pre-event visual observations that the primary site is environmentally unsuitable (*e.g.,* continuous observations of marine mammals), they would evaluate the potential to move the event to one of the secondary sites in accordance with the event-specific mitigation and monitoring plan (see table 11.5–2 of the application for additional information).	Prior to being repositioned, the northern Gulf of America ship shock trial box overlapped the Rice's whale core distribution area. Preliminary Navy Acoustic Effects Model data indicated that Rice's whales would have potentially been exposed to AUD INJ, TTS, and behavioral impacts from explosives if events were to occur at that location. Navy personnel determined it would be practicable to reposition the ship shock trial box outside of the Rice's whale core distribution area, and into a new location that would avoid potential exposure of Rice's whales to injurious levels of sound. The repositioned ship shock trial box is now located off the Naval Surface Warfare Center, Panama City Division Testing Range's southern boundary. Mitigation to not conduct ship shock trials in the Jacksonville OPAREA from November 15 through April 15 is designed to avoid potential injurious and behavioral impacts on NARW during calving season. Mitigation to consider marine mammal abundance during pre-event planning, to prioritize locations that are more than 2 nmi (3.7 km) from the western boundary of the Gulf Stream (where marine mammals would be expected in greater concentrations for foraging and migration) when conducting ship shock trials in the boxes that overlap the Jacksonville OPAREA, and to evaluate the environmental suitability of the selected site based on pre-event observations, are collectively designed to reduce the number of individual marine mammals exposed, as well as the level of impact that could potentially be received by each animal.

TABLE 71—SHIP SHOCK TRIAL MITIGATION AREA—Continued

Category	Mitigation requirements	Mitigation benefits
		The benefits of the mitigation for Rice's whales, NARW, and other marine mammal species would be substantial because ship shock trials use the largest NEW of any explosive activity conducted under the Proposed Action.

Table 72 details geographic mitigation related to MTEs (*i.e.,* Composite Training Unit Exercises and Sustainment Exercises). Mitigation is a continuation of existing measures.

TABLE 72—MAJOR TRAINING EXERCISE PLANNING AWARENESS MITIGATION AREA

Category	Mitigation requirements	Mitigation benefits
Acoustic, Explosives, Physical disturbance and strike.	Northeast: Within Major Training Exercise Planning Awareness Mitigation Areas located in the Northeast (*i.e.,* the combined areas within the Gulf of Maine, over the continental shelves off Long Island, Rhode Island, Massachusetts, and Maine), the Action Proponents must not conduct any full or partial MTEs. Mid-Atlantic: Within Major Training Exercise Planning Awareness Mitigation Areas located in the Mid-Atlantic (*i.e.,* the combined areas off Maryland, Delaware, and North Carolina), the Action Proponents must avoid conducting any full or partial MTEs to the maximum extent practical, and must not conduct more than four full or partial MTEs per year.	Mitigation to prohibit or limit MTEs within regional planning mitigation areas is collectively designed to reduce the number of marine mammal species, and individuals within each species, that are exposed to potential impacts from active sonar during MTEs. The mitigation areas are situated among highly productive environments and persistent oceanographic features associated with upwelling, steep bathymetric contours, and canyons. The areas have high marine mammal densities, abundance, or concentrated use for feeding, reproduction, or migration. Mitigation benefits would be substantial because MTEs are conducted on a larger scale and with more hours of active sonar use than other types of active sonar events. Mitigation for the Northeast planning areas (including in the Gulf of Maine) is designed to prevent MTEs from occurring within NARW foraging critical habitat, across the shelf break in the northeast, on Georges Bank, and in areas that contain underwater canyons (*e.g.,* Hydrographer Canyon). These locations (including within a portion of the Northeast Canyons and Seamounts National Marine Monument) have been associated with high occurrences of marine mammal feeding, abundance, or mating for harbor porpoises and humpback, minke, sei, fin, and NARW. Mitigation for the Mid-Atlantic planning areas is designed to limit the number of MTEs that could occur within large swaths of shelf break that contain underwater canyons or other habitats (*e.g.,* Norfolk Canyon, part of the Cape Hatteras Special Research Area) associated with high marine mammal diversity in this region, including blue, fin, minke, sei, sperm, beaked, dwarf sperm, pygmy sperm, and humpback whales, as well as Risso's dolphins and other delphinid species. The planning areas also overlap NARW migration habitats.

Table 73 details geographic mitigation related to active sonar and explosives (and special reporting for their use), and physical disturbance and strike stressors off the northeastern United States. The mitigation area extent matches that of the NARW foraging critical habitat designated in 2016 (81 FR 4838, February 26, 2016). Mitigation is a continuation of existing measures, with clarification that requirements pertain to in-water stressors (*i.e.,* not activities with no potential marine mammal impacts, such as air-to-air activities). Mitigation is designed to protect individual NARW within their foraging critical habitat. Mitigation will also protect individuals of other species whose biologically significant habitats overlap the mitigation area, including harbor porpoises and humpback, minke, sei, and fin whales. Special reporting for the use of acoustics and explosives is also required for this area (see Proposed Reporting section for details).

TABLE 73—NORTHEAST NORTH ATLANTIC RIGHT WHALE MITIGATION AREA

Category	Mitigation requirements	Mitigation benefits
Acoustic	The Action Proponents must minimize the use of low-frequency active sonar, mid-frequency active sonar, and high-frequency active sonar in the mitigation area to the maximum extent practical.	Mitigation is designed to minimize exposure of NARW to sounds with potential for injury or behavioral impacts.
Explosives	The Action Proponents must not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) within the mitigation area. The Action Proponents must not detonate explosive sonobuoys within 3 nmi (5.6 km) of the mitigation area.	Mitigation is designed to prevent exposure of NARW to explosives with potential for injury, mortality, or behavioral impacts. Mitigation to prohibit explosive sonobuoys within 3 nmi (5.6 km) is designed to further prevent exposure to large and dispersed explosive sonobuoy fields.

TABLE 73—NORTHEAST NORTH ATLANTIC RIGHT WHALE MITIGATION AREA—Continued

Category	Mitigation requirements	Mitigation benefits
Physical disturbance and strike.	The Action Proponents must not use non-explosive bombs within the mitigation area. During non-explosive torpedoes events within the mitigation area: —The Action Proponents must conduct activities during daylight hours in Beaufort sea state 3 or less. —In addition to Lookouts required as described in section 11.5 of the application, the Action Proponents must post two Lookouts in an aircraft during dedicated aerial surveys, and one Lookout on the submarine participating in the event (when surfaced). Lookouts must begin conducting visual observations immediately prior to the start of an event. If floating vegetation or marine mammals are observed in the event vicinity, the event must not commence until the vicinity is clear or the event is relocated to an area where the vicinity is clear. Lookouts must continue to conduct visual observations during the event. If marine mammals are observed in the vicinity, the event must cease until one of the Mitigation Zone All-Clear Conditions has been met as described in section 11.5 of the application. —During transits and normal firing, surface ships must maintain a speed of no more than 10 kn (18.5 km/hr); during submarine target firing, surface ships must maintain speeds of no more than 18 kn (33.3 km/hr); and during vessel target firing, surface ship speeds may exceed 18 kn (33.3 km/hr) for brief periods of time (*e.g.,* 10–15 minutes). For vessel transits within the mitigation area: —The Action Proponents must conduct a web query or e-mail inquiry to the North Atlantic Right Whale Sighting Advisory System or WhaleMap (*https://whalemap.org/*) to obtain the latest NARW sightings data prior to transiting the mitigation area. The Action Proponents must provide Lookouts the sightings data prior to standing watch. Lookouts must use that data to help inform visual observations during vessel transits. Surface ships must implement speed reductions after observing a NARW, if transiting within 5 nmi (9.3 km) of a sighting reported to the North Atlantic Right Whale Sighting Advisory System within the past week, and when transiting at night or during periods of reduced visibility.	Mitigation to prohibit use of non-explosive bombs is designed to reduce the potential for NARW to be struck by non-explosive ordnance. Mitigation to conduct non-explosive torpedo activities during daylight hours in Beaufort sea state 3 or less, and to post additional Lookouts from aircraft (and submarines, when surfaced), is designed to improve marine mammal sightability during visual observations. Mitigation for vessels to obtain sightings information from the North Atlantic Right Whale Sighting Advisory System and implement speed reductions in certain circumstances is designed to reduce the potential for vessels to encounter NARW. The North Atlantic Right Whale Sighting Advisory System is a NOAA Northeast Fisheries Science Center program that collects sightings information off the northeastern United States from aerial surveys, shipboard surveys, whale watching vessels, and opportunistic sources, such as the Coast Guard, commercial ships, fishing vessels, and the public.

Table 74 details geographic mitigation related to active sonar and special reporting for the use of active sonar and in-water explosives within the Gulf of Maine. Mitigation is a continuation of existing measures. Special reporting for the use of acoustics and explosives is also required for this area (see Proposed Reporting section for details).

TABLE 74—GULF OF MAINE MARINE MAMMAL MITIGATION AREA

Category	Mitigation requirements	Mitigation benefits
Acoustic	The Action Proponents must not use more than 200 hours of surface ship hull-mounted mid-frequency active sonar annually within the mitigation area.	Mitigation is designed to reduce exposure of NARW to potentially injurious levels of sound from the type of active sonar with the highest source power used in the Study Area within foraging critical habitat designated by NMFS in 2016 (81 FR 4838, February 26, 2016) and additional sea space southward over Georges Bank.

Table 75 details geographic mitigation related to active sonar and explosives (and special reporting for their use), and physical disturbance and strike stressors in the Jacksonville OPAREA. Mitigation is a continuation of existing measures, with clarification that requirements pertain to in-water stressors (*i.e.,* not activities with no potential marine mammal impacts, such as air-to-air activities).

TABLE 75—JACKSONVILLE OPERATING AREA NORTH ATLANTIC RIGHT WHALE MITIGATION AREA

Category	Mitigation requirements	Mitigation benefits
Acoustic, explosives, and physical disturbance and vessel strike.	From November 15 to April 15 within the mitigation area, prior to vessel transits or military readiness activities involving active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or non-explosive ordnance deployed against surface targets (including aerial-deployed mines), the Action Proponents must initiate communication with Fleet Area Control and Surveillance Facility, Jacksonville to obtain Early Warning System data. The facility must advise of all reported NARW sightings in the vicinity of planned vessel transits and military readiness activities. —Sightings data must be used when planning event details (*e.g.,* timing, location, duration) to minimize interactions with NARW to the maximum extent practical.	Mitigation is designed to minimize potential NARW-vessel interactions and exposure to stressors with the potential for mortality, injury, or behavioral disturbance within the portions of the reproduction (calving) critical habitat designated by NMFS in 2016 (81 FR 4838) and important migration habitat that overlaps the Jacksonville OPAREA. The benefits of the mitigation would be substantial because the Jacksonville OPAREA is an Action Proponent concentration area within the southeastern region.

TABLE 75—JACKSONVILLE OPERATING AREA NORTH ATLANTIC RIGHT WHALE MITIGATION AREA—Continued

Category	Mitigation requirements	Mitigation benefits
	The Action Proponents must provide Lookouts the sightings data prior to standing watch to help inform visual observations.	

Table 76 details geographic mitigation related to active sonar and explosives (and special reporting for their use), and physical disturbance and strike stressors off the Southeastern U.S. Mitigation is a continuation of existing measures, with clarification that requirements pertain to the use of in-water stressors (*i.e.,* not activities with no potential marine mammal impacts, such as air-to-air activities). The mitigation area is the largest area practical to implement within the NARW reproduction critical habitat designated by NMFS in 2016 (81 FR 4838). Mitigation is designed to protect reproductive mothers, calves, and mother–calf pairs within the only known NARW calving habitat. Mitigation benefits would be substantial because the mitigation area encompasses the Georgia and northeastern Florida coastlines (where the highest seasonal concentrations occur) and coastal extent of the Jacksonville OPAREA (an Action Proponent concentration area). Special reporting for the use of acoustics and explosives is also required for this area (see Proposed Reporting section for details).

TABLE 76—SOUTHEAST NORTH ATLANTIC RIGHT WHALE MITIGATION AREA

Category	Mitigation requirements	Mitigation benefits
Acoustic	From November 15 to April 15 within the mitigation area, the Action Proponents must not use high-frequency active sonar; or low-frequency or mid-frequency active sonar except: —To the maximum extent practical, the Action Proponents must minimize use of (1) helicopter dipping sonar (a mid-frequency active sonar source) and (2) low-frequency or surface ship hull-mounted mid-frequency active sonar during navigation training or object detection.	Mitigation is designed to minimize exposure to levels of sound that have the potential to cause injurious or behavioral impacts.
Explosives	From November 15 to April 15 within the mitigation area, the Action Proponents must not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets).	Mitigation is designed to prevent exposure to explosives with the potential for injury, mortality, or behavioral disturbance.
Physical disturbance and vessel strike.	From November 15 to April 15 within the mitigation area, the Action Proponents must not deploy non-explosive ordnance against surface targets (including aerial-deployed mines). From November 15 to April 15 within the mitigation area, surface ships must minimize north-south transits to the maximum extent practical, and must implement speed reductions after they observe a NARW, if they are within 5 nmi (9.3 km) of an Early Warning System sighting reported within the past 12 hours, and at night and in poor visibility.	Mitigation is designed to prevent strikes by non-explosive ordnance, and to decrease the potential for vessel strikes. North-south transit restrictions are designed to reduce the time ships spend in the highest seasonal occurrence areas to further decrease vessel strike risk.
Acoustic, explosives, and physical disturbance and vessel strike.	From November 15 to April 15 within the mitigation area, prior to vessel transits or military readiness activities involving active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or non-explosive ordnance deployed against surface targets (including aerial-deployed mines), the Action Proponents must initiate communication with Fleet Area Control and Surveillance Facility, Jacksonville to obtain Early Warning System sightings data. The facility must advise of all reported NARW sightings in the vicinity of planned vessel transits and military readiness activities. The Action Proponents must provide Lookouts the sightings data prior to standing watch to help inform visual observations.	Mitigation is designed to minimize potential vessel interactions and exposure to stressors with the potential for mortality, injury, or behavioral disturbance.

Table 77 details geographic mitigation related to active sonar, explosives, and physical disturbance and strike stressors off the U.S. east coast to the boundary of the U.S. EEZ. Mitigation is a continuation of existing measures, with clarification that requirements pertain to the use of in-water stressors (*i.e.,* not activities with no potential marine mammal impacts, such as air-to-air activities).

TABLE 77—DYNAMIC NORTH ATLANTIC RIGHT WHALE MITIGATION AREAS

Category	Mitigation requirements	Mitigation benefits
Acoustic, explosives, and physical disturbance and vessel strike.	The applicable dates and locations of this mitigation area must correspond with NMFS' Dynamic Management Areas, which fluctuate throughout the year based on the locations and timing of confirmed NARW detections. The Action Proponents must provide NARW Dynamic Management Area information (*e.g.,* location and dates) to applicable assets transiting and training or testing in the vicinity of the Dynamic Management Area. —The broadcast awareness notification messages must alert assets (and their Lookouts) to the possible presence of NARW in their vicinity.	The mitigation area extent matches the boundary of the U.S. EEZ on the East Coast, which is the full extent of where Dynamic Management Areas could potentially be established year-round. NMFS manages the Dynamic Management Areas program off the U.S. East Coast with the primary goal of reducing the likelihood of NARW vessel strikes from all mariners. Mitigation is designed to minimize potential NARW vessel interactions and exposure to acoustic stressors, explosives, and physical disturbance and strike stressors that have the potential to cause mortality, injury, or behavioral disturbance.

TABLE 77—DYNAMIC NORTH ATLANTIC RIGHT WHALE MITIGATION AREAS—Continued

Category	Mitigation requirements	Mitigation benefits
	Lookouts must use the information to help inform visual observations during military readiness activities that involve vessel movements, active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or non-explosive ordnance deployed against surface targets in the mitigation area.	

Table 78 details geographic mitigation related to active sonar and explosives (and special reporting for their use) in the northeastern Gulf of America. Mitigation is a continuation of existing measures. The mitigation area extent aligns with this species' small and resident population area identified by NMFS in its 2016 status review (Rosel *et al.,* 2016). Special reporting for the use of acoustics and explosives is also required for this area (see Proposed Reporting section for details).

TABLE 78—RICE'S WHALE MITIGATION AREA

Category	Mitigation requirements	Mitigation benefits
Acoustic	The Action Proponents must not use more than 200 hours of surface ship hull-mounted mid-frequency active sonar annually within the mitigation area.	Mitigation is designed to reduce exposure of individuals within the small and resident population of Rice's whales to potentially injurious levels of sound by the type of active sonar with the highest source power used in the Study Area.
Explosives	Except during mine warfare activities, the Action Proponents must not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) within the mitigation area.	Mitigation is designed to reduce exposure of individuals within the small and resident population of Rice's whales to explosives that have the potential to cause injury, mortality, or behavioral disturbance.

Mitigation Conclusions

NMFS has carefully evaluated the Action Proponents' proposed mitigation measures—many of which were developed with NMFS' input during the previous phases of AFTT authorizations but several of which are new since implementation of the 2018 to 2025 regulations—and considered a broad range of other measures (*i.e.,* the measures considered but eliminated in the 2018 AFTT Final EIS/OEIS, which reflect many of the comments that have arisen from public input or through discussion with NMFS in past years) in the context of ensuring that NMFS prescribes the means of effecting the least practicable adverse impact on the affected marine mammal species and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another: the manner in which, and the degree to which, the successful implementation of the mitigation measures is expected to reduce the likelihood and/or magnitude of adverse impacts to marine mammal species and their habitat; the proven or likely efficacy of the measures; and the practicability of the measures for applicant implementation, including consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

Based on our evaluation of the Action Proponents' proposed measures, as well as other measures considered by the Action Proponents and NMFS (see section 5.9 (Measures Considered but Eliminated) of chapter 5 (Mitigation) of the 2024 AFTT Draft Supplemental EIS/OEIS), NMFS has preliminarily determined that these proposed mitigation measures are appropriate means of effecting the least practicable adverse impact on marine mammal species and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and considering specifically personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity. Additionally, an adaptive management component helps further ensure that mitigation is regularly assessed and provides a mechanism to improve the mitigation, based on the factors above, through modification as appropriate.

The proposed rule comment period provides the public an opportunity to submit recommendations, views, and/or concerns regarding the Action Proponents' activities and the proposed mitigation measures. While NMFS has preliminarily determined that the Action Proponents' proposed mitigation measures would effect the least practicable adverse impact on the affected species and their habitat, NMFS will consider all public comments to help inform our final determination. Consequently, proposed mitigation measures may be refined, modified, removed, or added prior to the issuance of the final rule based on public comments received and, as appropriate, analysis of additional potential mitigation measures.

Proposed Monitoring

Section 101(a)(5)(A) of the MMPA states that in order to authorize incidental take for an activity, NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for incidental take authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present.

Although the Navy has been conducting research and monitoring for over 20 years in areas where it has been training, it developed a formal marine species monitoring program in support of the AFTT Study Area MMPA and ESA processes in 2009. Across all Navy training and testing study areas, the robust marine species monitoring program has resulted in hundreds of technical reports and publications on marine mammals that have informed Navy and NMFS analyses in environmental planning documents, rules, and Biological Opinions. The reports are made available to the public on the Navy's marine species monitoring website (*www.navymarinespeciesmonitoring.us*) and the data on the Ocean Biogeographic Information System

Spatial Ecological Analysis of Megavertebrate Populations (OBIS–SEAMAP) (*https://seamap.env.duke.edu/*).

The Navy would continue collecting monitoring data to inform our understanding of the occurrence of marine mammals in the AFTT Study Area; the likely exposure of marine mammals to stressors of concern in the AFTT Study Area; the response of marine mammals to exposures to stressors; the consequences of a particular marine mammal response to their individual fitness and, ultimately, populations; and the effectiveness of implemented mitigation measures. Taken together, mitigation and monitoring comprise the Navy's integrated approach for reducing environmental impacts from the specified activities. The Navy's overall monitoring approach seeks to leverage and build on existing research efforts whenever possible.

As agreed upon between the Action Proponents and NMFS, the monitoring measures presented here, as well as the mitigation measures described above, focus on the protection and management of potentially affected marine mammals. A well-designed monitoring program can provide important feedback for validating assumptions made in analyses and allow for adaptive management of marine mammals and their habitat, and other marine resources. Monitoring is required under the MMPA, and details of the monitoring program for the specified activities have been developed through coordination between NMFS and the Action Proponents through the regulatory process for previous Navy at-sea training and testing activities.

Navy Marine Species Research and Monitoring Strategic Framework

The initial structure for the U.S. Navy's marine species monitoring efforts was developed in 2009 with the Integrated Comprehensive Monitoring Program (ICMP). The intent of the ICMP was to provide an overarching framework for coordination of the Navy's monitoring efforts during the early years of the program's establishment. A Strategic Planning Process (U.S. Department of the Navy, 2013) was subsequently developed and together with the ICMP framework serves as a planning tool to focus marine species monitoring priorities defined by ESA and MMPA requirements, and to coordinate monitoring efforts across regions based on a set of common objectives. Using an underlying conceptual framework incorporating a progression of knowledge from occurrence to exposure/response, and ultimately consequences, the Strategic Planning Process was developed as a tool to help guide the investment of resources to address top level objectives and goals of the monitoring program most efficiently. The Strategic Planning Process identifies Intermediate Scientific Objectives, which form the basis of evaluating, prioritizing, and selecting new monitoring projects or investment topics and serve as the basis for developing and executing new monitoring projects across the Navy's training and testing ranges (both Atlantic and Pacific).

Monitoring activities relating to the effects of military readiness activities on marine species are generally designed address one or more of the following top-level goals:

(i) An increase in the understanding of the likely occurrence of marine mammals and ESA-listed marine species in the vicinity of the action (*i.e.,* presence, abundance, distribution, and density);

(ii) An increase in the understanding of the nature, scope, or context of the likely exposure of marine mammals and ESA-listed species to any of the potential stressors associated with the action (*e.g.,* sound, explosive detonation, or military expended materials), through better understanding of one or more of the following:

A. The nature of the action and its surrounding environment (*e.g.,* sound-source characterization, propagation, and ambient noise levels),

B. The affected species (*e.g.,* life history or dive patterns),

C. The likely co-occurrence of marine mammals and ESA-listed marine species with the action (in whole or part), or

D. The likely biological or behavioral context of exposure to the stressor for the marine mammal and ESA-listed marine species (*e.g.,* age class of exposed animals or known pupping, calving, or feeding areas).

(iii) An increase in the understanding of how individual marine mammals or ESA-listed marine species respond (behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible (*e.g.,* at what distance or received level)).

(iv) An increase in the understanding of how anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either:

A. The long-term fitness and survival of an individual; or

B. The population, species, or stock (*e.g.,* through impacts on annual rates of recruitment or survival).

(v) An increase in the understanding of the effectiveness of mitigation and monitoring measures.

(vi) A better understanding and record of the manner in which the authorized entity complies with the Incidental Take Authorization and Incidental Take Statement.

(vii) An increase in the probability of detecting marine mammals (through improved technology or methods), both specifically within the mitigation zone (thus allowing for more effective implementation of the mitigation) and in general, to better achieve the above goals; and

(viii) Ensuring that adverse impact of activities remains at the least practicable level.

The Navy's Marine Species Monitoring Program investments are evaluated through the Adaptive Management Review process to (1) assess overall progress, (2) review goals and objectives, and (3) make recommendations for refinement and evolution of the monitoring program's focus and direction. The Marine Species Monitoring Program has developed and matured significantly since its inception and now supports a portfolio of several dozen active projects across a range of geographic areas and protected species taxa addressing both regional priorities (*i.e.,* particular species of concern), and Navy-wide needs such as the behavioral response of beaked whales to training and testing activities.

A Research and Monitoring Summit was held in early 2023 to evaluate the current state of the Marine Species Monitoring Program in terms of progress, objectives, priorities, and needs, and to solicit valuable input from meeting participants including NMFS, Marine Mammal Commission, Navy, and scientific experts. The overarching goal of the summit was to facilitate updating the ICMP framework for guiding marine species research and monitoring investments, and to identify data gaps and priorities to be addressed over the next 5–10 years across a range of basic research through applied monitoring. One of the outcomes of this summit meeting is a refreshed strategic framework effectively replacing the ICMP which will provide increased coordination and synergy across the Navy's protected marine species investment programs (see section 13.1 of the application). This will contribute to the collective goal of supporting improved assessment of effects from training and testing activities through development of first in class science and data.

Past and Current Action Proponent Monitoring in the AFTT Study Area

The Navy's monitoring program has undergone significant changes since the first rule was issued for the AFTT Study Area in 2008 through the process of adaptive management. The monitoring program developed for the first cycle of environmental compliance documents (*e.g.,* U.S. Department of the Navy, 2008a, 2008b) utilized effort-based compliance metrics that were somewhat limiting. Through adaptive management discussions, the Navy designed and conducted monitoring studies according to scientific objectives and eliminated specific effort requirements.

Progress has also been made on the conceptual framework categories from the Scientific Advisory Group for Navy Marine Species Monitoring (U.S. Department of the Navy, 2011), ranging from occurrence of animals, to their exposure, response, and population consequences. The Navy continues to manage the Atlantic and Pacific program as a whole, with monitoring in each range complex taking a slightly different but complementary approach. The Navy has continued to use the approach of layering multiple simultaneous components in many of the range complexes to leverage an increase in return of the progress toward answering scientific monitoring questions. This includes in the AFTT Study Area, for example, (a) Analysis of Acoustic Ecology of North Atlantic Shelf Break Cetaceans and Effects of Anthropogenic Noise Impacts; (b) Mid-Atlantic Nearshore and Mid-shelf Baleen Whale Monitoring; (c) Atlantic Behavioral Response Study; and (d) Occurrence of Rice's Whale in the Northeastern Gulf of America.

Numerous publications, dissertations, and conference presentations have resulted from research conducted under the marine species monitoring program (*https://www.navymarinespeciesmonitoring.us/reading-room/*), leading to a significant contribution to the body of marine mammal science. Publications on occurrence, distribution, and density have fed the modeling input, and publications on exposure and response have informed Navy and NMFS analysis of behavioral response and consideration of mitigation measures.

Furthermore, collaboration between the monitoring program and the Navy's research and development (*e.g.,* the ONR) and demonstration-validation (*e.g.,* Living Marine Resources (LMR)) programs has been strengthened, leading to research tools and products that have already transitioned to the monitoring program. These include Marine Mammal Monitoring on Ranges, controlled exposure experiment behavioral response studies, acoustic sea glider surveys, and global positioning system-enabled satellite tags. Recent progress has been made with better integration with monitoring across all Navy at-sea study areas, including the AFTT Study Area and various other ranges. Publications from the LMR and ONR programs have also resulted in significant contributions to hearing, acoustic criteria used in effects modeling, exposure, and response, as well as in developing tools to assess biological significance (*e.g.,* consequences).

NMFS and the Navy also consider data collected during mitigations as monitoring. Data are collected by shipboard personnel on hours spent training, hours of observation, hours of sonar, and marine mammals observed within the mitigation zones when mitigations are implemented. These data are provided to NMFS in both classified and unclassified annual exercise reports, which would continue under this proposed rule.

NMFS has received multiple years' worth of annual exercise and monitoring reports addressing active sonar use and explosive detonations within the AFTT Study Area and other Navy range complexes. The data and information contained in these reports have been considered in developing mitigation and monitoring measures for the proposed military readiness activities within the AFTT Study Area. The Navy's annual exercise and monitoring reports may be viewed at: *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-military-readiness-activities* and *https://www.navymarinespeciesmonitoring.us/reporting/.*

The Navy's marine species monitoring program supports several monitoring projects in the AFTT Study Area at any given time. Additional details on the scientific objectives for each project can be found at: *https://www.navymarinespeciesmonitoring.us/regions/atlantic/current-projects/.* Projects can be either major multi-year efforts, or 1 to 2-year special studies. The emphasis on monitoring in the AFTT Study Area is to improve understanding of the occurrence and distribution of protected marine species within the AFTT Study Area, improve understanding of their exposure and response to sonar and explosives training and testing activities, and ultimately inform decision makers of the consequences of that exposure.

Specific monitoring under the 2018–2025 regulations included the following projects:

(i) Atlantic Behavioral Response Study;

(ii) Behavioral Response Analysis of Two Populations of Short-Finned Pilot Whales to Mid-Frequency Active Sonar;

(iii) Behavioral Response of Humpback Whales to Vessel Traffic;

(iv) Analysis of Acoustic Ecology of North Atlantic Shelf Break Cetaceans and Effects of Anthropogenic Noise Impacts;

(v) North Atlantic Right Whale Monitoring, Conservation, and Protection;

(vi) Atlantic Marine Assessment Program for Protected Species (AMAPPS);

(vii) Haul-Out Counts and Photo-Identification of Pinnipeds in Virginia;

(viii) Time-lapse Camera Surveys of Pinnipeds in Southeastern Virginia;

(ix) Pinniped Monitoring in the Northeast;

(x) Jacksonville Shallow Water Training Range Vessel Surveys;

(xi) Mid-Atlantic Autonomous Passive Acoustic Monitoring;

(xii) Mid-Atlantic Nearshore & Mid-shelf Baleen Whale Monitoring;

(xiii) Mid-Atlantic Offshore Cetacean Study; and

(xiv) Occurrence of Rice's Whale in the Northeastern Gulf of America.

Future monitoring efforts by the Action Proponents in the AFTT Study Area are anticipated to continue along the same objectives: establish the baseline habitat uses and movement patterns; establish the baseline behavior (foraging, dive patterns, *etc.*); evaluate potential exposure and behavioral responses of marine mammals exposed to training and testing activities, and support conservation and management of NARWs.

Currently planned monitoring projects and their Intermediate Scientific Objective for the 2025–2032 rule are listed below, many of which are continuations of projects currently underway. Other than those ongoing projects, monitoring projects are typically planned one year in advance; therefore, this list does not include all projects that will occur over the entire period of the rule.

(i) Atlantic Behavioral Response Study (ongoing)—The objective is to evaluate behavioral responses of marine mammals exposed to Navy training and testing activities.

(ii) Behavioral Response Analysis of Two Populations of Short-Finned Pilot Whales to Mid-Frequency Active Sonar (ongoing)—The objective is to evaluate behavioral responses of marine mammals exposed to Navy training and testing activities.

(iii) Analysis of Acoustic Ecology of North Atlantic Shelf Break Cetaceans and Effects of Anthropogenic Noise Impacts (ongoing)—The objectives are to (1) establish the baseline vocalization behavior of marine mammals where Navy training and testing activities occur; and (2) evaluate trends in distribution and abundance of populations that are regularly exposed to sonar and underwater explosives.

(iv) North Atlantic Right Whale Monitoring, Conservation, and Protection (ongoing)—The objectives are to (1) Establish the baseline habitat uses and movement patterns of marine mammals where Navy training and testing activities occur; and (2) establish the baseline behavior (foraging, dive patterns, *etc.*) of marine mammals where Navy training and testing activities occur.

(v) Haul-Out Counts and Photo-Identification of Pinnipeds in Virginia (ongoing)—The objectives are to (1) estimate the density of marine mammals and sea turtles in Navy range complexes and in specific training areas; (2) establish the baseline habitat uses and movement patterns of marine mammals and sea turtles where Navy training and testing activities occur; and (3) evaluate trends in distribution and abundance of populations that are regularly exposed to sonar and underwater explosives.

(vi) Time-lapse Camera Surveys of Pinnipeds in Southeastern Virginia (ongoing)—The objectives are to (1) estimate the density of marine mammals and sea turtles in Navy range complexes and in specific training areas; (2) establish the baseline habitat uses and movement patterns of marine mammals and sea turtles where Navy training and testing activities occur; and (3) evaluate trends in distribution and abundance of populations that are regularly exposed to sonar and underwater explosives.

(vii) Jacksonville Shallow Water Training Range Vessel Surveys (ongoing)—The objectives are to (1) establish the baseline habitat uses and movement patterns of marine mammals and sea turtles where Navy training and testing activities occur; (2) determine what populations of marine mammals are exposed to Navy training and testing activities; and (3) evaluate trends in distribution and abundance of populations that are regularly exposed to Navy training and testing activities.

(viii) Mid-Atlantic Autonomous Passive Acoustic Monitoring (ongoing)—The objectives are to (1) establish the baseline habitat uses and movement patterns of marine mammals where Navy training and testing activities occur; and (2) establish the baseline behavior (foraging, dive patterns, *etc.*) of marine mammals where Navy training and testing activities occur.

(ix) Mid-Atlantic Nearshore & Mid-shelf Baleen Whale Monitoring (ongoing)—The objectives are to (1) establish the baseline habitat uses and movement patterns of marine mammals where Navy training and testing activities occur; (2) establish the baseline behavior (foraging, dive patterns, *etc.*) of marine mammals where Navy training and testing activities occur; and (3) support conservation and management of North Atlantic right whales.

(x) Mid-Atlantic Offshore Cetacean Study (ongoing)—The objectives are to (1) establish the baseline habitat uses and movement patterns of marine mammals where Navy training and testing activities occur; and (2) establish the baseline behavior (foraging, dive patterns, *etc.*) of marine mammals where Navy training and testing activities occur.

Adaptive Management

The proposed regulations governing the take of marine mammals incidental to military readiness activities in the AFTT Study Area contain an adaptive management component. Our understanding of the effects of military readiness activities (*e.g.,* acoustic and explosive stressors) on marine mammals continues to evolve, which makes the inclusion of an adaptive management component both valuable and necessary within the context of 7-year regulations.

The reporting requirements associated with this rule are designed to provide NMFS with monitoring data from the previous year to allow NMFS to consider whether any changes to existing mitigation and monitoring requirements are appropriate. The use of adaptive management allows NMFS to consider new information from different sources to determine (with input from the Action Proponents regarding practicability) on an annual or biennial basis if mitigation or monitoring measures should be modified (including additions or deletions). Mitigation measures could be modified if new data suggests that such modifications would have a reasonable likelihood of more effectively accomplishing the goals of the mitigation and monitoring and if the measures are practicable. If the modifications to the mitigation, monitoring, or reporting measures are substantial, NMFS would publish a notice of the planned LOAs in the **Federal Register** and solicit public comment.

The following are some of the possible sources of applicable data to be considered through the adaptive management process: (1) Results from monitoring and exercise reports, as required by MMPA authorizations; (2) compiled results of Navy-funded research and development studies; (3) results from specific stranding investigations; (4) results from general marine mammal and sound research; and (5) any information which reveals that marine mammals may have been taken in a manner, extent, or number not authorized by these regulations or subsequent LOAs. The results from monitoring reports and other studies may be viewed at *https://www.navymarinespeciesmonitoring.us.*

Proposed Reporting

In order to issue incidental take authorization for an activity, section 101(a)(5)(A) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring. Reports from individual monitoring events, results of analyses, publications, and periodic progress reports for specific monitoring projects will be posted to the Navy's Marine Species Monitoring web portal: *https://www.navymarinespeciesmonitoring.us.*

There are several different reporting requirements for the Navy pursuant to the current regulations. All of these reporting requirements would be continued for the Navy under this proposed rule for the 7-year period.

Special Reporting for Geographic Mitigation Areas

The following sections describe special reporting for geographic mitigation areas that the Action Proponents must include in the Annual AFTT Training and Testing Reports. Special reporting for these areas is designed to aid the Action Proponents and NMFS in continuing to analyze potential impacts of training and testing in the mitigation areas. In addition to the mitigation area-specific requirements described below, for all mitigation areas, should national security require the Action Proponents to exceed the activity restrictions in a given mitigation area, Action Proponent personnel must provide NMFS with advance notification and include the information (*e.g.,* sonar hours, explosives usage, or restricted area use) in its annual activity reports submitted to NMFS.

Northeast North Atlantic Right Whale Mitigation Area

The Action Proponents must report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used in the mitigation area.

Gulf of Maine Marine Mammal Mitigation Area

The Action Proponents must report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used in the mitigation area.

Southeast North Atlantic Right Whale Mitigation Area

The Action Proponents must report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used in the mitigation area from November 15 to April 15.

Southeast North Atlantic Right Whale Special Reporting Mitigation Area

The Action Proponents must report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used within the mitigation area from November 15 to April 15. The mitigation area extent aligns with the boundaries of the North Atlantic right whale critical habitat for reproduction designated by NMFS in 2016 (81 FR 4838, January 27, 2016).

Rice's Whale Mitigation Area

The Action Proponents must report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used in the mitigation area.

Notification of Injured, Live Stranded, or Dead Marine Mammals

The Action Proponents would consult the Notification and Reporting Plan, which sets out notification, reporting, and other requirements when injured, live stranded, or dead marine mammals are detected. The Notification and Reporting Plan is available for review at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-military-readiness-activities.*

Annual AFTT Study Area Marine Species Monitoring Report

The Action Proponents would submit an annual AFTT Study Area marine species monitoring report describing the implementation and results from the previous calendar year. Data collection methods will be standardized across range complexes and the AFTT Study Area to allow for comparison in different geographic locations. The draft report must be submitted to the Director of the Office of Protected Resources of NMFS annually as specified in the LOAs. NMFS will submit comments or questions on the report, if any, within 3 months of receipt. The report will be considered final after the Action Proponents have addressed NMFS' comments, or 3 months after submittal of the draft if NMFS does not provide comments on the draft report. The report would describe progress of knowledge made with respect to intermediate scientific objectives within the AFTT Study Area associated with the ICMP. Similar study questions would be treated together so that progress on each topic can be summarized across all Navy ranges. The report need not include analyses and content that do not provide direct assessment of cumulative progress on the monitoring plan study questions.

Annual AFTT Training and Testing Reports

In the event that the analyzed sound levels were exceeded, the Action Proponents would submit a preliminary report(s) detailing the exceedance within 21 days after the anniversary date of issuance of the LOAs. Regardless of whether analyzed sound levels were exceeded, the Navy would submit a detailed report (AFTT Annual Training Exercise Report and Testing Activity Report) and Coast Guard would submit a detailed report (AFTT Annual Training Exercise Report) to NMFS annually as specified in the LOAs. NMFS will submit comments or questions on the reports, if any, within 1 month of receipt. The reports will be considered final after the Action Proponents have addressed NMFS' comments, or 1 month after submittal of the drafts if NMFS does not provide comments on the draft reports. The annual report shall contain information on MTEs, ship shock trials, SINKEX events, and a summary of all sound sources used (total hours or quantity (per the LOA)) of each bin of sonar or other non-impulsive source; total annual number of each type of explosive exercises; and total annual expended/detonated rounds (missiles, bombs, sonobuoys, *etc.*) for each explosive bin). The annual reports will also contain cumulative sonar and explosive use quantity from previous years' reports through the current year. Additionally, if there were any changes to the sound source allowance in the reporting year, or cumulatively, the reports would include a discussion of why the change was made and include analysis to support how the change did or did not affect the analysis in the 2024 AFTT Draft Supplemental EIS/OEIS and MMPA final rule. The annual reports would also include the details regarding specific requirements associated with specific mitigation areas. The analysis in the detailed report would be based on the accumulation of data from the current year's report and data collected from previous annual reports. The detailed reports shall also contain special reporting for the Northeast North Atlantic Right Whale Mitigation Area, Gulf of Maine Marine Mammal Mitigation Area, Southeast North Atlantic Right Whale Mitigation Area, and Rice's Whale Mitigation Area, as described in the LOAs.

Other Reporting and Coordination

The Action Proponents would continue to report and coordinate with NMFS for the following:

(i) Annual marine species monitoring technical review meetings that also include researchers and the Marine Mammal Commission; and

(ii) Annual Adaptive Management meetings that also include the Marine Mammal Commission (and could occur in conjunction with the annual marine species monitoring technical review meetings).

Preliminary Analysis and Negligible Impact Determination

General Negligible Impact Analysis

Introduction

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.,* population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be taken by Level A harassment or Level B harassment (as presented in table 35, table 36, and table 37), NMFS considers other factors, such as the likely nature of any responses (*e.g.,* intensity, duration) and the context of any responses (*e.g.,* critical reproductive time or location, migration), as well as effects on habitat and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS' implementing regulations (54 FR 40338, September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.,* as reflected in the regulatory status of the species, population size and growth rate where known, other ongoing sources of human-caused mortality, and ambient noise levels).

In the Estimated Take of Marine Mammals section, we identified the subset of potential effects that would be expected to rise to the level of takes both annually and over the 7-year period covered by this proposed rule, and then identified the maximum number of takes we believe could occur (mortality) or are reasonably expected to occur (harassment) based on the methods described. The impact that any given take will have is dependent on many case-specific factors that need to be considered in the negligible impact analysis (*e.g.,* the context of behavioral exposures such as duration or intensity of a disturbance, the health of impacted animals, the status of a species that incurs fitness-level impacts to individuals, *etc.*). For this proposed rule we evaluated the likely impacts of the enumerated maximum number of harassment takes that are proposed for authorization and reasonably expected to occur, in the context of the specific circumstances surrounding these predicted takes. We also include a specific assessment of serious injury or mortality (hereafter referred to as M/SI) takes that could occur, as well as consideration of the traits and statuses of the affected species and stocks. Last, we collectively evaluated this information, as well as other more taxa-specific information and mitigation measure effectiveness, in group-specific assessments that support our negligible impact conclusions for each stock or species. Because all of the Action Proponents' specified activities would occur within the ranges of the marine mammal stocks identified in the rule, all negligible impact analyses and determinations are at the stock level (*i.e.,* additional species-level determinations are not needed).

Harassment

The specified activities reflect representative levels of military readiness activities. The Description of the Proposed Activity section describes annual activities. There may be some flexibility in the exact number of hours, items, or detonations that may vary from year to year, but take totals would not exceed the maximum annual totals and 7-year totals indicated in table 35, table 36, and table 37. We base our analysis and negligible impact determination on the maximum number of takes that would be reasonably expected to occur annually and are proposed to be authorized, although, as stated before, the number of takes are only one part of the analysis, which includes extensive qualitative consideration of other contextual factors that influence the degree of impact of the takes on the affected individuals. To avoid repetition, we provide some general analysis immediately below that applies to all the species listed in table 35, table 36, and table 37, given that some of the anticipated effects of the Action Proponents' military readiness activities on marine mammals are expected to be relatively similar in nature. Below that, we provide additional information specific to Mysticetes, Odontocetes, and Pinnipeds and, finally, break our analysis into species (and/or stocks), or groups of species (and the associated stocks) where relevant similarities exist, to provide more specific information related to the anticipated effects on individuals of a specific stock or where there is information about the status or structure of any species that would lead to a differing assessment of the effects on the species or stock. Organizing our analysis by grouping species or stocks that share common traits or that will respond similarly to effects of the Action Proponents' activities and then providing species- or stock-specific information allows us to avoid duplication while assuring that we have analyzed the effects of the specified activities on each affected species or stock.

The Action Proponents' harassment take request is based on one model for pile driving, and a second model (NAEMO) for all other acoustic stressors, which NMFS reviewed and concurs appropriately estimate the maximum amount of harassment that is reasonably likely to occur. As described in more detail above, NAEMO calculates sound energy propagation from sonar and other transducers, air guns, and explosives during military readiness activities; the sound or impulse received by animat dosimeters representing marine mammals distributed in the area around the modeled activity; and whether the sound or impulse energy received by a marine mammal exceeds the thresholds for effects. Assumptions in the Navy models intentionally err on the side of overestimation when there are unknowns. The effects of the specified activities are modeled as though they would occur regardless of proximity to marine mammals, meaning that no activity-based mitigation is considered (*e.g.,* no power down or shut down). However, the modeling does quantitatively consider the possibility that marine mammals would avoid continued or repeated sound exposures to some degree, based on a species' sensitivity to behavioral disturbance. Additionally, the sonar modeling reflects some, but not all, of the geographic mitigation measures. NMFS provided input to, independently reviewed, and concurred with the Action Proponents on this process and the Action Proponents' analysis, which is described in detail in section 6 of the application, was used to quantify harassment takes for this rule.

The Action Proponents and NMFS anticipate more severe effects from takes resulting from exposure to higher received levels (though this is in no way a strictly linear relationship for behavioral effects throughout species, individuals, or circumstances) and less severe effects from takes resulting from exposure to lower received levels. However, there is also growing evidence of the importance of distance in predicting marine mammal behavioral response to sound—*i.e.,* sounds of a similar level emanating from a more distant source have been shown to be less likely to elicit a response of equal magnitude (DeRuiter 2012). The estimated number of takes by Level A harassment and Level B harassment does not equate to the number of individual animals the Action Proponents expect to harass (which is lower), but rather to the instances of take (*i.e.,* exposures above the Level A harassment and Level B harassment threshold) that are anticipated to occur over the 7-year period. These instances may represent either brief exposures (seconds or minutes) or, in some cases, longer durations of exposure within a day. In some cases, an animal that incurs a single take by AUD INJ or TTS may also experience a direct behavioral harassment from the same exposure. Some individuals may experience multiple instances of take (meaning over multiple days) over the course of the year, which means that the number of individuals taken is smaller than the total estimated takes. Generally speaking, the higher the number of takes as compared to the population abundance, the more repeated takes of individuals are likely, and the higher the actual percentage of individuals in the population that are likely taken at least once in a year. We look at this comparative metric (number of takes to population abundance) to give us a relative sense of where a larger portion of a species is being taken by the specified activities, where there is a likelihood that the same individuals are being taken across multiple days, and whether the number of days might be higher or more likely sequential. Where the number of instances of take is less than 100 percent of the abundance, and there is no information to specifically suggest that some subset of animals is known to congregate in an area in which activities are regularly occurring (*e.g.,* a small resident population, takes occurring in a known important area such as a BIA, or a large portion of the takes occurring in a certain region and season), the overall likelihood and number of repeated takes is generally considered low, as it could, on one extreme, mean that every take represents a separate individual in the population being taken on one day (a minimal impact to an individual) or, more likely, that some smaller number of individuals are taken on one day annually and some are taken on a few, not likely sequential, days annually, and of course some are not taken at all.

In the ocean, the use of sonar and other active acoustic sources is often transient and is unlikely to repeatedly expose the same individual animals within a short period, for example within one specific exercise. However, for some individuals of some species, repeated exposures across different activities could occur over the year, especially where events occur in generally the same area with more resident species. In short, for some species, we expect that the total anticipated takes represent exposures of a smaller number of individuals of which some would be exposed multiple times, but based on the nature of the specified activities and the movement patterns of marine mammals, it is unlikely that individuals from most stocks would be taken over more than a few days within a given year. This means that even where repeated takes of individuals are likely to occur, they are more likely to result from non-sequential exposures from different activities, and, even if sequential, individual animals are not predicted to be taken for more than several days in a row, at most. As described elsewhere, the nature of the majority of the exposures would be expected to be of a less severe nature, and based on the numbers, it is likely that any individual exposed multiple times is still only taken on a small percentage of the days of the year. The greater likelihood is that not every individual is taken, or perhaps a smaller subset is taken with a slightly higher average and larger variability of highs and lows, but still with no reason to think that, for most species or stocks, any individuals would be taken a significant portion of the days of the year.

Physiological Stress Response

Some of the lower level physiological stress responses (*e.g.,* orientation or startle response, change in respiration, change in heart rate) discussed earlier would likely co-occur with the predicted harassments, although these responses are more difficult to detect and fewer data exist relating these responses to specific received levels of sound. Level B harassment takes, then, may have a stress-related physiological component as well; however, we would not expect the Action Proponents' generally short-term, intermittent, and (typically in the case of sonar) transitory activities to create conditions of long-term continuous noise leading to long-term physiological stress responses in marine mammals that could affect reproduction or survival.

Behavioral Response

The estimates calculated using the BRF do not differentiate between the different types of behavioral responses that rise to the level of Level B harassment. As described in the application, the Action Proponents identified (with NMFS' input) that moderate behavioral responses, as characterized in Southall *et al.* (2021), would be considered a take. The behavioral responses predicted by the BRFs are assumed to be moderate severity exposures (*e.g.,* altered migration paths or dive profiles, interrupted nursing, breeding or feeding, or avoidance) that may last for the duration of an exposure. The Action Proponents then compiled the available data indicating at what received levels and distances those responses have occurred, and used the indicated literature to build biphasic behavioral response curves and cut-off conditions that are used to predict how many instances of Level B behavioral harassment occur in a day (see the "Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase 4)" technical report (U.S. Department of the Navy, 2024)). Take estimates alone do not provide information regarding the potential fitness or other biological consequences of the responses on the affected individuals. We therefore consider the available activity-specific, environmental, and species-specific information to determine the likely nature of the modeled behavioral responses and the potential fitness consequences for affected individuals.

Use of sonar and other transducers would typically be transient and temporary. The majority of acoustic effects to individual animals from sonar and other active sound sources during military readiness activities would be primarily from anti-submarine warfare events. It is important to note although anti-submarine warfare is one of the warfare areas of focus during MTEs, there are significant periods when active anti-submarine warfare sonars are not in use. Nevertheless, behavioral responses are assumed more likely to be significant during MTEs than during other anti-submarine warfare activities due to the duration (*i.e.,* multiple days), scale (*i.e.,* multiple sonar platforms), and use of high-power hull-mounted sonar in the MTEs. In other words, in the range of potential behavioral effects that might be expected as part of a response that qualifies as an instance of Level B behavioral harassment (which by nature of the way it is modeled/counted, occurs within 1 day), the less severe end might include exposure to comparatively lower levels of a sound, at a detectably greater distance from the animal, for a few or several minutes, and that could result in a behavioral response such as avoiding an area that an animal would otherwise have chosen to move through or feed in for some amount of time or breaking off one or a few feeding bouts. More severe effects could occur when the animal gets close enough to the source to receive a comparatively higher level, is exposed continuously to one source for a longer time, or is exposed intermittently to different sources throughout a day. Such effects might result in an animal having a more severe flight response and leaving a larger area for a day or more or potentially losing feeding opportunities for a day. However, such severe behavioral effects are expected to occur infrequently.

To help assess this, for sonar (LFAS/MFAS/HFAS) used in the AFTT Study Area, the Action Proponents provided information estimating the instances of take by Level B harassment by behavioral disturbance under each BRF that would occur within 6-dB increments (discussed below in the *Group and Species-Specific Analyses* section), and by distance in 5-km bins in section 2.3.3 of appendix A to the application. As mentioned above, all else being equal, an animal's exposure to a higher received level is more likely to result in a behavioral response that is more likely to lead to adverse effects, which could more likely accumulate to impacts on reproductive success or survivorship of the animal, but other contextual factors (*e.g.,* distance, duration of exposure, and behavioral state of the animals) are also important (Di Clemente *et al.,* 2018; Ellison *et al.,* 2012; Moore and Barlow, 2013, Southall *et al.,* 2019, Wensveen *et al.,* 2017, *etc.*). The majority of takes by Level B harassment are expected to be in the form of comparatively milder responses (*i.e.,* lower-level exposures that still rise to the level of take, but would likely be less severe along the continuum of responses that qualify as take) of a generally shorter duration. We anticipate more severe effects from takes when animals are exposed to higher received levels of sound or at closer proximity to the source. Because species belonging to taxa that share common characteristics are likely to respond and be affected in similar ways, these discussions are presented within each species group below in the *Group and Species-Specific Analyses* section. As noted previously in this proposed rule, behavioral response is likely highly variable between species, individuals within a species, and context of the exposure. Specifically, given a range of behavioral responses that may be classified as Level B harassment, to the degree that higher received levels of sound are expected to result in more severe behavioral responses, only a smaller percentage of the anticipated Level B harassment from the specified activities might result in more severe responses (see the *Group and Species-Specific Analyses* section below for more detailed information).

Diel Cycle

Many animals perform vital functions, such as feeding, resting, traveling, and socializing on a diel cycle (24-hour cycle). Behavioral responses to noise exposure, when taking place in a biologically important context, such as disruption of critical life functions, displacement, or avoidance of important habitat, are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.,* 2007). Henderson *et al.* (2016) found that ongoing smaller scale events had little to no impact on foraging dives for Blainville's beaked whale, while multi-day training events may decrease foraging behavior for Blainville's beaked whale (Manzano-Roth *et al.,* 2016). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered severe unless it could directly affect reproduction or survival (Southall *et al.,* 2007). Note that there is a difference between multiple-day substantive behavioral responses and multiple-day anthropogenic activities. For example, just because an at-sea exercise lasts for multiple days does not necessarily mean that individual animals are either exposed to those exercises for multiple days or, further, exposed in a manner resulting in a sustained multiple day substantive behavioral response. Large multi-day Navy exercises, such as anti-submarine warfare activities, typically include vessels moving faster than while in transit (typically 10–15 kn (18.5–27.8 km/hr) or higher) and generally cover large areas that are relatively far from shore (typically more than 3 nmi (5.6 km) from shore) and in waters greater than 600 ft (182.9 m) deep. Marine mammals are moving as well, which would make it unlikely that the same animal could remain in the immediate vicinity of the ship for the entire duration of the exercise. Further, the Action Proponents do not necessarily operate active sonar the entire time during an exercise. While it is certainly possible that these sorts of exercises could overlap with individual marine mammals multiple days in a row at levels above those anticipated to result in a take, because of the factors mentioned above, it is considered unlikely for the majority of takes. However, it is also worth noting that the Action Proponents conduct many different types of noise-producing activities over the course of the year and it is likely that some marine mammals will be exposed to more than one activity and taken on multiple days, even if they are not sequential.

Durations of Navy activities utilizing tactical sonar sources and explosives vary and are fully described in chapter 2 of the 2024 AFTT Draft Supplemental EIS/OEIS. Sonar used during anti-submarine warfare would impart the greatest amount of acoustic energy of any category of sonar and other transducers analyzed in the application and include hull-mounted, towed, line array, sonobuoy, helicopter dipping, and torpedo sonars. Most anti-submarine warfare sonars are MFAS (1–10 kHz); however, some sources may use higher or lower frequencies. Anti-submarine warfare training activities using hull-mounted sonar proposed for the AFTT Study Area generally last for only a few hours. However, anti-submarine warfare testing activities range from several hours, to days, to more than 10 days for large integrated anti-submarine warfare MTEs (see table 4 and table 5). For these multi-day exercises there will typically be extended intervals of non-activity in between active sonar periods. Because of the need to train in a large variety of situations, the Navy conducts anti-submarine warfare training exercises in varying locations. Given the average length and dynamic nature of anti-submarine warfare exercises (times of sonar use) and typical vessel speed, combined with the fact that the majority of the cetaceans would not likely remain in proximity to the sound source, it is unlikely that an animal would be exposed to LFAS/MFAS/HFAS at levels or durations likely to result in a substantive response that would then be carried on for more than one day or on successive days.

Most planned explosive events are instantaneous or scheduled to occur over a short duration (less than 2 hours) and the explosive component of these activities only lasts for minutes. Although explosive exercises may sometimes be conducted in the same general areas repeatedly, because of their short duration and the fact that they are in the open ocean and animals can easily move away, it is similarly unlikely that animals would be exposed for long, continuous amounts of time, or demonstrate sustained behavioral responses. Although SINKEXs may last for up to 48 hours (4–8 hours typically, possibly 1–2 days), they are almost always completed in a single day and only one event is planned annually for the AFTT Study Area (see table 6). They are stationary and conducted in deep, open water (where fewer marine mammals would typically be expected to be randomly encountered), and they have rigorous monitoring (see table 64) and shutdown procedures all of which make it unlikely that individuals would be exposed to the exercise for extended periods or on consecutive days, though some individuals may be exposed on multiple days.

Assessing the Number of Individuals Taken and the Likelihood of Repeated Takes

As described previously, Navy modeling uses the best available science to predict the instances of exposure above certain acoustic thresholds, which are equated, as appropriate, to harassment takes. As further noted, for active acoustics it is more challenging to parse out the number of individuals taken by Level B harassment and the number of times those individuals are taken from this larger number of instances, though factors such as movement ecology (*e.g.,* is the species resident and more likely to remain in closer proximity to ongoing activities, versus nomadic or migratory; Keen *et al.* 2021) or whether there are known BIAs where animals are known to congregate can help inform this. One method that NMFS uses to help better understand the overall scope of the impacts is to compare these total instances of take against the abundance of that species (or stock if applicable). For example, if there are 100 harassment takes in a population of 100, one can assume either that every individual was exposed above acoustic thresholds once per year, or that some smaller number were exposed a few times per year, and a few were not exposed at all. Where the instances of take exceed 100 percent of the population, multiple takes of some individuals are predicted and expected to occur within a year. Generally speaking, the higher the number of takes as compared to the population abundance, the more multiple takes of individuals are likely, and the higher the actual percentage of individuals in the population that are likely taken at least once in a year. We look at this comparative metric to give us a relative sense of where larger portions of the species are being taken by the Action Proponents' activities and where there is a higher likelihood that the same individuals are being taken across multiple days and where that number of days might be higher. It also provides a relative picture of the scale of impacts to each species.

In the ocean, unlike a modeling simulation with static animals, the transient nature of sonar use makes it unlikely to repeatedly expose the same individual animals within a short period, for example, within one specific exercise. However, some repeated exposures across different activities could occur over the year with more resident species. In short, we expect the total anticipated takes represent exposures of a smaller number of individuals of which some could be exposed multiple times, but based on the nature of the Action Proponents' activities and the movement patterns of marine mammals, it is unlikely that any particular subset would be taken over more than several sequential days (with a few possible exceptions discussed in the species-specific conclusions). In other cases, such as during pierside sonar testing at Naval Station Norfolk, repeated exposures of the same individuals may be more likely given the concentrated area within which the operations occur and the likelihood that a smaller number of animals would routinely use the affected habitat.

When calculating the proportion of a population taken (*e.g.,* the number of takes divided by population abundance), which can also be helpful in estimating the number of days over which some individuals may be taken, it is important to choose an appropriate population estimate against which to make the comparison. Herein, NMFS considers two potential abundance estimates, the SARs and the NMSDD abundance estimates. The SARs, where available, provide the official population estimate for a given species or stock in U.S. waters in a given year. These estimates are typically generated from the most recent shipboard and/or aerial surveys conducted, and in some cases, the estimates show substantial year-to-year variability. When the stock is known to range well outside of U.S. EEZ boundaries, population estimates based on surveys conducted only within the U.S. EEZ are known to be underestimates. The NMSDD-derived abundance estimates are abundances for within the U.S. EEZ boundaries only and, therefore, differ from some SAR abundance estimates.

The SAR and NMSDD abundance estimates can differ substantially because these estimates may be based on different methods and data sources. For example, the SARs only consider data from the past 8 year period, whereas the NMSDD considers a longer data history. Further, the SARs estimate the number of animals in a population but not spatial densities. NMSDD uses predictive density models to estimate species presence, even where sighting data is limited or lacking altogether. Thus, NMSDD density models beyond the U.S. EEZ have greater uncertainty than those within the U.S. EEZ, where most proposed activities would occur. Each density model is limited to the variables and assumptions considered by the original data source provider. NMFS considered these factors and others described in the Density Technical Report (U.S. Department of the Navy, 2024) when comparing the estimated takes to current population abundances for each species or stock.

In consideration of the factors described above, to estimate repeated impacts across large areas relative to species geographic distributions, comparing the impacts predicted in NAEMO to abundances predicted using the NMSDD models is usually preferable. By comparing estimated take to the NMSDD abundance estimates, impacts and abundance estimates are based on the same underlying assumptions about a species' presence. NMFS has compared the estimated take to the NMSDD abundance estimates herein for all stocks, with the exception of stocks where the abundance information fits into one of the following scenarios, in which case NMFS concluded that comparison to the SAR abundance estimate is more appropriate: (1) a species' or stocks' range extends beyond the U.S. EEZ and the SAR abundance estimate is greater than the NMSDD abundance. For highly migratory species (*e.g.,* large whales) or those whose geographic distribution extends beyond the boundaries of the AFTT Study Area (*e.g.,* populations with distribution along the entire western Atlantic Ocean rather than just the AFTT Study Area), comparisons to the SAR are appropriate. Many of the stocks present in the AFTT Study Area have ranges significantly larger than the AFTT Study Area, and that abundance is captured by the SAR. A good descriptive example is migrating large whales, which occur seasonally in the AFTT Study Area. Therefore, at any one time there may be a stable number of animals, but over the course of the entire year the entire population may pass through the AFTT Study Area. Therefore, comparing the estimated takes to an abundance, in this case the SAR abundance, which represents the total population, may be more appropriate than modeled abundances for only the AFTT Study Area; and (2) when the current minimum population estimate in the SAR is greater than the NMSDD abundance, regardless of whether the stock range extends beyond the EEZ. The NMSDD and SAR abundance estimates are both included in table 81 (mysticetes), table 83 (sperm whales, dwarf sperm whales, and pygmy sperm whales), table 85 (beaked whales), table 87 (dolphins and small whales), table 89 (porpoises), and table 91 (pinnipeds), and each table indicates which stock abundance estimate was selected for comparison to the take estimate for each species or stock.

Temporary Threshold Shift

NMFS and the Navy have estimated that all species of marine mammals may incur some level of TTS from active sonar. As mentioned previously, in general, TTS can last from a few minutes to days, be of varying degree, and occur across various frequency bandwidths, all of which determine the severity of the impacts on the affected individual, which can range from minor to more severe. Table 38 through table 46 indicate the number of takes by TTS that may be incurred by different species from exposure to active sonar, air guns, pile driving, and explosives. The TTS incurred by an animal is primarily characterized by three characteristics:

(i) Frequency—Available data suggest that most TTS occurs in the frequency range of the source up to one octave higher than the source (with the maximum TTS at ½ octave above) (Finneran 2015, Southall *et al.* 2019). The Navy's MF anti-submarine warfare sources, which are the highest power and most numerous sources and the ones that cause the most take by TTS, utilize the 1–10 kHz frequency band, which suggests that if TTS were to be induced by any of these MF sources it would be in a frequency band somewhere between approximately 1 and 20 kHz, which is in the range of communication calls for many odontocetes, but below the range of the echolocation signals used for foraging. There are fewer hours of HF source use and the sounds would attenuate more quickly, plus they have lower source levels, but if an animal were to incur TTS from these sources, it would cover a higher frequency range (sources are between 10 and 100 kHz, which means that TTS could range up to the highest frequencies audible to VHF cetaceans, approaching 200 kHz), which could overlap with the range in which some odontocetes communicate or echolocate. However, HF systems are typically used less frequently and for shorter time periods than surface ship and aircraft MF systems, so TTS from HF sources is less likely than from MF sources. There are fewer LF sources and the majority are used in the more readily mitigated testing environment, and TTS from LF sources would most likely occur below 2 kHz, which is in the range where many mysticetes communicate and also where other auditory cues are located (waves, snapping shrimp, fish prey). Also of note, the majority of sonar sources from which TTS may be incurred occupy a narrow frequency band, which means that the TTS incurred would also be across a narrower band (*i.e.,* not affecting the majority of an animal's hearing range).

(ii) Degree of the shift (*i.e.,* by how many dB the sensitivity of the hearing is reduced)—Generally, both the degree of TTS and the duration of TTS will be greater if the marine mammal is exposed to a higher level of energy (which would occur when the peak SPL is higher or the duration is longer). The threshold for the onset of TTS was discussed previously in this rule. An animal would have to approach closer to the source or remain in the vicinity of the sound source appreciably longer to increase the received SEL, which would be difficult considering the Lookouts and the nominal speed of an active sonar vessel (10–15 kn (18.5–27.8 km/hr)) and the relative motion between the sonar vessel and the animal. In the TTS studies discussed in the Potential Effects of Specified Activities on Marine Mammals and Their Habitat section, some using exposures of almost an hour in duration or up to 217 SEL, most of the TTS induced was 15 dB or less, though Finneran *et al.* (2007) induced 43 dB of TTS with a 64-second exposure to a 20 kHz source. The SQS–53 (MFAS) hull-mounted sonar (MF1) nominally emits a short (1-second) ping typically every 50 seconds, incurring those levels of TTS due to this source is highly unlikely. Sources with higher duty cycles produce longer ranges to effects and contribute to auditory effects from this action. Since any hull-mounted sonar, such as the SQS–53, engaged in anti-submarine warfare training would be moving at between 10 and 15 kn (18.5 to 27.8 km/hr) and nominally pinging every 50 seconds, the vessel will have traveled a minimum distance of approximately 843.2 ft (257 m) during the time between those pings. For a Navy vessel moving at a nominal 10 kn (18.5 km/hr), it is unlikely a marine mammal would track with the ship and could maintain speed parallel to the ship to receive adequate energy over successive pings to suffer TTS. In short, given the anticipated duration and levels of sound exposure, we would not expect marine mammals to incur more than relatively low levels of TTS in most cases for sonar exposure. To add context to this degree of TTS, individual marine mammals may regularly experience variations of 6 dB differences in hearing sensitivity in their lifetime (Finneran *et al.,* 2000, Finneran *et al.,* 2002, Schlundt *et al.,* 2000).

(iii) Duration of TTS (recovery time)—In the TTS laboratory studies (as discussed in the Potential Effects of Specified Activities on Marine Mammals and Their Habitat section), some using exposures of almost an hour in duration or up to 217 dB SEL, almost all individuals recovered within 1 day (or less, often in minutes), although in one study (Finneran *et al.,* 2015; Southall *et al.* 2019), recovery took 4 days.

Compared to laboratory studies, marine mammals are likely to experience lower SELs from sonar used in the AFTT Study Area due to movement of the source and animals, and because of the lower duty cycles typical of higher power sources (though some of the Navy MF1C sources have higher duty cycles). Therefore, TTS resulting from MFAS would likely be of lesser magnitude and duration compared to laboratory studies. Also, for the same reasons discussed in the Preliminary Analysis and Negligible Impact Determination—Diel Cycle section, and because of the short distance between the source and animals needed to reach high SELs, it is unlikely that animals would be exposed to the levels necessary to induce TTS in subsequent time periods such that hearing recovery is impeded. Additionally, though the frequency range of TTS that marine mammals might incur would overlap with some of the frequency ranges of their vocalization types, the frequency range of TTS from MFAS would not usually span the entire frequency range of one vocalization type, much less span all types of vocalizations or other critical auditory cues.

As a general point, the majority of the TTS takes are the result of exposure to hull-mounted MFAS (MF narrower band sources), with fewer from explosives (broad-band lower frequency sources), and even fewer from LFAS or HFAS sources (narrower band). As described above, we expect the majority of these takes to be in the form of mild, short-term (minutes to hours), narrower band (only affecting a portion of the animal's hearing range) TTS. This means that for one to several times per year, for several minutes, maybe a few hours, or at most in limited circumstances a few days, a taken individual will have diminished hearing sensitivity (more than natural variation, but nowhere near total deafness). More often than not, such an exposure would occur within a narrower mid- to higher frequency band that may overlap part (but not all) of a communication, echolocation, or predator range, but sometimes across a lower or broader bandwidth. The significance of TTS is also related to the auditory cues that are germane within the time period that the animal incurs the TTS. For example, if an odontocete has TTS at echolocation frequencies, but incurs it at night when it is resting and not feeding, it is not impactful. In short, the expected results of any one of these small number of mild TTS occurrences could be that (1) it does not overlap signals that are pertinent to that animal in the given time period, (2) it overlaps parts of signals that are important to the animal, but not in a manner that impairs interpretation, or (3) it reduces detectability of an important signal to a small degree for a short amount of time—in which case the animal may be aware and be able to compensate (but there may be slight energetic cost), or the animal may have some reduced opportunities (*e.g.,* to detect prey) or reduced capabilities to react with maximum effectiveness (*e.g.,* to detect a predator or navigate optimally). However, it is unlikely that individuals would experience repeated or high degree TTS overlapping in frequency and time with signals critical for behaviors that would impact overall fitness.

Auditory Masking or Communication Impairment

The ultimate potential impacts of masking on an individual (if it were to occur) are similar to those discussed for TTS, but an important difference is that masking only occurs during the time of the signal, versus TTS, which continues beyond the duration of the signal. Fundamentally, masking is referred to as a chronic effect because one of the key harmful components of masking is its duration—the fact that an animal would have reduced ability to hear or interpret critical cues becomes much more likely to cause a problem the longer it is occurring. Also inherent in the concept of masking is the fact that the potential for the effect is only present during the times that the animal and the source are in close enough proximity for the effect to occur (and further, this time period would need to coincide with a time that the animal was utilizing sounds at the masked frequency). As our analysis has indicated, because of the relative movement of vessels and the sound sources primarily involved in this rule, we do not expect the exposures with the potential for masking to be of a long duration.

Masking is fundamentally more of a concern at lower frequencies, because low frequency signals propagate significantly farther than higher frequencies and because they are more likely to overlap both the narrower LF calls of mysticetes, as well as many non-communication cues such as fish and invertebrate prey, and geologic sounds that inform navigation. Masking is also more of a concern from continuous sources (versus intermittent sonar signals) where there is no quiet time between pulses and detection and interpretation of auditory signals is likely more challenging. For these reasons, dense aggregations of, and long exposure to, continuous LF activity are much more of a concern for masking, whereas comparatively short-term exposure to the predominantly intermittent pulses of often narrow frequency range MFAS or HFAS, or explosions are not expected to result in a meaningful amount of masking. While the Action Proponents occasionally use LF and more continuous sources, it is not in the contemporaneous aggregate amounts that would be expected to accrue to degrees that would have the potential to affect reproductive success or survival. Additional detail is provided below.

Standard hull-mounted MFAS typically pings every 50 seconds. Some hull-mounted anti-submarine sonars can also be used in an object detection mode known as ''Kingfisher'' mode (*e.g.,* used on vessels when transiting to and from port) where pulse length is shorter but pings are much closer together in both time and space since the vessel goes slower when operating in this mode, and during which an increased likelihood of masking in the vicinity of vessel could be expected. For the majority of other sources, however, the pulse length is significantly shorter than hull-mounted active sonar, on the order of several microseconds to tens of milliseconds. Some of the vocalizations that many marine mammals make are less than 1 second long, so, for example with hull-mounted sonar, there would be a 1 in 50 chance (only if the source was in close enough proximity for the sound to exceed the signal that is being detected) that a single vocalization might be masked by a ping. However, when vocalizations (or series of vocalizations) are longer than the 1 second pulse of hull-mounted sonar, or when the pulses are only several microseconds long, the majority of most animals' vocalizations would not be masked.

Most anti-submarine warfare sonars and countermeasures use MF frequencies and a few use LF and HF frequencies. Most of these sonar signals are limited in the temporal, frequency, and spatial domains. The duration of most individual sounds is short, lasting up to a few seconds each. A few systems operate with higher duty cycles or nearly continuously, but they typically use lower power, which means that an animal would have to be closer, or in the vicinity for a longer time, to be masked to the same degree as by a higher level source. Nevertheless, masking could occasionally occur at closer ranges to these high-duty cycle and continuous active sonar systems, but as described previously, it would be expected to be of a short duration. While data are lacking on behavioral responses of marine mammals to continuously active sonars, mysticete species are known to habituate to novel and continuous sounds (Nowacek *et al.,* 2004), suggesting that they are likely to have similar responses to high-duty cycle sonars. Furthermore, most of these systems are hull-mounted on surface ships with the ships moving at least 10 kn (18.5 km/hr), and it is unlikely that the ship and the marine mammal would continue to move in the same direction and the marine mammal subjected to the same exposure due to that movement. Most anti-submarine warfare activities are geographically dispersed and last for only a few hours, often with intermittent sonar use even within this period. Most anti-submarine warfare sonars also have a narrow frequency band (typically less than one-third octave). These factors reduce the likelihood of sources causing significant masking. HF signals (above 10 kHz) attenuate more rapidly in the water due to absorption than do lower frequency signals, thus producing only a very small zone of potential masking. If masking or communication impairment were to occur briefly, it would more likely be in the frequency range of MFAS (the more powerful source), which overlaps with some odontocete vocalizations (but few mysticete vocalizations); however, it would likely not mask the entirety of any particular vocalization, communication series, or other critical auditory cue, because the signal length, frequency, and duty cycle of the MFAS/HFAS signal does not perfectly resemble the characteristics of any single marine mammal species' vocalizations.

Other sources used in the Action Proponents' training and testing that are not explicitly addressed above, many of either higher frequencies (meaning that the sounds generated attenuate even closer to the source) or used less frequently, would be expected to contribute to masking over far smaller areas and/or times. For the reasons described here, any limited masking that could potentially occur would be minor and short-term.

In conclusion, masking is more likely to occur in the presence of broadband, relatively continuous noise sources such as from vessels, however, the duration of temporal and spatial overlap with any individual animal and the spatially separated sources that the Action Proponents use would not be expected to result in more than short-term, low impact masking that would not affect reproduction or survival.

Auditory Injury From Sonar Acoustic Sources and Explosives and Non-Auditory Injury From Explosives

Table 38 through table 46 indicate the number of takes of each species by Level A harassment in the form of auditory injury resulting from exposure to active sonar and/or explosives is estimated to occur, and table 50 indicates the totals across all activities. The number of takes estimated to result from auditory injury annually from sonar, air guns, and explosives for each species/stock from all activities combined ranges from 0 to 180 (the 180 is for the Western North Atlantic stock of dwarf sperm whale). Nineteen stocks (all odontocetes) have the potential to incur non-auditory injury from explosives, and the number of individuals from any given stock from all activities combined ranges from 1 to 3 (the 3 is for the Northern Gulf of America stock of pantropical spotted dolphin). As described previously, the Navy's model likely overestimates the number of injurious takes to some degree. Nonetheless, these Level A harassment take numbers represent the maximum number of instances in which marine mammals would be reasonably expected to incur auditory and/or non-auditory injury, and we have analyzed them accordingly.

If a marine mammal is able to approach a surface vessel within the distance necessary to incur auditory injury in spite of the mitigation measures, the likely speed of the vessel (nominally 10–15 kn (18.5–27.8 km/hr)) and relative motion of the vessel would make it very difficult for the animal to remain in range long enough to accumulate enough energy to result in more than a mild case of auditory injury. As discussed previously in relation to TTS, the likely consequences to the health of an individual that incurs auditory injury can range from mild to more serious, and is dependent upon the degree of auditory injury and the frequency band associated with auditory injury. The majority of any auditory injury incurred as a result of exposure to Navy sources would be expected to be in the 2–20 kHz range (resulting from the most powerful hull-mounted sonar) and could overlap a small portion of the communication frequency range of many odontocetes, whereas other marine mammal groups have communication calls at lower frequencies. Because of the broadband nature of explosives, auditory injury incurred from exposure to explosives would occur over a lower, but wider, frequency range. Regardless of the frequency band, the more important point in this case is that any auditory injury accrued as a result of exposure to Navy activities would be expected to be of a small amount (single digits). Permanent loss of some degree of hearing is a normal occurrence for older animals, and many animals are able to compensate for the shift, both in old age or at younger ages as the result of stressor exposure. While a small loss of hearing sensitivity may include some degree of energetic costs for compensating or may mean some small loss of opportunities or detection capabilities, at the expected scale it would be unlikely to impact behaviors, opportunities, or detection capabilities to a degree that would interfere with reproductive success or survival.

The Action Proponents implement mitigation measures (described in the Proposed Mitigation Measures section) during explosive activities, including delaying detonations when a marine mammal is observed in the mitigation zone. Nearly all explosive events would occur during daylight hours thereby improving the sightability of marine mammals and mitigation effectiveness. Observing for marine mammals during the explosive activities would include visual and passive acoustic detection methods (the latter when they are available and part of the activity) before the activity begins, in order to cover the mitigation zones that can range from 200 yd (183 m) to 2,500 yd (2,286 m) depending on the source (*e.g.,* explosive sonobuoy, explosive torpedo, explosive bombs), and 2.5 nmi (4.6 km) for sinking exercises (see table 55 through table 64).

The type and amount of take by Level A harassment are indicated for all species and species groups in table 81, table 83, table 85, table 87, table 89, and table 91. Generally speaking, non-auditory injuries from explosives could range from minor lung injuries (the most sensitive organ and first to be affected) that consist of some short-term reduction of health and fitness immediately following the injury that heals quickly and will not have any discernible long-term effects, up to more impactful permanent injuries across multiple organs that may cause health problems and negatively impact reproductive success (*i.e.,* increase the time between pregnancies or even render reproduction unlikely) but fall just short of a ''serious injury'' by virtue of the fact that the animal is not expected to die. Nonetheless, due to the Navy's mitigation and detection capabilities, we would not expect marine mammals to typically be exposed to a more severe blast located closer to the source—so the impacts likely would be less severe. In addition, most non-auditory injuries and mortalities or serious injuries are predicted for stocks with medium to large group sizes, mostly delphinids, which increases sightability. It is still difficult to evaluate how these injuries may or may not impact an animal's fitness, however, these effects are only seen in very small numbers (single digits for all stocks) and mostly in species of moderate, high, and very high abundances. In short, it is unlikely that any, much less all, of the small number of injuries accrued to any one stock would result in reduced reproductive success of any individuals; even if a few injuries did result in reduced reproductive success of individuals, the status of the affected stocks are such that it would not be expected to adversely impact rates of reproduction (and auditory injury of the low severity anticipated here is not expected to affect the survival of any individual marine mammals).

Serious Injury and Mortality

NMFS is authorizing a very small number of serious injuries or mortalities that could occur in the event of a vessel strike or as a result of marine mammal exposure to explosive detonations (mostly during ship shock trials). We note here that the takes from potential vessel strikes or explosive exposures enumerated below could result in non-serious injury, but their worst potential outcome (mortality) is analyzed for the purposes of the negligible impact determination.

The MMPA requires that PBR be estimated in SARs and that it be used in applications related to the management of take incidental to commercial fisheries (*i.e.,* the take reduction planning process described in section 118 of the MMPA and the determination of whether a stock is ''strategic'' as defined in section 3). While nothing in the statute requires the application of PBR outside the management of commercial fisheries interactions with marine mammals, NMFS recognizes that as a quantitative metric, PBR may be useful as a consideration when evaluating the impacts of other human-caused activities on marine mammal stocks. Outside the commercial fishing context, and in consideration of all known human-caused mortality, PBR can help inform the potential effects of M/SI requested to be authorized under section 101(a)(5)(A). As noted by NMFS and the U.S. FWS in our implementing regulations for the 1986 amendments to the MMPA (54 FR 40341, September 29, 1989), the Services consider many factors, when available, in making a negligible impact determination, including, but not limited to, the status of the species or stock relative to OSP (if known); whether the recruitment rate for the species or stock is increasing, decreasing, stable, or unknown; the size and distribution of the population; and existing impacts and environmental conditions. In this multi-factor analysis, PBR can be a useful indicator for when, and to what extent, the agency should take an especially close look at the circumstances associated with the potential mortality, along with any other factors that could influence annual rates of recruitment or survival.

Below we describe how PBR is considered in NMFS M/SI analysis. Please see the 2020 Northwest Training and Testing Final Rule (85 FR 72312, November 12, 2020) for a background discussion of PBR and how it was adopted for use authorizing incidental take under section 101(a)(5)(A) for specified activities such as the Action Proponent's training and testing in the AFTT Study Area.

When considering PBR during evaluation of effects of M/SI under section 101(a)(5)(A), we utilize a two-tiered analysis for each stock for which M/SI is proposed for authorization:

(i) *Tier 1:* Compare the total human-caused average annual M/SI estimate from all sources, including the M/SI proposed for authorization from the specific activity, to PBR. If the total M/SI estimate is less than or equal to PBR, then the specific activity is considered to have a negligible impact on that stock. If the total M/SI estimate (including from the specific activity) exceeds PBR, conduct the Tier 2 analysis.

(ii) *Tier 2:* Evaluate the estimated M/SI from the specified activity relative to the stock's PBR. If the M/SI from the specified activity is less than or equal to 10 percent of PBR and other major sources of human-caused mortality have mitigation in place, then the individual specified activity is considered to have a negligible impact on that stock. If the estimate exceeds 10 percent of PBR, then, absent other mitigating factors, the specified activity is considered likely to have a non-negligible impact on that stock.

Additional detail regarding the two tiers of the evaluation are provided below.

As indicated above, the goal of the Tier 1 assessment is to determine whether total annual human-caused mortality, including from the specified activity, would exceed PBR. To aid in the Tier 1 evaluation and get a clearer picture of the amount of annual M/SI that remains without exceeding PBR, for each species or stock, we first calculate a ''residual PBR,'' which equals PBR minus the ongoing annual human-caused M/SI (*i.e.,* Residual PBR = PBR − (annual M/SI estimate from the SAR + other M/SI authorized under 101(a)(5)(A)). If the ongoing human-caused M/SI from other sources does not exceed PBR, then residual PBR is a positive number, and we consider how the proposed authorized incidental M/SI from the specified activities being evaluated compares to residual PBR using the Tier 1 framework in the following paragraph. If the ongoing anthropogenic mortality from other sources already exceeds PBR, then residual PBR is a negative number and we move to the Tier 2 discussion further below to consider the M/SI from the specific activities.

To reiterate the Tier 1 analysis overview in the context of residual PBR, if the M/SI from the specified activity does not exceed PBR, the impacts of the authorized M/SI on the species or stock are generally considered to be negligible. As a simplifying analytical tool in the Tier 1 evaluation, we first consider whether the M/SI from the specified activities could cause incidental M/SI that is less than 10 percent of residual PBR, which we consider an ''insignificance threshold.'' If so, we consider M/SI from the specified activities to represent an insignificant incremental increase in ongoing anthropogenic M/SI for the marine mammal stock in question that alone will clearly not adversely affect annual rates of recruitment and survival and for which additional analysis or discussion of the anticipated M/SI is not required because the negligible impact standard clearly will not be exceeded on that basis alone.

When the M/SI from the specified activity is above the insignificance threshold in the Tier 1 evaluation, it does not indicate that the M/SI associated with the specified activities is necessarily approaching a level that would exceed negligible impact. Rather, it is used a cue to look more closely if and when the M/SI for the specified activity approaches residual PBR, as it becomes increasingly necessary (the closer the M/SI from the specified activity is to 100 percent residual PBR) to carefully consider whether there are other factors that could affect reproduction or survival, such as take by Level A and/or Level B harassment that has been predicted to impact reproduction or survival of individuals, or other considerations such as information that illustrates high uncertainty involved in the calculation of PBR for some stocks. Recognizing that the impacts of harassment of any authorized incidental take (by Level A or Level B harassment from the specified activities) would not combine with the effects of the authorized M/SI to adversely affect the stock through effects on recruitment or survival, if the proposed authorized M/SI for the specified activity is less than residual PBR, the M/SI, alone, would be considered to have a negligible impact on the species or stock. If the proposed authorized M/SI is greater than residual PBR, then the assessment should proceed to Tier 2.

For the Tier 2 evaluation, recognizing that the total annual human-caused M/SI exceeds PBR, we consider whether the incremental effects of the proposed authorized M/SI for the specified activity, specifically, would be expected to result in a negligible impact on the affected species or stocks. For the Tier 2 assessment, consideration of other factors (positive or negative), including those described above (*e.g.,* the certainty in the data underlying PBR and the impacts of any harassment authorized for the specified activity), as well as the mitigation in place to reduce M/SI from other activities is especially important to assessing the impacts of the M/SI from the specified activity on the species or stock. PBR is a conservative metric and not sufficiently precise to serve as an absolute predictor of population effects upon which mortality caps would appropriately be based. For example, in some cases stock abundance (which is one of three key inputs into the PBR calculation) is underestimated because marine mammal survey data within the U.S. EEZ are used to calculate the abundance even when the stock range extends well beyond the U.S. EEZ. An underestimate of abundance could result in an underestimate of PBR. Alternatively, we sometimes may not have complete M/SI data beyond the U.S. EEZ to compare to PBR, which could result in an overestimate of residual PBR. The accuracy and certainty around the data that feed any PBR calculation, such as the abundance estimates, must be carefully considered to evaluate whether the calculated PBR accurately reflects the circumstances of the particular stock.

Also, as referenced above, in some cases the ongoing human-caused mortality from activities other than those being evaluated already exceeds PBR and, therefore, residual PBR is negative. In these cases, any additional mortality, no matter how small, and no matter how small relative to the mortality caused by other human activities, would result in greater exceedance of PBR. PBR is helpful in informing the analysis of the effects of mortality on a species or stock because it is important from a biological perspective to be able to consider how the total mortality in a given year may affect the population. However, section 101(a)(5)(A) of the MMPA indicates that NMFS shall authorize the requested incidental take from a specified activity if we find that ''the total of such taking [*i.e.,* from the specified activity] will have a negligible impact on such species or stock.'' In other words, the task under the statute is to evaluate the applicant's anticipated take in relation to their take's impact on the species or stock, not other entities' impacts on the species or stock. Neither the MMPA nor NMFS' implementing regulations call for consideration of other unrelated activities and their impacts on the species or stock.

Accordingly, we may find that the impacts of the taking from the specified activity may (alone) be negligible even when total human-caused mortality from all activities exceeds PBR if (in the context of a particular species or stock). Specifically, where the authorized M/SI would be less than or equal to 10 percent of PBR and management measures are being taken to address M/SI from the other contributing activities (*i.e.,* other than the specified activities covered by the incidental take authorization under consideration), the impacts of the authorized M/SI would be considered negligible. In addition, we must also still determine that any impacts on the species or stock from other types of take (*i.e.,* harassment) caused by the applicant do not combine with the impacts from mortality or serious injury addressed here to result in adverse effects on the species or stock through effects on annual rates of recruitment or survival.

As noted above, while PBR is useful in informing the evaluation of the effects of M/SI in section 101(a)(5)(A) determinations, it is one consideration to be assessed in combination with other factors and is not determinative. For example, as explained above, the accuracy and certainty of the data used to calculate PBR for the species or stock must be considered. And we reiterate the considerations discussed above for why it is not appropriate to consider PBR an absolute cap in the application of this guidance. Accordingly, we use PBR as a trigger for concern while also considering other relevant factors to provide a reasonable and appropriate means of evaluating the effects of potential mortality on rates of recruitment and survival, while acknowledging that it is possible for total human-caused M/SI to exceed PBR (or for the M/SI from the specified activity to exceed 10 percent of PBR in the case where other human-caused mortality is exceeding PBR, as described in the last paragraph) by some small amount and still make a negligible impact determination under section 101(a)(5)(A).

We note that on June 17, 2020, NMFS finalized new Criteria for Determining Negligible Impact under MMPA section 101(a)(5)(E). The guidance explicitly notes the differences in the negligible impact determinations required under section 101(a)(5)(E), as compared to sections 101(a)(5)(A) and 101(a)(5)(D), and specifies that the procedure in that document is limited to how the agency conducts negligible impact analyses for commercial fisheries under section 101(a)(5)(E). In this proposed rule, NMFS has described its method for considering PBR to evaluate the effects of potential mortality in the negligible impact analysis. NMFS has reviewed the 2020 guidance and determined that our consideration of PBR in the evaluation of mortality as described above and in the proposed rule remains appropriate for use in the negligible impact analysis for the Action proponent's activities under section 101(a)(5)(A).

Our evaluation of the M/SI for each of the species and stocks for which mortality or serious injury could occur follows.

We first consider maximum potential incidental M/SI from the Action Proponents' vessel strike analysis for the affected large whales (table 79) and from the Action Proponents' explosive detonations for the affected small cetaceans (table 80) in consideration of NMFS' threshold for identifying insignificant M/SI take. By considering the maximum potential incidental M/SI in relation to PBR and ongoing sources of anthropogenic mortality, as described above, we begin our evaluation of whether the potential incremental addition of M/SI through vessel strikes and explosive detonations may affect the species' or stocks' annual rates of recruitment or survival. We also consider the interaction of those mortalities with incidental taking of that species or stock by harassment pursuant to the specified activity.

Based on the methods discussed previously, NMFS is proposing to authorize six mortalities of large whales due to vessel strike over the course of the 7-year rule, three by each Action Proponent. Across the 7-year duration of the rule, two takes by mortality (annual average of 0.29 takes) of fin whale (Western North Atlantic stock), minke whale (Canadian East Coast stock), sei whale (Nova Scotia stock), and sperm whale (North Atlantic stock) could occur and are proposed for authorization table 79); one take by mortality (annual average of 0.14 takes) of the Northern Gulf of America stock of sperm whale could occur and is proposed for authorization; four takes by mortality (annual average of 0.57 takes) of humpback whale (Gulf of Maine stock) could occur and are proposed for authorization (table 79). To calculate the annual average of M/SI by vessel strike, we divided the 7-year proposed take by serious injury or mortality by seven.

TABLE 79—SUMMARY INFORMATION RELATED TO MORTALITIES REQUESTED FOR VESSEL STRIKE

[2025–2032]

Common name	Stock	Stock abundance	Total annual M/SI [a]	Fisheries interactions (Y/N); annual rate of M/SI from fisheries interactions	Annual M/SI due to vessel collision	NEFSC authorized take (annual) [b]	PBR	Residual PBR (PBR minus annual M/SI) [c]	Recent UME (Y/N); number of strandings, year declared	Annual proposed take by serious injury or mortality (all action proponents) [d]	7-Year proposed take by serious injury or mortality (all action proponents)
Fin Whale	Western North Atlantic	6,802	2.05	Y; 1.45	0.6	0	11	8.95	N	0.29	2
Humpback Whale	Gulf of Maine	1,396	12.15	Y; 7.75	4.4	0	22	9.85	Y; 244, 2017	0.57	4
Minke Whale	Canadian Eastern Coastal	21,968	9.40	Y; 8.6	0.8	1	170	159.6	Y; 198, 2018	0.29	2
Sei Whale	Nova Scotia	6,292	0.60	Y; 0.4	0	0	6.2	5.6	N	0.29	2
Sperm Whale	North Atlantic	5,895	0.20	N	0	0	9.28	9.08	N	0.29	2
Sperm Whale *	Northern Gulf of America	1,614	9.60	Y; 0.2	0	0	2	−7.6	N	0.14	[e] 1

Note: Unk = Unknown; N/A = Not Applicable.

* Stock abundance from NMSDD (see table 2.4–1 in appendix A of the application).

[a] This column represents the total number of incidents of M/SI that could potentially accrue to the specified species or stock.

[b] This column represents the annual authorized take by mortality in the 2021 LOA for Northeast Fisheries Science Center Fisheries Research Activities. No take of large whales was authorized in the 2020 LOA for Southeast Fisheries Science Center Fisheries Research Activities.

[c] This value represents the calculated PBR less the average annual estimate of ongoing anthropogenic mortalities (*i.e.,* total annual human-caused M/SI, which is presented in the SARs).

[d] This column represents the annual take by serious injury or mortality during Navy training and testing activities and was calculated by the number of mortalities proposed for authorization divided by 7 years.

[e] Authorized for U.S. Navy only.

The Action Proponents also requested a small number of takes by M/SI from explosives. Across the 7-year duration of the rule, NMFS is proposing to authorize five takes by M/SI (annual average of 0.71 takes) of pantropical spotted dolphin (Northern Gulf of America stock), two takes by M/SI (annual average of 0.29 takes) of striped dolphin (Northern Gulf of America stock), two takes by M/SI (annual average of 0.29 takes) of bottlenose dolphin (Western North Atlantic Offshore stock), one take by M/SI (annual average of 0.14 takes) of Tamanend's bottlenose dolphin (Western North Atlantic South Carolina/Georgia Coastal), and three takes by M/SI (annual average of 0.43 takes) of Clymene dolphin (Western North Atlantic stock) (table 80). To calculate the annual average of M/SI from explosives, we divided the 7-year proposed take by serious injury or mortality by seven (table 80), the same method described for vessel strikes.

TABLE 80—SUMMARY INFORMATION RELATED TO AFTT SERIOUS INJURY OR MORTALITY FROM EXPLOSIVES
[2025–2032]

Species	Stock	Stock abundance	Total annual M/SI [a]	Fisheries interactions (Y/N); annual rate of M/SI from fisheries interactions	SEFSC authorized take (annual) [b]	NEFSC authorized take (annual) [b]	PBR	Residual PBR (PBR minus annual M/SI) [c]	Recent UME (Y/N); number of strandings, year declared	Annual proposed take by serious injury or mortality (all action proponents) [d]	7-Year proposed take by serious injury or mortality (all action proponents)	Population trend
Pantropical spotted dolphin	Northern Gulf of America ...	37,195	241	N	0.8	0	304	62.2	N	0.71	5	Potentially increasing.
Striped dolphin *	Northern Gulf of America ...	7,782	13	N	0.6	0	12	−1.6	N	0.29	2	Unk.
Bottlenose dolphin *	Western North Atlantic Offshore.	150,704	28	Y; 28	0.8	1.6	507	476.6	N	0.29	2	Stable, potentially decreasing.
Tamanend's bottlenose dolphin.	Western North Atlantic, South/Carolina Georgia Coastal.	9,121	0.2–0.6	Y; 0.2–0.6	0.6	0	73	71.8	N	0.14	1	Unk (insufficient data).
Clymene dolphin	Western North Atlantic	21,778	0	N	0	0	126	126	N	0.43	3	Unk.

Note: Unk = Unknown, SEFSC = Southeast Fisheries Science Center, NEFSC = Northeast Fisheries Science Center.
* Stock abundance from NMSDD (see table 2.4–1 in appendix A of the application).
[a] This column represents the total number of incidents of M/SI that could potentially accrue to the specified species or stock.
[b] These columns represents the annual authorized take by mortality in the 2020 LOA for Southeast Fisheries Science Center Fisheries Research Activities and the 2021 LOA for Northeast Fisheries Science Center Fisheries Research Activities.
[c] This value represents the calculated PBR less the average annual estimate of ongoing anthropogenic mortalities (*i.e.,* total annual human-caused M/SI, which is presented in the SARs).
[d] This column represents the annual take by serious injury or mortality during training and testing activities and was calculated by the number of mortalities proposed for authorization divided by 7 years.

Stocks With M/SI From the Specified Activity Below the Insignificance Threshold—

As noted above, for a species or stock with M/SI proposed for authorization less than 10 percent of residual PBR, we consider M/SI from the specified activities to represent an insignificant incremental increase in ongoing anthropogenic M/SI that alone (*i.e.,* in the absence of any other take and barring any other unusual circumstances) will clearly not adversely affect annual rates of recruitment and survival. In this case, as shown in table 79 and table 80, the following species or stocks have potential or estimated take by M/SI from vessel strike and explosives, respectively, and proposed for authorization below their insignificance threshold: fin whale (Western North Atlantic stock), humpback whale (Gulf of Maine stock), minke whale (Canadian East Coast stock), sei whale (Nova Scotia stock), sperm whale (North Atlantic stock), pantropical spotted dolphin (Northern Gulf of America Stock), bottlenose dolphin (Western North Atlantic Offshore), Tamanend's bottlenose dolphin (Western North Atlantic South Carolina/Georgia Coastal Stock), Clymene dolphin (Western North Atlantic Stock). While the authorized M/SI of humpback whales (Gulf of Maine stock) and minke whales (Canadian East Coast stock) are each below the insignificance threshold, because of the current UMEs, we further address how the authorized M/SI and the UMEs inform the negligible impact determinations immediately below. For the other seven stocks with authorized M/SI below the insignificance threshold, there are no other known factors, information, or unusual circumstances that indicate anticipated M/SI below the insignificance threshold could have adverse effects on annual rates of recruitment or survival and they are not discussed further. For the remaining stocks with potential M/SI above the insignificance threshold, how that M/SI compares to residual PBR, as well as additional factors, are discussed below as well.

Humpback Whale (Gulf of Maine Stock)

For this stock, PBR is currently set at 22. The total annual M/SI from other sources of anthropogenic mortality is estimated to be 12.15. This yields a residual PBR of 9.85. The additional 0.57 annual mortalities that are authorized in this rule are below the insignificance threshold (10 percent of residual PBR, in this case 0.985). Nonetheless, since January 2016, elevated humpback whale mortalities have occurred along the Atlantic coast from Maine to Florida. As of February 6, 2025, there have been 244 known strandings, and of the whales examined, about 40 percent had evidence of human interaction either from vessel strike or entanglement. NOAA is consulting with researchers that are conducting studies on the humpback whale populations, and these efforts may provide information on changes in whale distribution and habitat use that could provide additional insight into how these vessel interactions occurred. However, even in consideration of the UME, the incremental increase in annual mortality from the Action Proponents' specified activities is not expected to adversely affect annual rates of recruitment or survival.

Minke Whale (Canadian East Coast Stock)

For this stock, PBR is currently set at 170. The total annual M/SI from other sources of anthropogenic mortality is estimated to be 9.4. In addition, 1 annual mortality has been authorized for this same stock in the current incidental take regulations for NMFS' Northeast Fisheries Science Center (86 FR 58434, October 21, 2021). This yields a residual PBR of 159.6. The additional 0.29 annual mortalities that are authorized in this rule are well below the insignificance threshold (10 percent of residual PBR, in this case 16.0). Nonetheless, minke whale mortalities detected along the Atlantic coast from Maine through South Carolina resulted in the declaration of an on-going UME in 2017. Preliminary findings show evidence of human interactions or infectious disease, but these findings are not consistent across all of the minke whales examined, so more research is needed. As of February 10, 2025, a total of 198 minke whales have stranded during this UME, averaging about 25 animals per year. However, even in consideration of the UME, the incremental increase in annual mortality from the Action Proponents' activities is not expected to adversely affect annual rates of recruitment or survival.

Stocks With M/SI From the Specified Activity Above the Insignificance Threshold (and, in This Case, Also Above Residual PBR)—

Sperm Whale (Northern Gulf of America Stock)

For the Northern Gulf of America stock of sperm whale, PBR is currently set at 2 and the total annual M/SI is estimated at 9.6, yielding a residual PBR of −7.6. NMFS is proposing to authorize one M/SI (U.S. Navy only) over the 7-year duration of the rule (indicated as 0.14 annually for the purposes of comparing to PBR and evaluating overall effects on annual rates of recruitment and survival), which means that residual PBR is exceeded by 7.74. However, as described above, given that the negligible impact determination is based on the assessment of take of the activity being analyzed, when total annual mortality from human activities is higher, but the impacts from the specific activity being analyzed are very small, NMFS may still find the impact of the authorized take from a specified activity to be negligible even if total human-caused mortality exceeds PBR—specifically if the authorized mortality is less than 10 percent of PBR and management measures are being taken to address serious injuries and mortalities from the other activities causing mortality (*i.e.,* other than the specified activities covered by the incidental take authorization in consideration). When those considerations are applied here, the authorized lethal take (0.14 annually) of Northern Gulf of America stock of sperm whale is less than 10 percent of PBR (PBR is 2). Additionally, there are management measures in place to address M/SI from activities other than those the Action Proponents are conducting (as discussed below). Immediately below, we explain the information that supports our finding that the M/SI proposed for authorization herein is not expected to result in more than a negligible impact on this stock. As described previously, NMFS must also ensure that impacts by the applicant on the species or stock from other types of take (*i.e.,* harassment) do not combine with the impacts from mortality to adversely affect the species or stock via impacts on annual rates of recruitment or survival, which we have done further below in the stock-specific conclusion sections.

As discussed, we also take into consideration management measures in place to address M/SI caused by other activities. As reported in the SAR, of the total annual M/SI of this stock (9.6), 9.4 of those M/SI are from the DWH oil spill. (The remaining 0.2 are fishery-related M/SI.) Since the DWH spill, there have been numerous recovery efforts for marine mammals. The DWH oil spill NRDA settlement allocated $144,000,000 to marine mammal restoration, and as of 2021, $30,968,016 has been allocated (DWH NRDA Trustees, 2021). Projects have focused on understanding and assessing Gulf cetacean populations, enhancing the capacity of stranding and response programs, enhancing our understanding of, and reducing, stressors on cetaceans, and developing and implementing decision support tools for cetaceans. Recovery efforts have included some efforts to minimize impacts to marine mammals from ocean noise. Proposals and planning for additional pilot projects, including projects to test existing alternatives to traditional airgun seismic surveys, engineering solutions for vessel quieting, and operational approaches for quieting commercial vessels while underway (Southall *et al.* 2024).

In this case, 0.14 M/SI means one mortality in 1 of the 7 years and zero mortalities in 6 of those 7 years. Therefore, the Action Proponents would not be contributing to the total human-caused mortality at all in 6 of the 7, or 85.7 percent, of the years covered by this rulemaking. That means that even if a Northern Gulf of America stock of sperm whale were to be taken by mortality from vessel strike, in 6 of the 7 years there could be no effect on annual rates of recruitment or survival from Action Proponent-caused M/SI. Additionally, the loss of a male would have far less, if any, effect on population rates and absent any information suggesting that one sex is more likely to be struck than another, we can reasonably assume that there is a 50 percent chance that the single strike authorized by this rulemaking would be a male, thereby further decreasing the likelihood of impacts on the population rate. In situations like this where potential M/SI is fractional, consideration must be given to the lessened impacts anticipated due to the absence of M/SI in 6 of the 7 years and the fact that the single strike could be a male. Lastly, we reiterate that PBR is a conservative metric and also not sufficiently precise to serve as an absolute predictor of population effects upon which mortality caps would appropriately be based. This is especially important given the minor difference between zero and one across the 7-year period covered by this rulemaking, which is the smallest distinction possible when considering mortality. As noted above, Wade *et al.* (1998) (authors of the paper from which the current PBR equation is derived) note, ''Estimating incidental mortality in 1 year to be greater than the PBR calculated from a single abundance survey does not prove the mortality will lead to depletion; it identifies a population worthy of careful future monitoring and possibly indicates that mortality-mitigation efforts should be initiated.'' Importantly, M/SI proposed for authorization is below 10 percent of PBR, and management actions are in place to support recovery of the stock following the DWH oil spill impacts. Based on the presence of the factors described above, we do not expect lethal take from Navy activities, alone, to adversely affect Northern Gulf of America stock of sperm whales through effects on annual rates of recruitment or survival. Nonetheless, the fact that total human-caused mortality exceeds PBR necessitates close attention to the remainder of the impacts (*i.e.,* harassment) on the Northern Gulf of America stock of sperm whale from the Action Proponents' activities to ensure that the total authorized takes have a negligible impact on the species or stock. Therefore, this information will be considered in combination with our assessment of the impacts of authorized harassment takes in the *Group and Species-Specific Analyses* section that follows.

Striped Dolphin (Northern Gulf of America Stock)

For striped dolphin (Northern Gulf of America stock), PBR is currently set at 12 and the total annual M/SI is estimated at greater than or equal to 13. As described in the SAR, these 13 M/SI are predicted M/SI from the DWH oil spill. In addition, 0.6 annual mortalities have been authorized for this same stock in the current incidental take regulations for NMFS' Southeast Fisheries Science Center (85 FR 27028, May 6, 2020). This yields a residual PBR of −1.6. NMFS is proposing to authorize two M/SI for the Navy over the 7-year duration of the rule (indicated as 0.29 annually for the purposes of comparing to PBR and evaluating overall effects on annual rates of recruitment and survival), which means that residual PBR is exceeded by 1.74. However, as described above, given that the negligible impact determination is based on the assessment of take of the activity being analyzed, when total annual mortality from human activities is higher, but the impacts from the specific activity being analyzed are very small, NMFS may still find the impact of the authorized take from a specified activity to be negligible even if total human-caused mortality exceeds PBR—specifically if the authorized mortality is less than 10 percent of PBR and management measures are being taken to address serious injuries and mortalities from the other activities causing mortality (*i.e.,* other than the specified activities covered by the incidental take authorization in consideration). When those considerations are applied here, the authorized lethal take (0.29 annually) of Northern Gulf of America stock of striped dolphin is less than 10 percent of PBR (PBR is 12). Additionally, there are management measures in place to address M/SI from activities other than those the Action Proponents are conducting (as discussed below). Immediately below, we explain the information that supports our finding that the M/SI proposed for authorization herein is not expected to result in more than a negligible impact on this stock. As described previously, NMFS must also ensure that impacts by the applicant on the species or stock from other types of take (*i.e.,* harassment) do not combine with the impacts from mortality to adversely affect the species or stock via impacts on annual rates of recruitment or survival, which we have done further below in the stock-specific conclusion sections.

As discussed, we also take into consideration management measures in place to address M/SI caused by other activities. As reported in the SAR, all 13 of the total annual M/SI of this stock are from the DWH oil spill. As described in the previous section in more detail, since the DWH spill, there have been numerous recovery efforts for marine mammals, including some efforts to minimize impacts to marine mammals from ocean noise, such as pilot projects to test existing alternatives to traditional airgun seismic surveys, engineering solutions for vessel quieting, and operational approaches for quieting commercial vessels while underway (Southall *et al.* 2024).

Additionally of note, in this case, 0.29 M/SI means one mortality in 1 of the 7 years and zero mortalities in 6 of those 7 years. Therefore, the Action Proponents would not be contributing to the total human-caused mortality at all in 6 of the 7, or 85.7 percent, of the years covered by this rulemaking. That means that even if a striped dolphin were to be taken by mortality from explosives, in 6 of the 7 years there could be no effect on annual rates of recruitment or survival from Action Proponent-caused M/SI. Additionally, the loss of a male would have far less, if any, effect on population rates and absent any information suggesting that one sex is more likely to be injured than another, we can reasonably assume that there is a 50 percent chance that the two mortalities authorized by this rulemaking would be a male, thereby further decreasing the likelihood of impacts on the population rate. In situations like this where potential M/SI is fractional, consideration must be given to the lessened impacts anticipated due to the absence of M/SI in 6 of the 7 years and the fact that the single strike could be a male. Lastly, we reiterate that PBR is a conservative metric and also not sufficiently precise to serve as an absolute predictor of population effects upon which mortality caps would appropriately be based. This is especially important given the minor difference between zero and one across the 7-year period covered by this rulemaking, which is the smallest distinction possible when considering mortality. As noted previously, Wade *et al.* (1998) state, ''Estimating incidental mortality in 1 year to be greater than the PBR calculated from a single abundance survey does not prove the mortality will lead to depletion; it identifies a population worthy of careful future monitoring and possibly indicates that mortality-mitigation efforts should be initiated.'' Further, M/SI proposed for authorization is below 10 percent of PBR, and management actions are in place to support recovery of the stock following the DWH oil spill impacts. Based on the presence of the factors described above, we do not expect lethal take from Navy activities, alone, to adversely affect Northern Gulf of America stock of striped dolphins through effects on annual rates of recruitment or survival. Nonetheless, the fact that total human-caused mortality exceeds PBR necessitates close attention to the remainder of the impacts (*i.e.,* harassment) on the Northern Gulf of America stock of striped dolphins from the Action Proponents' activities to ensure that the total authorized takes have a negligible impact on the species or stock. Therefore, this information will be considered in combination with our assessment of the impacts of authorized harassment takes in the *Group and Species-Specific Analyses* section that follows.

Deepwater Horizon Oil Spill

As discussed in the earlier *Deepwater Horizon Oil Spill* section, the DWH oil spill caused a suite of adverse health effects to marine mammals in the GOM. Coastal and estuarine bottlenose dolphin populations were some of the most severely injured (Hohn *et al.,* 2017; Rosel *et al.,* 2017; Thomas *et al.,* 2017), but oceanic species were also exposed and experienced increased mortality, increased reproductive failure, and a higher likelihood of other adverse health effects.

Due to the scope of the spill, the magnitude of potentially injured populations, and the difficulties and limitations of working with marine mammals, it is impossible to quantify injury without uncertainty. Wherever possible, the quantification results represent ranges of values that encapsulate the uncertainty inherent in the underlying datasets. The population model outputs shown in table 15 best represent the temporal magnitude of the injury and the potential recovery time from the injury (DWH NRDA Trustees, 2016). The values in the table inform the baseline levels of both individual health and susceptibility to additional stressors, as well as stock status, with which the effects of the Action Proponents' takes are considered in the negligible impact analysis. Additionally, estimates of annual mortality for many stocks now include mortality attributed to the effects of the DWH oil spill (see table 15) (Hayes *et al.,* 2024), and these mortality estimates are considered as part of the environmental baseline.

Group and Species-Specific Analyses

In this section, we build on the general analysis that applies to all marine mammals in the AFTT Study Area from the previous sections. We first include information and analysis that applies to mysticetes or, separately, odontocetes, or pinnipeds, and then within those three sections, more specific information that applies to smaller groups, where applicable, and the affected species or stocks. The specific authorized take numbers are also included in the analyses below, and so here we provide some additional context and discussion regarding how we consider the authorized take numbers in those analyses.

The maximum amount and type of incidental take of marine mammals reasonably likely to occur and therefore proposed to be authorized from exposures to sonar and other active acoustic sources and explosions during the 7-year activity period are shown in table 35, table 36, and table 37, and the subset attributable to ship shock trials is included in table 45.

In the discussions below, the estimated takes by Level B harassment represent instances of take, not the number of individuals taken (the much lower and less frequent Level A harassment takes are far more likely to be associated with separate individuals), and in some cases individuals may be taken more than one time. As part of our evaluation of the magnitude and severity of impacts to marine mammal individuals and the species, and specifically in an effort to better understand the degree to which the modeled and estimated takes likely represent repeated takes of the individuals of a given species/stock, we consider the total annual numbers of take by harassment (auditory injury, non-auditory injury, TTS, and behavioral disturbance) for species or stocks as compared to their associated abundance estimates—specifically, take numbers higher than the stock abundance clearly indicate that some number of individuals are being taken on more than one day in the year, and broadly higher or lower ratios of take to abundance may reasonably be considered to equate to higher or lower likelihood of repeated takes, respectively, other potentially influencing factors being equal. In addition to the mathematical consideration of estimated take compared to abundance, we also consider other factors or circumstances that may influence the likelihood of repeated takes, where known, such as circumstances where activities resulting in take are focused in an area and time (*e.g.,* instrumented ranges or a homeport, or long-duration activities such as manor training exercises) and/or where the same individual marine mammals are known to congregate over longer periods of time (*e.g.,* pinnipeds at a haulout, mysticetes in a known foraging area, or resident odontocetes with smaller home ranges). Similarly, and all else being equal, estimated takes that are largely focused in one region and/or season (see table 81, table 83, table 85, table 87, table 89, and table 91) may indicate a higher likelihood of repeated takes of the same individuals.

Occasional, milder behavioral responses are unlikely to cause long-term consequences for individual animals or populations, and even if some smaller subset of the takes are in the form of a longer (several hours or a day) and more severe response, if they are not expected to be repeated over a comparatively longer duration of sequential days, impacts to individual fitness are not anticipated. Nearly all studies and experts agree that infrequent exposures of a single day or less are unlikely to impact an individual's overall energy budget (Farmer *et al.,* 2018; Harris *et al.,* 2017; King *et al.,* 2015; NAS 2017; New *et al.,* 2014; Southall *et al.,* 2007; Villegas-Amtmann *et al.,* 2015; Hoekendijk *et al.,* 2018; Wisniewska *et al.,* 2018; Czapanskiy *et al.,* 2021; Pirotta, 2022). Generally speaking, and in the case of most species impacted by the proposed activities, in the cases where some number of individuals may reasonably be expected to be taken on more than one day within a year, that number of days would be comparatively small and also with no reason to expect that those takes would occur on sequential days. In the rarer cases of species where individuals might be expected to be taken on a comparatively higher number of days of the year and there are reasons to think that these days might be sequential or clumped together, the likely impacts of this situation are discussed explicitly in the species discussions.

To assist in understanding what this analysis means, we clarify a few issues related to estimated takes and the analysis here. An individual that incurs AUD INJ or TTS may sometimes, for example, also be subject to behavioral disturbance at the same time. As described above in this section, the degree of auditory injury, and the degree and duration of TTS, expected to be incurred from the Navy's activities are not expected to impact marine mammals such that their reproduction or survival could be affected. Similarly, data do not suggest that a single instance in which an animal accrues auditory injury or TTS and is also subjected to behavioral disturbance would result in impacts to reproduction or survival. Alternately, we recognize that if an individual is subjected to behavioral disturbance repeatedly for a longer duration and on consecutive days, effects could accrue to the point that reproductive success is impacted. Accordingly, in analyzing the number of takes and the likelihood of repeated and sequential takes, we consider the total takes, not just the takes by Level B harassment by behavioral disturbance, so that individuals potentially exposed to both threshold shift and behavioral disturbance are appropriately considered. The number of takes by Level A harassment by auditory injury are so low (and zero in some cases) compared to abundance numbers that it is considered highly unlikely that any individual would be taken at those levels more than once.

Use of sonar and other transducers would typically be transient and temporary. The majority of acoustic effects to most marine mammal stocks from sonar and other active sound sources during the specified military readiness activities would be primarily from anti-submarine warfare events. On the less severe end, exposure to comparatively lower levels of sound at a detectably greater distance from the animal, for a few or several minutes, could result in a behavioral response such as avoiding an area that an animal would otherwise have moved through or fed in, or breaking off one or a few feeding bouts. More severe behavioral effects could occur when an animal gets close enough to the source to receive a comparatively higher level of sound, is exposed continuously to one source for a longer time, or is exposed intermittently to different sources throughout a day. Such effects might result in an animal having a more severe flight response and leaving a larger area for a day or more, or potentially losing feeding opportunities for a day. However, such severe behavioral effects are expected to occur infrequently. In addition to the proximity to the source, the type of activity and the season and location during which an animal is exposed, can inform the impacts. These factors, including the numbers and types of effects that are estimated in areas known to be biologically important for certain species are discussed in the group and species-specific sections, below.

Further, as described in the Proposed Mitigation Measures section, this proposed rule includes mitigation measures that would reduce the probability and/or severity of impacts expected to result from acute exposure to acoustic sources or explosives, vessel strike, and impacts to marine mammal habitat. Specifically, the Action Proponents would use a combination of delayed starts, powerdowns, and shutdowns to avoid mortality or serious injury, minimize the likelihood or severity of AUD INJ or non-auditory injury, and reduce instances of TTS or more severe behavioral disturbance caused by acoustic sources or explosives. The Action Proponents would also implement multiple time/area restrictions that would reduce take of marine mammals in areas or at times where they are known to engage in important behaviors, such as calving, where the disruption of those behaviors would have a higher probability of resulting in impacts on reproduction or survival of individuals that could lead to population-level impacts.

These time/area restrictions include ship shock trial mitigation areas throughout the Study Area, MTE Planning Awareness Mitigation Areas in the Northeast and Mid-Atlantic, a Gulf of Maine Marine Mammal Mitigation Area, several mitigation areas specific to NARW, and a Rice's Whale Mitigation Area. Mitigation areas for NARW and Rice's whale specifically are discussed in those species-specific sections below. However, it is important to note that measures in those areas, while developed to protect those species, would also benefit other marine mammals in those areas. Therefore, they are discussed here also.

Regarding ship shock trials, the Action Proponents will not conduct ship shock trials within the Rice's whale core distribution area in the northern Gulf of America or within the portion of the ship shock trial box that overlaps the Jacksonville OPAREA from November 15 through April 15. These mitigation measures would avoid potential exposure of Rice's whales to injurious levels of sound and avoid potential injurious and behavioral impacts to NARW during calving season. Additionally, pre-event planning for ship shock trials will include the selection of sites where marine mammal abundance is expected to be the lowest during the planned event and prioritize sites more than 2 nmi (3.7 km) from the western boundary of the Gulf Stream where marine mammals would be expected in greater concentrations for foraging and migration. Overall, the benefits of Ship Shock Trial Mitigation Areas would be substantial for all marine mammal taxa because ship shock trials use the largest NEW of any explosive activity conducted in the AFTT Study Area.

Regarding MTEs, the Action Proponents will not conduct any MTEs or any portion of any MTE in the Major Training Exercise Planning Awareness Mitigation Areas in the northeast. This would restrict MTEs from occurring within NARW foraging critical habitat, on Georges Bank, and in areas that contain underwater canyons (*e.g.,* Hydrographer Canyon, and a portion of the Northeast Canyons and Seamounts National Marine Monument), as these locations have been associated with high marine mammal abundance, feeding, and mating. In the Major Training Exercise Planning Awareness Mitigation Areas in the mid-Atlantic, the Action Proponents will not conduct any MTEs or any portion of any MTE to the maximum extent practicable, and would conduct no more than four (or a portion of more than four) MTEs per year. This would restrict the number of MTEs that could occur within large swaths of shelf break that contain underwater canyons or other habitats (*e.g.,* Norfolk Canyon, part of the Cape Hatteras Special Research Area) associated with high marine mammal diversity in this region.

In the Gulf of Maine Marine Mammal Mitigation Area, the Action Proponents would use no more than 200 hours of surface ship hull-mounted MFAS annually. This measure is designed to reduce exposure of marine mammals to potentially injurious levels of sound from surface ship hull-mounted MFAS, the type of active sonar with the highest power source used in the Study Area.

Additionally, the action proponents would implement four mitigation areas specifically designed to protect NARW. These include the Northeast North Atlantic Right Whale Mitigation Area, Jacksonville Operating Area North Atlantic Right Whale Mitigation Area, Southeast North Atlantic Right Whale Mitigation Area, and the Dynamic North Atlantic Right Whale Mitigation Areas. These areas are designed to reduce exposure of NARWs to acoustic and explosive stressors as well as vessel strike risk in foraging critical habitat, reproduction critical habitat, and in areas and times when the species has a higher occurrence in these areas. The Northeast North Atlantic Right Whale Mitigation Area would also protect other marine mammal species, including those with BIAs that overlap the mitigation area, including fin whale, humpback whale, minke whale, sei whale, and harbor porpoise (LaBrecque *et al.,* 2015).

In addition to the nature and context of the disturbance, including whether take occurs in a known BIA, species-specific factors affect the severity of impacts to individual animals and population consequences of disturbance. Keen *et al.* (2021) identifies three population consequences of disturbance themes: life history traits, environmental conditions, and disturbance source characteristics. Life history traits considered in Keen *et al.* (2021) include movement ecology (whether animals are resident, nomadic, or migratory), reproductive strategy (capital breeders, income breeders, or mixed), body size (based on size and life stage), and pace of life (slow or fast).

Regarding movement ecology, resident animals that have small home ranges relative to the size and duration of an impact zone would have a higher risk of repeated exposures to an ongoing activity. Animals that are nomadic over a larger range may have less predictable risk of repeated exposure. For resident and nomadic populations, overlap of a stressor with feeding or reproduction depends more on time of year rather than location in their habitat range. In contrast, migratory animals may have higher or reduced potential for exposure during feeding and reproduction based on both location, time of the year, and duration of an activity. The risk of repeated exposure during individual events may be lower during migration as animals maintain directed transit through an area.

Reproduction is energetically expensive for female marine mammals, and reproductive strategy can influence an animal's sensitivity to disturbance. Mysticetes and phocids are capital breeders. Capital breeders rely on their capital, or energy stores, to migrate, maintain pregnancy, and nurse a calf. Capital breeders would be more resilient to short-term foraging disruption due to their reliance on built-up energy reserves, but are vulnerable to prolonged foraging impacts during gestation. Otariids and most odontocetes are income breeders, which rely on some level of income, or regular foraging, to give birth and nurse a calf. Income breeders would be more sensitive to the consequences of disturbances that impact foraging during lactation. Some species exhibit traits of both, such as beaked whales.

Smaller animals require more food intake per unit body mass than large animals. They must consume food on a regular basis and are likely to be non-migratory and income breeders. The smallest odontocetes, the porpoises, must maintain high metabolisms to maintain thermoregulation and cannot rely on blubber stores for long periods of time, whereas larger odontocetes can more easily thermoregulate. The larger size of other odontocetes is an adaptation for deep diving that allows them to access high quality mesopelagic and bathypelagic prey. Both small and large odontocetes have lower foraging efficiency than the large whales. The filter-feeding large whales (mysticetes) consume most of their food within several months of the year and rely on extensive lipid reserves for the remainder of the year. The metabolism of mysticetes allows for fasting while seeking prey patches during foraging season and prolonged periods of fasting outside of foraging season (Goldbogen *et al.,* 2023). Their energy stores support capital breeding and long migrations. The effect of a temporary feeding disturbance is likely to have inconsequential impacts to a mysticete but may be consequential for small cetaceans. Despite their relatively smaller size, amphibious pinnipeds have lower thermoregulatory requirements because they spend a portion of time on land. For purposes of this assessment, marine mammals were generally categorized as small (less than 10 ft (3.05 m)), medium (10–30 ft (3.05–9.1 m)), or large (more than 30 ft (9.1 m)) based on length.

Populations with a fast pace of life are characterized by early age of maturity, high birth rates, and short life spans, whereas populations with a slow pace of life are characterized by later age of maturity, low birth rates, and long life spans. The consequences of disturbance in these populations differ. Although reproduction in populations with a fast pace of life are more sensitive to foraging disruption, these populations are quick to recover. Reproduction in populations with a slow pace of life is resilient to foraging disruption, but late maturity and low birth rates mean that long-term impacts to breeding adults have a longer-term effect on population growth rates. Pace of life was categorized for each species in this analysis by comparing age at sexual maturity, birth rate interval, life span, body size, and feeding and reproductive strategy.

Southall *et al.* (2023) also identified factors that inform a population's vulnerability. The authors describe a framework to assess risk to populations from specific industry impact scenarios at different locations or times of year. While this approach may not be suitable for many military readiness activities, for which alternate spatial or seasonal scenarios are not usually feasible, the concepts considered in that framework's population vulnerability assessment are useful in this analysis, including population status (endangered or threatened), population trend (decreasing, stable, or increasing), population size, and chronic exposure to other anthropogenic or environmental stressors (*e.g.,* fisheries interactions, pollution, climate change, *etc.*). These factors are also considered when assessing the overall vulnerability of a stock to repeated effects from acoustic and explosive stressors.

In consideration of the factors outlined above, if impacts to individuals increase in magnitude or severity such that repeated and sequential higher severity impacts occur (the probability of this goes up for an individual the higher total number of takes it has) or the total number of moderate to more severe impacts increases substantially, especially if occurring across sequential days, then it becomes more likely that the aggregate effects could potentially interfere with feeding enough to reduce energy budgets in a manner that could impact reproductive success via longer cow-calf intervals, terminated pregnancies, or calf mortality. It is important to note that these impacts only accrue to females, which only comprise approximately 50 percent of the population. Based on energetic models, it takes energetic impacts of a significantly greater magnitude to cause the death of an adult marine mammal, and females will always terminate a pregnancy or stop lactating before allowing their health to deteriorate. Also, the death of an adult female has significantly more impact on population growth rates than reductions in reproductive success, while the death of an adult male has very little effect on population growth rates. However, as explained earlier, such severe impacts from the specified activities would be very infrequent and not considered likely to occur at all for most species and stocks. We note that the negligible impact analysis is inherently a two-tiered assessment that first evaluates the anticipated impacts of the activities on marine mammals individuals, and then if impacts are expected to reproduction or survival of any individuals further evaluates the effects of those individual impacts on rates of reproduction and survival of the species or stock, in the context of the status of the species or stock. The analyses below in some cases address species collectively if they occupy the same functional hearing group (*i.e.,* very-low, low, high, and very high-frequency cetaceans), share similar life history strategies, and/or are known to behaviorally respond similarly to acoustic stressors. Because some of these groups or species share characteristics that inform the impact analysis similarly, it would be duplicative to repeat the same analysis for each species. In addition, similar species typically have the same hearing capabilities and behaviorally respond in the same manner.

Thus, our analysis below considers the effects of the specified activities on each affected species or stock even where discussion is organized by functional hearing group and/or information is evaluated at the group level. Where there are meaningful differences between a species or stock that would further differentiate the analysis, they are either described within the section or the discussion for those species or stocks is included as a separate subsection. Specifically below, we first give broad descriptions of the mysticete, odontocete, and pinniped groups and then differentiate into further groups as appropriate.

Mysticetes

This section builds on the broader discussion above and brings together the discussion of the different types and amounts of take that different stocks will incur, the applicable mitigation for each stock, and the status and life history of the stocks to support the negligible impact determinations for each stock. We have already described above why we believe the incremental addition of the small number of low-level auditory injury takes will not have any meaningful effect towards inhibiting reproduction or survival. We have also described above in this section the unlikelihood of any masking or habitat impacts having effects that would impact the reproduction or survival of any of the individual marine mammals affected by the Action Proponents' activities. For mysticetes, there is no predicted non-auditory injury from explosives for any stock. Regarding the severity of individual takes by Level B harassment by behavioral disturbance for mysticetes, the majority of these responses are anticipated to occur at received levels below 172 dB, and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Much of the discussion below focuses on the behavioral effects and the mitigation measures that reduce the probability or severity of effects in biologically important areas or other habitat. Because there are multiple stock-specific factors in relation to the status of the species, as well as mortality take for several stocks, at the end of the section we break out stock-specific findings.

In table 81 below for mysticetes, we indicate the total annual mortality, Level A harassment, and Level B harassment, and a number indicating the instances of total take as a percentage of abundance.

In table 82 below, we indicate the status, life history traits, important habitats, and threats that inform our analysis of the potential impacts of the estimated take on the affected mysticete stocks.

TABLE 81—ANNUAL ESTIMATED TAKE BY LEVEL B HARASSMENT, LEVEL A HARASSMENT, AND MORTALITY AND RELATED INFORMATION FOR MYSTICETES IN THE AFTT STUDY AREA

Marine mammal species	Stock	NMFS stock abundance	NMSDD abundance	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	Maximum annual take	Maximum annual harassment as percentage of stock abundance	Season(s) with 40 percent of take or greater	Region(s) with 40 percent of take or greater
North Atlantic right whale	Western	*372	216	414	2	0	416	112	Spring (45 percent) Winter (40 percent).	Northeast (70 percent).
Blue whale	Western North Atlantic	*Unk	19	71	1	0	72	Und	N/A	Mid-Atlantic (48 percent).
Bryde's whale	Primary	*N/A	N/A	11	0	0	11	Und	Winter (48 percent)	High Seas (100 percent).
Fin whale	Western North Atlantic	*6,802	1,075	2,616	21	0.29	2,637	39	N/A	Mid-Atlantic (62 percent).
Humpback whale	Gulf of Maine	*1,396	690	844	12	0.57	856.57	61	Spring (50 percent)	Mid-Atlantic (48 percent) Northeast (43 percent).
Minke whale	Canadian East Coast	*21,968	1,339	4,643	56	0.29	4,699	21	Winter (51 percent)	Southeast (47 percent).
Rice's whale	Northern Gulf of America	*51	118	303	3	0	306	600	Winter (44 percent)	Gulf of America (100 percent).
Sei whale	Nova Scotia	*6,292	316	747	7	0.29	754.29	12	Spring (41 percent)	N/A.

Note: N/A = Not Applicable. NMSDD abundances are averages only within the U.S. EEZ.

* Indicates which abundance estimate was used to calculate the maximum annual take as a percentage of abundance, either the NMFS SAR (Hayes *et al.*, 2024) or the NMSDD (table 2.4–1 in appendix A of the application). Please refer to the following section for details on which abundance estimate was selected.

TABLE 82—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO MYSTICETES IN THE AFTT STUDY AREA

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (LaBrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality/ serious injury (from other human activities)
North Atlantic right whale.	Western	Endangered.	Depleted Strategic	Migratory	Migratory	Large	Capital	Slow	Vessel strikes, entanglement, habitat degradation, pollution, vessel disturbance, ocean noise, climate change.	UME (declared 2017, active).	Critical Habitat: Northeastern US Foraging Area Unit 1, Southeastern US Calving Area Unit 2.	Yes: Feeding (n=3), Migration (n=1), Reproduction (n=2).	Great South Channel/ Georges Bank Shelf Break, Gulf of ME Mating, Migratory Corridor Scotian Shelf, Southeast Atlantic Calving, Southern New England.	Decreasing.	0.73	14.8
Blue whale.	Western North Atlantic.	Endangered.	Depleted Strategic	Migratory	Migratory	Large	Capital	Slow	Vessel strikes, entanglement, habitat degradation, pollution, vessel disturbance, ocean noise, climate change.	No	No	No	None identified.	Unk, but possibly increasing.	0.8	0

TABLE 82—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO MYSTICETES IN THE AFTT STUDY AREA—Continued

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (LaBrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality/serious injury (from other human activities)
Bryde's whale.	Primary	Not Listed.	....	Unknown, likely migratory.	Unknown, likely migratory.	Large	Capital ...	Slow	Vessel strikes, entanglement, habitat degradation, pollution, vessel disturbance, ocean noise, climate change.	No	No	No	None identified.	Unk	N/A	N/A
Fin whale.	Western North Atlantic.	Endangered.	Depleted Strategic	Migratory	Migratory	Large	Capital ...	Slow	Vessel strikes, entanglement, habitat degradation, pollution, vessel disturbance, ocean noise, climate change.	No	No	Yes: Feeding (n=3).	East of Montauk Point, Southern Gulf of ME.	Unk	11	2.05
Humpback whale.	Gulf of Maine.	Not Listed.	Not Depleted. Not Strategic.	Migratory	Migratory	Large	Capital ...	Slow	Vessel strikes, entanglement, habitat degradation, pollution, vessel disturbance, ocean noise, climate change.	UME (declared 2017, active).	No	Yes: Feeding (n=1).	Gulf of ME Child, Gulf of ME Parent, Mid-Atlantic Shelf, NY Bight Parent, South New England.	Increasing.	22	12.15
Minke whale.	Canadian East Coast.	Not Listed.	Not Depleted. Not Strategic.	Migratory	Migratory	Med/Large.	Capital ...	Slow	Vessel strikes, entanglement, habitat degradation, pollution, vessel disturbance, climate change, disease.	UME (declared 2017, active).	No	Yes: Feeding (n=2).	Central Gulf of ME/Parker Ridge/Cashes Ledge, Southwestern Gulf of ME/Georges Bank.	Unk	170	9.4

Rice's whale.	Northern Gulf of America.	Endangered.	Depleted Strategic	Nomadic	Nomadic	Large	Capital ...	Slow	Vessel strike, ocean noise, energy exploration and development, oil spills, fisheries and aquaculture interaction, ocean debris, small population size, limited distribution, climate change.	Small stock size, DWH.	Proposed Critical Habitat: Proposed Gulf of America 100–400 m isobath.	Yes: Small and resident population.	Expanded Range, Northeastern Gulf of America.	Decreasing.	0.1	0.5
Sei whale.	Nova Scotia.	Endangered.	Depleted Strategic	Migratory	Migratory	Large	Capital ...	Slow	Vessel strike, entanglement, ocean noise, climate change.	No	No	Yes: Feeding (n=1).	Gulf of ME ..	Unk	6.2	0.6

Note: Unk = Unknown; N/A = Not Applicable.

North Atlantic Right Whale (Western Stock)—

North Atlantic right whales are listed as endangered under the ESA and as both a depleted and strategic stock under the MMPA. The current stock abundance estimate is 372 animals. As described in the *Unusual Mortality Events* section, a UME has been designated for NARW. North Atlantic right whales are migratory, though they have been detected across their range year-round. Detections in the mid-Atlantic are occurring more frequently (Engelhaupt *et al.* 2023), and Navy's AFTT Phase IV Density Technical Report predicts a NARW density in the Mid-Atlantic Bight that is almost an order of magnitude higher from 2010–2019 compared to 2003–2009, which is consistent with visual and acoustic surveys showing an increase in the use of the region (Davis *et al.,* 2020; O'Brien *et al.,* 2022).

As described in the Description of Marine Mammals and Their Habitat in the Area of the Specified Activities section, the AFTT Study Area overlaps the NARW migratory corridor BIA, which represent areas and months within which a substantial portion of a species or population is known to migrate (LeBrecque *et al.* 2015). The Study Area also overlaps three seasonal feeding BIAs in the northeast Atlantic, a seasonal mating BIA in the central Gulf of Maine, and a seasonal calving BIA in the southeast Atlantic (LaBrecque *et al.* 2015), as well as important feeding habitat in southern New England, primarily along the western side of Nantucket Shoals (Estabrook *et al.,* 2022; Kraus *et al.,* 2016; Leiter *et al.,* 2017; O'Brien *et al.,* 2022, Quintano-Rizzo *et al.,* 2021). Additionally, the AFTT Study Area overlaps ESA-designated critical habitat for the NARW (Unit 1 and Unit 2) as described in the *Critical Habitat* section of this proposed rule.

NARW are threatened due to a low population abundance, compromised body condition, high mortality rates, and low reproductive rates. They face several chronic anthropogenic and non-anthropogenic risk factors, including vessel strike, entanglement, and climate change, among others. Recent studies have reported individuals showing high stress levels (*e.g.,* Corkeron *et al.,* 2017) and poor health, which has further implications on reproductive success and calf survival (Christiansen *et al.,* 2020; Stewart *et al.,* 2021; Stewart *et al.,* 2022; Pirotta *et al.* 2024). Given these factors, the status of the NARW population is of heightened concern and, therefore, additional analysis is warranted.

As shown in table 81, the maximum annual allowable instances of take under this proposed rule by Level A Harassment and Level B harassment is 2 and 414, respectively. Given the current status of the NARW, the loss of even one individual could significantly impact the population. However, no mortality is anticipated or proposed for authorization, and nor is any non-auditory injury. The total take allowable across all 7 years of the rule is indicated in table 49.

Regarding the potential takes associated with auditory impairment, as described in the Auditory Injury from Sonar Acoustic Sources and Explosives and Non-Auditory Injury from Explosives section above, any takes in the form of TTS are expected to be lower-level, of short duration (from minutes to, at most, several hours or less than a day), and mostly not in a frequency band that would be expected to interfere with NARW communication or other important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival. For similar reasons, while auditory injury impacts last longer, the low anticipated levels of AUD INJ that could be reasonably expected to result from these activities are unlikely to have any effect on fitness.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 172 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. NARWs are large-bodied capital breeders with a slow pace of life, which would generally be less susceptible to impacts from shorter duration foraging disruptions.

Further, as described in the *Group and Species-Specific Analyses* section above and the Proposed Mitigation Measures section, mitigation measures, several of which are designed specifically to reduce impacts to North Atlantic right whale, are expected to further reduce the potential severity of impacts through real-time operational measures that minimize higher level/longer duration exposures and time/area measures that reduce impacts in high value habitat. Specifically, this proposed rule includes several proposed geographic mitigation areas for NARW: Northeast North Atlantic Right Whale Mitigation Area, Gulf of Maine Mitigation Area, Jacksonville Operating Area North Atlantic Right Whale Mitigation Area, Southeast North Atlantic Right Whale Mitigation Area, Dynamic North Atlantic Right Whale Mitigation Areas, MTE Planning Awareness Mitigation Areas in the northeast and mid-Atlantic, and ship shock trial mitigation areas. The Northeast North Atlantic Right Whale Mitigation Area and Southeast North Atlantic Right Whale Mitigation Area in particular would reduce exposures in times and areas where impacts would be more likely to affect feeding and energetics (note that these mitigation areas are not quantitatively accounted for in the modeling, which means that the mitigation may prevent some of the takes predicted—though the analysis considers that they could all occur). Also, because of the proposed mitigation measures, the estimated takes would be less likely to occur in areas or at times where impacts would be likely to affect feeding and energetics or important cow/calf interactions that could lead to reduced reproductive success or survival, including those in areas known to be biologically important, and such impacts are not anticipated. Any impacts predicted in the east coast migratory corridor are less likely to impact individuals during feeding or breeding behaviors.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the number of takes by harassment as compared to the stock/species abundance (see table 81), it is likely that some portion of the individuals taken are taken repeatedly over a small number of days, particularly in the Northeast (70 percent of the takes predicted are in this region) during the winter and spring where and when a combined 58 percent of takes of this stock would occur and animals are likely feeding. This is when North Atlantic right whales have a higher density at feeding grounds located near and south of Cape Cod, including areas overlapped by the Narragansett Bay OPAREA in the Northeast Range Complexes, and in the migratory corridor through the northeast region. However, given the variety of activity types that contribute to take across separate exercises conducted at different times and in different areas, the fact that many result from transient activities conducted at sea, and fact that the number of takes as compared to the abundance is just above 100 percent (112 percent), it is unlikely that takes would be in high enough numbers for any one individual or occur clumped across sequential days in a manner likely to impact foraging success and energetics, or that other behaviors such that reproduction or survival of any individuals is likely to be impacted.

Given the magnitude and severity of the impacts discussed above to NARW (considering annual take maxima and the total across 7 years) and their habitat, and in consideration of the required mitigation measures and other information presented, the Action Proponents' activities are unlikely to result in impacts on the reproduction or survival of any individuals and, thereby, unlikely to affect annual rates of recruitment or survival. Further, we have considered the UME for NARW species described above, and even in consideration of the fact that some of the affected individuals may have compromised health, given the anticipated impacts of the activity, the proposed take is not expected to exacerbate the effects of the UME or otherwise impact the population. For these reasons, we have determined that the take by harassment anticipated and proposed for authorization would have a negligible impact on the Western stock of NARW.

Blue Whale (Western North Atlantic Stock)—

Blue whales are listed as endangered under the ESA and as both depleted and strategic under the MMPA. The stock abundance is currently unknown, though NMFS' SAR reports an N_{min} (minimum abundance) of 402. The stock's primary range is outside of the AFTT Study Area. There are no UMEs or other factors that cause particular concern for this stock, and there are no known biologically important areas for blue whales in the AFTT Study Area. They are frequently located in continental shelf waters near eastern Canada but have also been sighted off the coast of Florida and along the mid-Atlantic ridge (likely the southern portion of their feeding range). Blue whales face several chronic anthropogenic and non-anthropogenic risk factors, including vessel strike, entanglement, and climate change, among others.

As shown in table 81, the maximum annual allowable instances of take under this proposed rule by Level A Harassment and Level B harassment is 1 and 71, respectively. No mortality is anticipated or proposed for authorization, and nor is any non-auditory injury. The total take allowable across all 7 years of the rule is indicated in table 49.

Regarding the potential takes associated with auditory impairment, as described in the Auditory Injury from Sonar Acoustic Sources and Explosives and Non-Auditory Injury from Explosives section above, any takes in the form of TTS are expected to be lower-level, of short duration, and mostly not in a frequency band that would be expected to interfere with blue whale communication or other important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival. For similar reasons, while auditory injury impacts last longer, the low anticipated levels of AUD INJ that could be reasonably expected to result from these activities are unlikely to have any effect on fitness.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 172 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Blue whales are large-bodied capital breeders with a slow pace of life, and are therefore generally less susceptible to impacts from shorter duration foraging disruptions. Further, as described in the *Group and Species-Specific Analyses* section above and the Proposed Mitigation Measures section, mitigation measures are expected to further reduce the potential severity of impacts through real-time operational measures that minimize higher level/longer duration exposures and time/area measures that reduce impacts in high value habitat.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the lower number of takes by harassment as compared to the stock/species abundance (see table 81), their migratory movement pattern, and the absence of take concentrated in areas in which animals are known to congregate, it is unlikely that any individual blue whales would be taken on more than a small number of days within a year and, therefore, the anticipated behavioral disturbance is not expected to affect reproduction or survival.

Given the magnitude and severity of the impacts discussed above to blue whales (considering annual take maxima and the total across 7 years) and their habitat, and in consideration of the required mitigation measures and other information presented, the Action Proponents' activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and proposed for authorization would have a negligible impact on the Western North Atlantic stock of blue whales.

Bryde's Whale (Primary)—

This population of Bryde's whales spans the mid- and southern Atlantic. They have not been designated as a stock under the MMPA, are not ESA-listed, and there is no current reported population trend. There are no UMEs or other factors that cause particular concern for this stock and no known biologically important areas for Bryde's whale in the AFTT Study Area. Most Bryde's whales congregate in tropical waters south of the AFTT Study Area, and only occasionally travel as far north as Virginia. Bryde's whales generally face several chronic anthropogenic and non-anthropogenic risk factors, including vessel strike, entanglement, and climate change, among others.

As shown in table 81, the maximum annual allowable instances of take under this proposed rule by Level B harassment is 11. No mortality is anticipated or proposed for authorization, and nor is any auditory or non-auditory injury (Level A harassment). The total take allowable across all 7 years of the rule is indicated in table 49.

Regarding the potential takes associated with TTS, as described in the Temporary Threshold Shift section above, any takes in the form of TTS are expected to be lower-level, of short duration, and mostly not in a frequency band that would be expected to interfere with Bryde's whale communication or other important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 172 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Bryde's whales are large-bodied capital breeders with a slow pace of life, and are therefore generally less susceptible to impacts from shorter duration foraging disruptions.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the low number of takes by harassment (see table 81), their migratory movement pattern, and the absence of take concentrated in areas in which animals are known to congregate, it is unlikely that any individual Bryde's whales would be taken on more than a small number of days within a year and, therefore, the anticipated behavioral disturbance is not expected to affect reproduction or survival.

Given the magnitude and severity of the impacts discussed above to this population of Bryde's whales (considering annual take maxima and the total across 7 years) and their habitat, and in consideration of the required mitigation measures and other information presented, the Action Proponents' activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and proposed for authorization would have a negligible impact on Bryde's whales.

Fin Whale (Western North Atlantic Stock)—

Fin whales are listed as endangered under the ESA throughout the species' range and as both depleted and strategic under the MMPA. The Western North Atlantic stock abundance is 6,802 animals. There are no UMEs or other factors that cause particular concern for this stock. As described in the Description of Marine Mammals and Their Habitat in the Area of the Specified Activities section, the AFTT Study Area overlaps three fin whale feeding BIAs: (1) June to October in the northern Gulf of Maine; (2) year-round in the southern Gulf of Maine, and (3) March to October east of Montauk Point (LeBrecque *et al.* 2015), and more recent data supports that these areas remain biologically important (King *et al.,* 2021; Lomac-MacNair *et al.,* 2022). There is no ESA-designated critical habitat for fin whales in the AFTT Study Area. The Western North Atlantic stock of fin whales may be present year-round in the Atlantic with higher densities near the shelf break in the Northeast and mid-Atlantic. Densities near feeding areas on the shelf in the Northeast are higher in the summer. Fin whales face several chronic anthropogenic and non-anthropogenic risk factors, including vessel strike, entanglement, and climate change, among others.

As shown in table 81, the maximum annual allowable instances of take under this proposed rule by Level A Harassment and Level B harassment is 21 and 2,616, respectively. As indicated, the rule also allows for up to 2 takes by serious injury or mortality over the course of the 7-year rule, the impacts of which are discussed above in the Serious Injury and Mortality section. No non-auditory injury is anticipated or proposed for authorization. The total take allowable across all 7 years of the rule is indicated in table 49.

Regarding the potential takes associated with auditory impairment, as described in the Auditory Injury from Sonar Acoustic Sources and Explosives and Non-Auditory Injury from Explosives section above, any takes in the form of TTS are expected to be lower-level, of short duration (even the longest recovering in less than a day), and mostly not in a frequency band that would be expected to interfere with fin whale communication or other important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival. For similar reasons, while auditory injury impacts last longer, the low anticipated levels of AUD INJ that could be reasonably expected to result from these activities are unlikely to have any effect on fitness.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 172 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Of the takes by Level B harassment, 5 would occur east of Montauk Point between March and October, and 52 would occur in the southern Gulf of Maine, both areas known to be biologically important for fin whale foraging. None of the takes by Level A harassment would occur in areas known to be biologically important. However, given that fin whales are large-bodied capital breeders with a slow pace of life, and are therefore generally less susceptible to impacts from shorter duration foraging disruptions, as well as the small number of takes anticipated to occur in the BIA, we do not anticipate that takes in this BIA would occur to any individual fin whale on more than a small number of days within a year, as described further below. Further, as described in the *Group and Species-Specific Analyses* section above and the Proposed Mitigation Measures section, mitigation measures are expected to further reduce the potential severity of impacts through real-time operational measures that minimize higher level/longer duration exposures and time/area measures that reduce impacts in high value habitat.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the number of takes by harassment as compared to the stock/species abundance (see table 81), it is likely that some portion of the individuals taken are taken repeatedly over a small number of days. However, given the variety of activity types that contribute to take across separate exercises conducted at different times and in different areas, and the fact that many result from transient activities conducted at sea, it is unlikely that repeated takes would occur either in numbers or clumped across sequential days in a manner likely to impact foraging success and energetics or other behaviors such that reproduction or survival of any individuals is are likely to be impacted. Further, this stock is migratory, and the takes are not concentrated within a specific season.

As analyzed and described in the Mortality section above, given the status of the stock and in consideration of other ongoing human-caused mortality, the M/SI proposed for authorization for the Western North Atlantic stock of fin whales (2 over the course of the 7-year rule, or 0.29 annually) would not, alone, be expected to adversely affect the stock through rates of recruitment or survival. Given the magnitude and severity of the take by harassment discussed above and any anticipated habitat impacts, and in consideration of the required mitigation measures and other information presented, the take by harassment proposed for authorization is unlikely to result in impacts on the reproduction or survival of any individuals and, thereby, unlikely to affect annual rates of recruitment or survival either alone or in combination with the M/SI proposed for authorization. For these reasons, we have determined that the take anticipated and proposed for authorization would have a negligible impact on the Western North Atlantic stock of fin whales.

Humpback Whale (Gulf of Maine Stock)—

The West Indies DPS of humpback whales is not listed as threatened or endangered under the ESA, and the Gulf of Maine stock, which includes individuals from the West Indies DPS, is not considered depleted or strategic under the MMPA. The stock abundance is 1,396 animals. As described in the Description of Marine Mammals and Their Habitat in the Area of the Specified Activities section, humpback whales along the Atlantic Coast have been experiencing an active UME as elevated humpback whale mortalities have occurred along the Atlantic coast from Maine through Florida since January 2016. Of the cases examined, approximately 40 percent had evidence of human interaction (vessel strike or entanglement). As also described in the Description of Marine Mammals and Their Habitat in the Area of the Specified Activities section, the AFTT Study Area overlaps a humpback whale feeding BIA (LeBrecque *et al.* 2015). This BIA is further supported by more recent information that suggests that the Gulf of Maine, Mid-Atlantic Shelf, New York Bight, and south New England are all important for humpback whale feeding (Brown *et al.,* 2019; Hayes *et al.,* 2019; Aschettino *et al.,* 2020; Davis *et al.,* 2020; Zeh *et al.,* 2020; King *et al.,* 2021; Pershing *et al.,* 2021; Stepanuk *et al.,* 2021; Zoidis *et al.,* 2021; Lomac-MacNair *et al.,* 2022; Smith *et al.,* 2022). There is no ESA-designated critical habitat for the Gulf of Maine stock of humpback whales given that the associated DPS is not ESA-listed. The Gulf of Maine stock of humpback whales have particularly strong site fidelity in the Gulf of Maine feeding grounds March to December and in the Caribbean calving grounds from December to May. Humpback whales, however, may occur in the AFTT Study Area, particularly in the mid-Atlantic and Northeast, year-round. They occur near the Chesapeake Bay mouth except in the summer. Humpback whales face several chronic anthropogenic and non-anthropogenic risk factors, including vessel strike, entanglement, and climate change, among others.

As shown in table 81, the maximum annual allowable instances of take under this proposed rule by Level A Harassment and Level B harassment is 12 and 844, respectively. As indicated, the rule also allows for up to 4 takes by serious injury or mortality over the course of the 7-year rule, the impacts of which are discussed above in the Serious Injury and Mortality section. No non-auditory injury is anticipated or proposed for authorization. The total take allowable across all 7 years of the rule is indicated in table 49.

Regarding the potential takes associated with auditory impairment, as described in the Auditory Injury from Sonar Acoustic Sources and Explosives and Non-Auditory Injury from Explosives section above, any takes in the form of TTS are expected to be lower-level, of short duration (even the longest recovering in several hours or less than a day), and mostly not in a frequency band that would be expected to interfere with humpback whale communication or other important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival. For similar reasons, while auditory injury impacts last longer, the low anticipated levels of AUD INJ that could be reasonably expected to result from these activities are unlikely to have any effect on fitness.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 172 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Humpback whales are large-bodied capital breeders with a slow pace of life, and are therefore generally less susceptible to impacts from shorter duration foraging disruptions. Further, as described in the *Group and Species-Specific Analyses* section above and the Proposed Mitigation Measures section, mitigation measures are expected to further reduce the potential severity of impacts through real-time operational measures that minimize higher level/longer duration exposures and time/area measures that reduce impacts in high value habitat.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the number of takes by harassment as compared to the stock/species abundance (see table 81) and the fact that a portion of the takes occur in BIAs, it is likely that some portion of the individuals taken are taken repeatedly over a small number of days. However, given the migratory nature of the stock, the variety of activity types that contribute to take across separate exercises conducted at different times and in different areas (*i.e.,* not concentrated within a specific region and season), and the fact that many result from transient activities conducted at sea, it is unlikely that repeated takes would occur either in numbers or clumped across sequential days in a manner likely to impact foraging success and energetics or other behaviors such that reproduction or survival of any individuals likely to be impacted. Further, as noted above, humpback whales are large-bodied capital breeders with a slow pace of life, and are therefore generally less susceptible to impacts from shorter duration foraging disruptions. As analyzed and described in the Mortality section above, given the status of the stock and in consideration of other ongoing human-caused mortality, the M/SI proposed for authorization for Gulf of Maine humpback whales (4 over the course of the 7-year rule, or 0.57 annually) would not, alone, be expected to adversely affect the stock through rates of recruitment or survival. Given the magnitude and severity of the take by harassment discussed above and any anticipated habitat impacts, and in consideration of the required mitigation measures and other information presented, the take by harassment proposed for authorization is unlikely to result in impacts on the reproduction or survival of any individuals and, thereby, unlikely to affect annual rates of recruitment or survival either alone or in combination with the M/SI proposed for authorization. Last, we have both considered the effects of the UME on this stock in our analysis and findings regarding the impact of the activity on the stock, and, also, determined that we do not expect the proposed take to exacerbate the effects of the UME or otherwise impact the population. For these reasons, we have determined that the take anticipated and proposed for authorization would have a negligible impact on the Gulf of Maine stock of humpback whales.

Minke Whale (Canadian East Coast Stock)—

Minke whales are not listed as threatened or endangered under the ESA and are not considered depleted or strategic under the MMPA. The stock abundance is 21,968 animals (Hayes *et al.,* 2024). The stock's range extends beyond the AFTT Study Area. There is an ongoing UME for minke whales along the Atlantic Coast from Maine through South Carolina, with the highest number of deaths in Massachusetts, Maine, and New York. Preliminary findings in several of the whales have shown evidence of human interactions or infectious diseases. However, we note that the stock abundance is greater than 21,000 and the take proposed for authorization is not expected to exacerbate the UME in any way. As described in the Description of Marine Mammals and Their Habitat in the Area of the Specified Activities section, the AFTT Study Area overlaps two minke whale feeding BIAs (Labrecque *et al.,* 2015; CeTAP, 1982; Murphy, 1995). There is no ESA-designated critical habitat for minke whales, as the species is not ESA-listed. Minke whales face several chronic anthropogenic and non-anthropogenic risk factors, including vessel strike, entanglement, and climate change, among others.

As shown in table 81, the maximum annual allowable instances of take under this proposed rule by Level A Harassment and Level B harassment is 56 and 4,643, respectively. As indicated, the rule also allows for up to 2 takes by serious injury or mortality over the course of the 7-year rule, the impacts of which are discussed above in the Serious Injury and Mortality section. The total take allowable across all 7 years of the rule is indicated in table 49.

Regarding the potential takes associated with auditory impairment, as described in the Auditory Injury from Sonar Acoustic Sources and Explosives and Non-Auditory Injury from Explosives section above, any takes in the form of TTS are expected to be lower-level, of short duration, and mostly not in a frequency band that would be expected to interfere with minke whale communication or other important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival. For similar reasons, while auditory injury impacts last longer, the low anticipated levels of AUD INJ that could be reasonably expected to result from these activities are unlikely to have any effect on fitness.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 172 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Minke whales are medium-to-large-bodied capital breeders with a slow pace of life, and are therefore generally less susceptible to impacts from shorter duration foraging disruptions. Further, as described in the *Group and Species-Specific Analyses* section above and the Proposed Mitigation Measures section, mitigation measures are expected to further reduce the potential severity of impacts through real-time operational measures that minimize higher level/longer duration exposures and time/area measures that reduce impacts in high value habitat.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the lower number of takes by harassment as compared to the stock/species abundance (see table 81), their migratory movement pattern, and the absence of take concentrated in areas in which animals are known to congregate, it is unlikely that any individual minke whales would be taken on more than a small number of days within a year and, therefore, the anticipated behavioral disturbance is not expected to affect reproduction or survival.

As analyzed and described in the Mortality section above, given the status of the stock and in consideration of other ongoing human-caused mortality, the M/SI proposed for authorization for Canadian East Coast minke whales (2 over the course of the 7-year rule, or 0.29 annually) would not, alone, be expected to adversely affect the stock through rates of recruitment or survival. Given the magnitude and severity of the take by harassment discussed above and any anticipated habitat impacts, and in consideration of the required mitigation measures and other information presented, the take by harassment proposed for authorization is unlikely to result in impacts on the reproduction or survival of any individuals and, thereby, unlikely to affect annual rates of recruitment or survival either alone or in combination with the M/SI proposed for authorization. Last, we have both considered the effects of the UME on this stock in our analysis and findings regarding the impact of the activity on the stock, and, also, determined that we do not expect the proposed take to exacerbate the effects of the UME or otherwise impact the population. For these reasons, we have determined that the take anticipated and proposed for authorization would have a negligible impact on the Canadian East Coast stock of minke whales.

Rice's Whale (Northern Gulf of America Stock)—

Rice's whales are listed as endangered under the ESA and as both depleted and strategic under the MMPA. The stock abundance is 51 animals (Hayes *et al.,* 2024). The AFTT Study Area overlaps the Rice's whale small and resident population BIA (LaBrecque *et al.* 2015, further supported by more recent information (*e.g.,* Rosel *et al.* 2021, Garrison *et al.* 2024)), as well as proposed ESA-designated critical habitat (88 FR 47453, July 24, 2023), as described in the Description of Marine Mammals in the Area of Specified Activities section. Rice's whales face several chronic anthropogenic and non-anthropogenic risk factors, including vessel strike, energy exploration and development, climate change, and a limited population size and distribution, among others. Although this stock is not experiencing a UME, given the stock's status, low abundance and vulnerability, constricted range, and lingering effects of exposure to oil from the DWH oil spill (which include adverse health effects on individuals, as well as population effects), additional analysis is warranted.

Although there is new evidence of Rice's whale occurrence in the central and western Gulf of America from passive acoustic detections (Soldevilla *et al.,* 2022; 2024), the highest densities of Rice's whales remain confined to the northeastern Gulf of America core habitat, where their occurrence would overlap activities conducted in the offshore portions of the Naval Surface Warfare Center, Panama City Division Testing Area. The number of individuals that occur in the central and western Gulf of America and nature of their use of this area is poorly understood. Soldevilla *et al.* (2022) suggest that more than one individual was present on at least one occasion, as overlapping calls of different call subtypes were recorded in that instance, but also state that call detection rates suggest that either multiple individuals are typically calling or that individual whales are producing calls at higher rates in the central/western Gulf of America. Soldevilla *et al.* (2024) provide further evidence that Rice's whale habitat encompasses all 100–400 m depth waters encircling the entire Gulf of America (including Mexican waters), but they also note that further research is needed to understand the density of whales in these areas, seasonal changes in whale density, and other aspects of habitat usage.

As shown in table 81, the maximum annual allowable instances of take under this proposed rule by Level A Harassment and Level B harassment is 3 and 303, respectively. No mortality is anticipated or proposed for authorization, and nor is any non-auditory injury. The total take allowable across all 7 years of the rule is indicated in table 49. Most impacts to Rice's whale are due to unmanned underwater vehicle testing, which may use sonars at a variety of frequencies for multiple hours most days of the year on the testing range. 44 percent of takes of this stock would occur during the winter when Rice's whale densities are predicted to be highest in the northeastern Gulf of America.

Regarding the potential takes associated with auditory impairment, as described in the Auditory Injury from Sonar Acoustic Sources and Explosives and Non-Auditory Injury from Explosives section above, any takes in the form of TTS are expected to be lower-level, of short duration (from minutes to, at most, several hours or less than a day), and mostly not in a frequency band that would be expected to interfere with Rice's whale communication or other important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival. For similar reasons, while auditory injury impacts last longer, the low anticipated levels of AUD INJ that could be reasonably expected to result from these activities are unlikely to have any effect on fitness.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 172 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Rice's whales are large-bodied capital breeders with a slow pace of life, which would generally be expected to be less susceptible to impacts from shorter-term foraging disruption. Further, as described in the *Group and Species-Specific Analyses* section above and the Proposed Mitigation Measures section, mitigation measures are expected to further reduce the potential severity of impacts through real-time operational measures that minimize higher level/longer duration exposures and time/area measures that reduce impacts in high value habitat. In particular, this proposed rulemaking includes a Rice's Whale Mitigation Area that overlaps the Rice's whale small and resident population area identified by NMFS in its 2016 status review (Rosel *et al.,* 2016). This area encompasses the area where Rice's whales are most likely to occur as well as most of the eastern portion of proposed critical habitat. Within this area, the Action Proponents must not use more than 200 hours of surface ship hull-mounted mid-frequency active sonar annually and must not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) except during mine warfare activities. Additionally, the Ship Shock Trial Mitigation Area would ensure that the northern Gulf of America ship shock trial box is situated outside of the Rice's whale core distribution area. These restrictions would reduce the severity of impacts to Rice's whales by reducing their exposure to levels of sound from sonar or explosives that would have the potential to cause injury, or mortality, thereby reducing the likelihood of those effects and, further, minimizing the severity of behavioral disturbance.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the number of takes by harassment as compared to the stock/species abundance (see table 81), it is likely that some portion of the individuals taken are taken repeatedly over a moderate number of days. However, unlike most large whales, Rice's whales are not migratory but are nomadic, so the risk of repeated impacts on individuals is likely similar within the population as animals move throughout their range. Further, given the variety of activity types that contribute to take across separate exercises conducted at different times and in different areas, and the fact that many result from transient activities conducted at sea, it is unlikely that takes would occur either in numbers or clumped across sequential days in a manner likely to impact foraging success and energetics or other behaviors such that reproduction or survival are likely to be impacted. While Rice's whale core habitat is in the northeastern portion of the Gulf of America which has been identified as biologically important (LaBrecque *et al.* 2015), and a majority of takes would occur in that area, additional important Rice's whale habitat occurs between the 100 m and 400 m (328 ft and 1,312 ft) isobath in the Gulf of America (Soldevilla *et al.,* 2024; 88 FR 47453, July 24, 2023).

Given the magnitude and severity of the impacts discussed above to Rice's whale (considering annual take maxima and the total across 7 years) and their habitat, and in consideration of the required mitigation measures and other information presented, the Action Proponents' activities are unlikely to result in impacts on the reproduction or survival of any individuals and, thereby, unlikely to affect annual rates of recruitment or survival. Last, we are aware that Rice's whales have experienced lower rates of reproduction and survival since the DWH oil spill, however, those effects are reflected in the SARs and other data considered in these analyses and do not change our findings. For these reasons, we have determined that the take by harassment anticipated and proposed for authorization would have a negligible impact on Rice's whale.

Sei Whale (Nova Scotia Stock)—

Sei whales are listed as endangered under the ESA throughout its range and are considered depleted and strategic under the MMPA. The Nova Scotia stock abundance is 6,292 animals. There are no UMEs or other factors that cause particular concern for this stock. As described in the Description of Marine Mammals and Their Habitat in the Area of the Specified Activities section, the AFTT Study Area overlaps a sei whale feeding BIA. There is no ESA-designated critical habitat for sei whales in the AFTT Study Area. The highest sei whale abundance in U.S. waters occurs during spring, with sightings concentrated along the eastern margin of Georges Bank, into the Northeast Channel area, south of Nantucket, and along the southwestern edge of Georges Bank (CETAP 1982; Hayes *et al.* 2024; Kraus *et al.* 2016; Roberts *et al.* 2016; Palka *et al.* 2017; Cholewiak *et al.* 2018). Sei whales face several chronic anthropogenic and non-anthropogenic risk factors, including vessel strike, entanglement, and climate change, among others.

As shown in table 81, the maximum annual allowable instances of take under this proposed rule by Level A Harassment and Level B harassment is 7 and 747, respectively. As indicated, the rule also allows for up to 2 takes by serious injury or mortality over the course of the 7-year rule, the impacts of which are discussed above in the Serious Injury and Mortality section. The total take allowable across all 7 years of the rule is indicated in table 49.

Regarding the potential takes associated with auditory impairment, as described in the Auditory Injury from Sonar Acoustic Sources and Explosives and Non-Auditory Injury from Explosives section above, any takes in the form of TTS are expected to be lower-level, of short duration, and mostly not in a frequency band that would be expected to interfere with sei whale communication or other important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival. For similar reasons, while auditory injury impacts last longer, the low anticipated levels of AUD INJ that could be reasonably expected to result from these activities are unlikely to have any effect on fitness.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 172 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Sei whales are large-bodied capital breeders with a slow pace of life, and are therefore generally less susceptible to impacts from shorter duration foraging disruptions. Further, as described in the *Group and Species-Specific Analyses* section above and the Proposed Mitigation Measures section, mitigation measures are expected to further reduce the potential severity of impacts through real-time operational measures that minimize higher level/longer duration exposures and time/area measures that reduce impacts in high value habitat.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the lower number of takes by harassment as compared to the stock/species abundance (see table 81) and their migratory movement pattern, it is unlikely that any individual sei whales would be taken on more than a small number of days within a year and, therefore, the anticipated behavioral disturbance is not expected to affect reproduction or survival.

As analyzed and described in the Mortality section above, given the status of the stock and in consideration of other ongoing human-caused mortality, the M/SI proposed for authorization for the Nova Scotia stock of sei whales (2 over the course of the 7-year rule, or 0.29 annually) would not, alone, be expected to adversely affect the stock through rates of recruitment or survival. Given the magnitude and severity of the take by harassment discussed above and any anticipated habitat impacts, and in consideration of the required mitigation measures and other information presented, the take by harassment proposed for authorization is unlikely to result in impacts on the reproduction or survival of any individuals and, thereby, unlikely to affect annual rates of recruitment or survival either alone or in combination with the M/SI proposed for authorization. For these reasons, we have determined that the take anticipated and proposed for authorization would have a negligible impact on the Nova Scotia stock of sei whales.

Odontocetes

This section builds on the broader discussion above and brings together the discussion of the different types and amounts of take that different stocks will incur, the applicable mitigation for each stock, and the status and life history of the stocks to support the negligible impact determinations for each stock. We have already described above why we believe the incremental addition of the small number of low-level auditory injury takes will not have any meaningful effect towards inhibiting reproduction or survival. We have also described above in this section the unlikelihood of any masking or habitat impacts having effects that would impact the reproduction or survival of any of the individual marine mammals affected by the Action Proponents' activities. Some odontocete stocks have predicted non-auditory injury from explosives, discussed further below. Regarding the severity of individual takes by Level B harassment by behavioral disturbance for odontocetes, the majority of these responses are anticipated to occur at received levels below below 178 dB for most odontocete species and below 154 dB for sensitive species (*i.e.,* beaked whales and harbor porpoises, for which a lower behavioral disturbance threshold is applied), and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Much of the discussion below focuses on the behavioral effects and the mitigation measures that reduce the probability or severity of effects in biologically important areas or other habitat. Because there are multiple stock-specific factors in relation to the status of the species, as well as mortality take for several stocks, at the end of the section we break out stock- or group-specific findings.

In table 83 (sperm whales, dwarf sperm whales, and pygmy sperm whales), table 85 (beaked whales), table 87 (dolphins and small whales), table 89 (porpoises), and table 91 (pinnipeds), we indicate the total annual mortality, Level A harassment, and Level B harassment, and a number indicating the instances of total take as a percentage of abundance.

In table 84 (sperm whales, dwarf sperm whales, and pygmy sperm whales), table 86 (beaked whales), table 88 (dolphins and small whales), table 90 (porpoises), and table 92 (pinnipeds), below, we indicate the status, life history traits, important habitats, and threats that inform our analysis of the potential impacts of the estimated take on the affected odontocete stocks.

Sperm Whales, Dwarf Sperm Whales, and Pygmy Sperm Whales—

TABLE 83—ANNUAL ESTIMATED TAKE BY LEVEL B HARASSMENT, LEVEL A HARASSMENT, AND MORTALITY AND RELATED INFORMATION FOR ATLANTIC STOCKS OF SPERM WHALE, DWARF SPERM WHALE, AND PYGMY SPERM WHALE IN THE AFTT STUDY AREA

Marine mammal species	Stock	NMFS stock abundance	NMSDD abundance	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	Maximum annual take	Maximum annual take as percentage of stock abundance	Season(s) with 40 percent of take or greater	Region(s) with 40 percent of take or greater
Sperm whale	Northern Gulf of America	1,180	*1,614	275	0	0.14	275	17	N/A	Gulf of America (60 percent).
Dwarf sperm whales	Northern Gulf of America[a]	336	*510	189	22	0	211	41	N/A	Gulf of America (96 percent).
Pygmy sperm whales	Northern Gulf of America[a]	336	*510	175	22	0	197	39	N/A	Gulf of America (95 percent).
Sperm whale	North Atlantic	*5,895	4,242	12,590	7	0.29	12,597	214	N/A	Mid-Atlantic (80 percent).
Dwarf sperm whale	Western North Atlantic[a]	*9,474	2,426	6,326	180	0	6,506	69	N/A	Mid-Atlantic (73 percent).
Pygmy sperm whales	Western North Atlantic[a]	*9,474	2,426	6,294	176	0	6,470	68	N/A	Mid-Atlantic (72 percent).

Note: N/A = Not Applicable. NMSDD abundances are averages only within the U.S. EEZ.
* Indicates which abundance estimate was used to calculate the maximum annual take as a percentage of abundance, either the NMFS SAR (Hayes *et al.,* 2024) or the NMSDD (table 2.4–1 in appendix A of the application). Please refer to the following section for details on which abundance estimate was selected.
[a] Because Kogia sima and K. breviceps are difficult to differentiate at sea, the reported abundance estimates for the Western North Atlantic stock are for both species of Kogia combined.

TABLE 84—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO SPERM WHALE, DWARF SPERM WHALE, AND PYGMY SPERM WHALE IN THE AFTT STUDY AREA

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (Labrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality /serious injury
Sperm whale	Northern Gulf of America.	Endangered.	Depleted Strategic	Resident-migratory.	Large	Income	Slow	Vessel strike, entanglement, ocean noise, marine debris, oil spills and contaminants, energy exploration and development, climate change.		No	No	None identified.	Unk, but possibly stable.	2	9.6
Dwarf sperm whales.	Northern Gulf of America.	Not Listed.	Not Depleted. Not Strategic.	Unknown	Small-Med.	Income	Fast	Entanglement, vessel strike, marine debris, ocean noise, energy exploration and development, oil spills, disease, climate change.		No	No	None identified.	Unk	2.5	31
Pygmy sperm whales.	Northern Gulf of America.	Not Listed.	Not Depleted. Not Strategic.	Unknown	Small-Med.	Income	Fast	Entanglement, vessel strike, marine debris, ocean noise, energy exploration and development, oil spills, disease, climate change.		No	No	None identified.	Unk	2.5	31
Sperm whale	North Atlantic.	Endangered.	Depleted Strategic	Nomadic	Large	Income	Slow	Vessel strike, entanglement, ocean noise, marine debris, oil spills and contaminants, climate change.	No	No	No	None identified.	Unk	9.28	0.2

TABLE 84—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO SPERM WHALE, DWARF SPERM WHALE, AND PYGMY SPERM WHALE IN THE AFTT STUDY AREA—Continued

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (Labrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality /serious injury
Dwarf sperm whale.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Unknown	Small-Med.	Income	Fast	Entanglement, vessel strike, marine debris, ocean noise, hunting (Lesser Antilles), disease, climate change.	No	No	No	None identified.	Increasing ...	57	Unk
Pygmy sperm whales.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Unknown	Small-Med.	Income	Fast	Entanglement, vessel strike, marine debris, ocean noise, hunting (Lesser Antilles), disease, climate change.	No	No	No	None identified.	Increasing ...	57	Unk

Note: Unk = Unknown.

Sperm Whale (North Atlantic Stock), Dwarf Sperm Whale (Western North Atlantic and Northern Gulf of America Stocks), Pygmy Sperm Whale (Western North Atlantic and Northern Gulf of America Stocks)

Sperm whales are listed as endangered under the ESA and the North Atlantic stock is considered depleted and strategic under the MMPA. Neither dwarf sperm whale nor pygmy sperm whale is listed under the ESA, and none of the stocks are considered depleted or strategic. The stock abundances range from 510 (combined estimate for the Northern Gulf of America stocks of dwarf and pygmy sperm whales from Navy's NMSDD) to 5,895 for the North Atlantic stock of sperm whale. There are no UMEs or other factors that cause particular concern for the stocks in the Atlantic Ocean, and there are no known biologically important areas for these stocks in the AFTT Study Area. These stocks face several chronic anthropogenic and non-anthropogenic risk factors, including entanglement and climate change, among others.

As shown in table 83, the maximum annual allowable instances of take under this proposed rule by Level A Harassment and Level B harassment range from 7 (North Atlantic stock of sperm whale) to 180 (Western North Atlantic stock of dwarf sperm whale) and 175 (Northern Gulf of America stock of pygmy sperm whale) to 12,590 (North Atlantic stock of sperm whale), respectively. As indicated, the rule also allows for up to 2 takes by serious injury or mortality of North Atlantic sperm whales over the course of the 7-year rule, the impacts of which are discussed above in the Serious Injury and Mortality section. The total take allowable for each stock across all 7 years of the rule is indicated in table 49.

Regarding the potential takes associated with auditory impairment, as described in the Auditory Injury from Sonar Acoustic Sources and Explosives and Non-Auditory Injury from Explosives section above, any takes in the form of TTS are expected to be lower-level, of short duration (even the longest recovering in several hours or less than a day), and mostly not in a frequency band that would be expected to interfere with odontocete echolocation, overlap more than a relatively narrow portion of the vocalization range of any single species or stock, or preclude detection or interpretation of important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival. For similar reasons, while auditory injury impacts last longer, the low anticipated levels of AUD INJ that could be reasonably expected to result from these activities are unlikely to have any effect on fitness. The rule also allows for one take of North Atlantic sperm whale by non-auditory injury (table 50). As described above, given the small number of potential exposures and the anticipated effectiveness of the mitigation measures in minimizing the pressure levels to which any individuals are exposed, these injuries are unlikely to impact reproduction or survival.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 178 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Pygmy and dwarf sperm whales are small-medium bodied income breeders with a fast pace of life. They are generally more sensitive to missed foraging opportunities, especially during lactation, but would be quick to recover given their fast pace of life. Sperm whales are large-bodied income breeders with a slow pace of life, and are likely more resilient to missed foraging opportunities due to acoustic disturbance than smaller odontocetes. However, they may be more susceptible to impacts due to lost foraging opportunities during reproduction, especially if they occur during lactation (Farmer *et al.,* 2018). Further, as described in the *Group and Species-Specific Analyses* section above and the Proposed Mitigation Measures section, mitigation measures are expected to further reduce the potential severity of impacts through real-time operational measures that minimize higher level/longer duration exposures and time/area measures that reduce impacts in high value habitat.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the number of takes by harassment as compared to the stock/species abundance (see table 83) and the fact that the majority of takes of the Northern Gulf of America stock of pygmy and dwarf sperm whale occur in the Gulf of America (95 and 96 percent, respectively), and the majority of takes of the North Atlantic stock of sperm whale and Western North Atlantic stock of pygmy and dwarf sperm whale occur in the mid-Atlantic (80, 72, and 73 percent, respectively) it is likely that some portion of the individuals taken are taken repeatedly over a small number of days. However, given the variety of activity types that contribute to take across separate exercises conducted at different times and in different areas, and the fact that many result from transient activities conducted at sea, it is unlikely that repeated takes would occur either in numbers or clumped across sequential days in a manner likely to impact foraging success and energetics or other behaviors such that reproduction or survival are likely to be impacted. Further, sperm whales are nomadic, and there are no known foraging areas or other areas within which animals from any of these stocks are known to congregate.

As analyzed and described in the Mortality section above, given the status of the stock and in consideration of other ongoing human-caused mortality, the M/SI proposed for authorization for the North Atlantic stock of sperm whales (2 over the course of the 7-year rule, or 0.29 annually) would not, alone, be expected to adversely affect the stock through rates of recruitment or survival. Given the magnitude and severity of the take by harassment for each stock discussed above and any anticipated habitat impacts, and in consideration of the required mitigation measures and other information presented, the take by harassment proposed for authorization is unlikely to result in impacts on the reproduction or survival of any individuals and, thereby, unlikely to affect annual rates of recruitment or survival of any of these stocks either alone or, for the North Atlantic stock of sperm whale, in combination with the M/SI proposed for authorization. Last, we are aware that some Northern Gulf of America stocks have experienced lower rates of reproduction and survival since the DWH oil spill, however, those effects are reflected in the SARs and other data considered in these analyses and do not change our findings. For these reasons, we have determined that the take by harassment anticipated and proposed for authorization would have a negligible impact on the North Atlantic stock of sperm whale, Northern Gulf of America stocks of dwarf and pygmy sperm whales, and Western

North Atlantic stocks of dwarf and pygmy sperm whales.

Sperm Whale (Northern Gulf of America stock)

Sperm whales are listed as endangered under the ESA and the Northern Gulf of America stock is considered depleted and strategic under the MMPA. The Navy's NMSDD estimates the stock abundance as 1,614 animals. Sperm whales aggregate at the mouth of the Mississippi River and along the continental slope in or near cyclonic cold-core eddies (counterclockwise water movements in the northern hemisphere with a cold center) or anticyclone eddies (clockwise water movements in the northern hemisphere) (Davis *et al.,* 2007). Habitat models for sperm whale occurrence indicate a high probability of suitable habitat along the shelf break off the Mississippi delta, Desoto Canyon, and western Florida (Best *et al.,* 2012; Weller *et al.,* 2000), and this area may be important for feeding and reproduction (Baumgartner *et al.,* 2001; Jochens *et al.,* 2008; NMFS, 2010), although the seasonality of breeding in Northern Gulf of America stock of sperm whales is not known (Jochens *et al.,* 2008). This stock faces several chronic anthropogenic and non-anthropogenic risk factors, including vessel strike, entanglement, oil spills, and climate change, among others.

As shown in table 83, the maximum annual allowable instances of take under this proposed rule by Level B harassment is 275. As indicated, the rule also allows for up to 1 takes by serious injury or mortality over the course of the 7-year rule, the impacts of which are discussed above in the Serious Injury and Mortality section. No Level A harassment (auditory or non-auditory injury) is proposed for authorization. The total take allowable across all 7 years of the rule is indicated in table 49.

Regarding the potential takes associated with TTS, as described in the Temporary Threshold Shift section above, any takes in the form of TTS are expected to be lower-level, of short duration (even the longest recovering in several hours or less than a day), and mostly not in a frequency band that would be expected to interfere with sperm whale communication or other important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 178 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Sperm whales are large-bodied income breeders with a slow pace of life, and are likely more resilient to missed foraging opportunities due to acoustic disturbance than smaller odontocetes. However, they may be more susceptible to impacts due to lost foraging opportunities during reproduction, especially if they occur during lactation (Farmer *et al.,* 2018).

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the lower number of takes by harassment as compared to the stock/species abundance (see table 83), their migratory movement pattern, and the absence of take concentrated in areas in which animals are known to congregate, it is unlikely that any individual sperm whales would be taken on more than a small number of days within a year and, therefore, the anticipated behavioral disturbance is not expected to affect reproduction or survival.

As analyzed and described in the Mortality section above, given the status of the stock and in consideration of other ongoing human-caused mortality, the M/SI proposed for authorization for the Northern Gulf of America stock of sperm whales (one over the course of the 7-year rule, or 0.14 annually) would not, alone, be expected to adversely affect the stock through rates of recruitment or survival. Given the magnitude and severity of the take by harassment discussed above and any anticipated habitat impacts, and in consideration of the required mitigation measures and other information presented, the take by harassment proposed for authorization is unlikely to result in impacts on the reproduction or survival of any individuals and, thereby, unlikely to affect annual rates of recruitment or survival either alone or in combination with the M/SI proposed for authorization. Last, we are aware that some Northern Gulf of America stocks have experienced lower rates of reproduction and survival since the DWH oil spill, however, those effects are reflected in the SARs and other data considered in these analyses and do not change our findings. For these reasons, we have determined that the take anticipated and proposed for authorization would have a negligible impact on the Northern Gulf of America stock of sperm whales.

Beaked Whales—

This section builds on the broader odontocete discussion above (*i.e.,* that information applies to beaked whales as well), and brings together the discussion of the different types and amounts of take that different beaked whale species and stocks will likely incur, any additional applicable mitigation, and the status of the species and stocks to support the negligible impact determinations for each species or stock.

TABLE 85—ANNUAL ESTIMATED TAKE BY LEVEL B HARASSMENT, LEVEL A HARASSMENT, AND MORTALITY AND RELATED INFORMATION FOR ATLANTIC STOCKS OF BEAKED WHALES IN THE AFTT STUDY AREA

Marine mammal species	Stock	NMFS stock abundance	NMSDD abundance	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	Maximum annual take	Maximum annual take as percentage of stock abundance	Season(s) with 40 percent of take or greater	Region(s) with 40 percent of take or greater
Blainville's beaked whale.	Northern Gulf of America.	98	* 99	126	0	0	126	127	N/A	Key West (64 percent).
Goose-beaked whale.	Northern Gulf of America.	18	* 368	460	0	0	460	125	N/A	Key West (62 percent).
Gervais' beaked whale.	Northern Gulf of America.	20	* 386	125	0	0	125	32	N/A	Key West (65 percent).
Blainville's beaked whale.	Western North Atlantic.	* 2,936	1,279	25,705	1	0	25,706	876	N/A	Mid-Atlantic (66 percent).

TABLE 85—ANNUAL ESTIMATED TAKE BY LEVEL B HARASSMENT, LEVEL A HARASSMENT, AND MORTALITY AND RELATED INFORMATION FOR ATLANTIC STOCKS OF BEAKED WHALES IN THE AFTT STUDY AREA—Continued

Marine mammal species	Stock	NMFS stock abundance	NMSDD abundance	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	Maximum annual take	Maximum annual take as percentage of stock abundance	Season(s) with 40 percent of take or greater	Region(s) with 40 percent of take or greater
Goose-beaked whale.	Western North Atlantic.	4,260	* 4,901	112,070	2	0	112,072	2,287	N/A	Mid-Atlantic (80 percent).
Gervais' beaked whale.	Western North Atlantic.	* 8,595	991	25,446	1	0	25,447	296	N/A	Mid-Atlantic (66 percent).
Northern bottlenose whale.	Western North Atlantic.	* Unk	82	1,651	1	0	1,652	Unk	N/A	Northeast (47 percent) Mid-Atlantic (52 percent).
Sowerby's beaked whale.	Western North Atlantic.	492	* 1,279	25,622	1	0	25,623	2,003	N/A	Mid-Atlantic (67 percent).
True's beaked whale.	Western North Atlantic.	* 4,480	1,279	25,582	0	0	25,582	571	N/A	Mid-Atlantic (68 percent).

Note: Unk = Unknown; N/A = Not Applicable. NMSDD abundances are averages only within the U.S. EEZ.

* Indicates which abundance estimate was used to calculate the maximum annual take as a percentage of abundance, either the NMFS SAR (Hayes *et al.,* 2024) or the NMSDD (table 2.4–1 in appendix A of the application). Please refer to the following section for details on which abundance estimate was selected.

TABLE 86—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO BEAKED WHALES IN THE AFTT STUDY AREA

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (Labrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality/serious injury
Blainville's beaked whale.	Northern Gulf of America.	Not Listed	Not Depleted. Not Strategic.	Nomadic-resident.	Med	Mixed	Med	Entanglement, marine debris, ocean noise, energy exploration and development, oil spills, climate change.	N/A	No	No	None identified	Unk	0.7	5.2
Goose-beaked whale.	Northern Gulf of America.	Not Listed	Not Depleted. Not Strategic.	Nomadic-resident.	Med	Mixed	Med	Ocean noise, energy exploration and development, oil spills, climate change.	N/A	No	No	None identified	Unk	0.1	5.2
Gervais' beaked whale.	Northern Gulf of America.	Not Listed	Not Depleted. Not Strategic.	Nomadic-resident.	Med	Mixed	Med	Entanglement, ocean noise, energy exploration and development, oil spills, climate change.	N/A	No	No	None identified	Unk	0.1	5.2
Blainville's beaked whale.	Western North Atlantic.	Not Listed	Not Depleted. Not Strategic.	Nomadic-resident.	Med	Mixed	Med	Entanglement, marine debris, ocean noise, climate change.	N/A	No	No	None identified	Unk	24	0.2
Goose-beaked whale.	Western North Atlantic.	Not Listed	Not Depleted. Not Strategic.	Nomadic-resident.	Med	Mixed	Med	Ocean noise, climate change.	N/A	No	No	Georges Bank and New England Seamounts, Canyons off New Jersey and Delmarva, Cape Hatteras, Southeast U.S..	Unk, possibly increasing.	38	0.2
Gervais' beaked whale.	Western North Atlantic.	Not Listed	Not Depleted. Not Strategic.	Nomadic-resident.	Med	Mixed	Med	Entanglement, hunting, ocean noise, climate change.	N/A	No	No	None identified	Unk	70	0
Northern bottlenose whale.	Western North Atlantic.	Not Listed	Not Depleted. Not Strategic.	Nomadic-resident.	Large	Mixed	Med	Ocean noise, hunting, climate change.	N/A	No	No	None identified	Unk	Unk	0
Sowerby's beaked whale.	Western North Atlantic.	Not Listed	Not Depleted. Not Strategic.	Nomadic-resident.	Med	Mixed	Med	Ocean noise, PCBs, entanglement, climate change.	N/A	No	No	None identified	Unk	3.4	0
True's beaked whale.	Western North Atlantic.	Not Listed	Not Depleted. Not Strategic.	Nomadic-resident.	Med	Mixed	Med	Ocean noise, climate change.	N/A	No	No	None identified	Unk, possibly increasing.	34	0.2

Note: N/A = Not Applicable; Und = Undetermined; Unk = Unknown.

Beaked Whales (Western North Atlantic Stocks)

These stocks are not listed as endangered or threatened under the ESA, and they are not considered depleted or strategic under the MMPA. The stock abundance estimates generally range from 1,279 (Sowerby's beaked whale, NMSDD) to 8,595 (Gervais' beaked whale). The SAR states that the abundance of Western North Atlantic northern bottlenose whale is unknown, and the NMSDD estimates the stock abundance as 82 animals, but reports that the estimate is from within the EEZ and is lower than the overall population abundance given that the range of the stock exceeds the EEZ boundary. See the Density Technical Report (U.S. Department of the Navy, 2024) for additional information. There are no UMEs or other factors that cause particular concern for this stock, and there are no known biologically important areas for beaked whales in the AFTT Study Area, though of note, these stocks generally occur in higher densities year-round in deep waters over the Atlantic continental shelf margins. The Western North Atlantic stocks of goose-beaked whales and Blainville's beaked whales generally congregate over continental shelf margins from Canada to North Carolina, with goose-beaked whales reported as far south as the Caribbean and Blainville's beaked whales as far south as the Bahamas. The Western North Atlantic stock of Gervais' beaked whales generally congregate over continental shelf margins from New York to North Carolina. The Western North Atlantic stock of Sowerby's beaked whales is the most northerly distributed stock of deep-diving mesoplodonts, and they generally congregate over continental shelf margins from Labrador to Massachusetts. The Western North Atlantic stock of True's beaked whales generally congregate over continental shelf margins from Nova Scotia to Cape Hatteras, with northern occurrence likely relating to the Gulf Stream. The Western North Atlantic stock of Northern bottlenose whales is uncommon in U.S. waters and generally congregates in areas of high relief, including shelf breaks and submarine canyons from the Davis Strait to New England, although strandings have occurred as far south as North Carolina. Western North Atlantic beaked whales face several chronic anthropogenic and non-anthropogenic risk factors, including entanglement and climate change, among others.

As shown in table 85, the maximum annual allowable instances of take under this proposed rule by Level A Harassment and Level B harassment range from 0 to 2 and 1,651 to 112,070, respectively. No mortality is anticipated or proposed for authorization, and nor is any non-auditory injury. The total take allowable across all 7 years of the rule is indicated in table 49.

Regarding the potential takes associated with auditory impairment (for True's beaked whale, TTS only), as described in the Auditory Injury from Sonar Acoustic Sources and Explosives and Non-Auditory Injury from Explosives section above, any takes in the form of TTS are expected to be lower-level, of short duration (from minutes to, at most, several hours or less than a day), and mostly not in a frequency band that would be expected to interfere with odontocete echolocation, overlap more than a relatively narrow portion of the vocalization range of any single species or stock, or preclude detection or interpretation of important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival. For similar reasons, while auditory injury impacts last longer, the low anticipated levels of AUD INJ that could be reasonably expected to result from these activities (for all Western North Atlantic beaked whales except True's beaked whales) are unlikely to have any effect on fitness.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 154 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Beaked whales are medium-to-large-bodied odontocetes with a medium pace of life and likely moderately resilient to missed foraging opportunities due to acoustic disturbance. They are mixed breeders (*i.e.,* behaviorally income breeders), and they demonstrate capital breeding strategies during gestation and lactation (Keen *et al.,* 2021), so they may be more vulnerable to prolonged loss of foraging opportunities during gestation. Further, as described in the *Group and Species-Specific Analyses* section above and the Proposed Mitigation Measures section, mitigation measures are expected to further reduce the potential severity of impacts through real-time operational measures that minimize higher level/longer duration exposures and time/area measures that reduce impacts in high value habitat.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the number of takes by harassment as compared to the stock/species abundance (see table 85), it is likely that some portion of the individuals taken are taken repeatedly over a small (Western North Atlantic northern bottlenose whale and Gervais' beaked whale) to moderate (all other stocks) number of days, with the exception of Sowerby's beaked whales (discussed below). However, given the variety of activity types that contribute to take across separate exercises conducted at different times and in different areas, and the fact that many result from transient activities conducted at sea, it is unlikely that takes would occur clumped across sequential days in a manner likely to impact foraging success and energetics or other behaviors such that reproduction or survival are likely to be impacted. Further, while there are several known high-density areas for goose-beaked whales, around canyons, seamounts, and Cape Hatteras, which is common for multiple species, there are no known foraging areas or other areas within which animals are known to congregate for reproductive or other important behaviors, and nor are the takes concentrated within a specific region and season.

Regarding the magnitude of repeated takes for the Sowerby's beaked whales, given the high number of takes by harassment as compared to the stock abundance, it is more likely that some number of individuals would experience a comparatively higher number of repeated takes over a potentially fair number of sequential days. Due to the higher number of repeated takes, it is more likely that a portion of the individuals taken by harassment (approximately 50 percent of which would be female) could be repeatedly interrupted during foraging in a manner and amount such that impacts to the energy budgets of a small number of females (from either losing feeding opportunities or expending considerable energy moving away from sound sources or finding alternative feeding options) could cause them to forego reproduction for a year (noting that beaked whale calving intervals may be about 2 years) (New *et al.,* 2013)).

Energetic impacts to males are generally meaningless to population rates unless they cause death, and it takes extreme energy deficits beyond what would ever be likely to result from these activities to cause the death of an adult marine mammal, male or female. While the population trend of this stock is not known, it is not considered depleted or strategic, and there are no known sources of human-caused mortality indicated in the SARs. Importantly, the increase in a calving interval by a year would have far less of an impact on a population rate than a mortality would and, accordingly, a small number of instances of foregone reproduction would not be expected to adversely affect this stock through effects on annual rates of recruitment or survival (noting also that no mortality is predicted or authorized for this stock). The population trend of the Western North Atlantic stock of goose-beaked whales is not known but possibly increasing, and, like the Sowerby's beaked whale stock, it is not considered depleted or strategic, and there are no known sources of human-caused mortality indicated in the SARs. Importantly, the increase in a calving interval by a year would have far less of an impact on a population rate than a mortality would and, accordingly, a limited number of instances of foregone reproduction would not be expected to adversely affect this stock through effects on annual rates of recruitment or survival (noting also that no mortality is predicted or authorized for this stock).

Given the magnitude and severity of the take by harassment discussed above and any anticipated habitat impacts, and in consideration of the required mitigation measures and other information presented, the Action Proponents' activities are unlikely to result in impacts on the reproduction or survival of any individuals of the Western North Atlantic stocks of beaked whales (Blainville's beaked whale, goose-beaked whale, Gervais' beaked whale, northern bottlenose dolphin, and True's beaked whale), with the exception of Sowerby's beaked whales, and thereby unlikely to affect annual rates of recruitment or survival. For Sowerby's beaked whales, as described above, we do not anticipate the relatively small number of individuals that might be taken over repeated days within the year in a manner that results in a year of foregone reproduction to adversely affect either stock through effects on rates of recruitment or survival, given the statuses of these stocks. For these reasons, we have determined that the total take (considering annual maxima and across seven years) anticipated and proposed for authorization would have a negligible impact on all Western North Atlantic beaked whales.

Beaked Whales (Northern Gulf of America Stocks)

These stocks are not listed as endangered or threatened under the ESA, and they are not considered depleted or strategic under the MMPA. The estimated abundances of these Blainville's beaked whale, goose-beaked whale, and Gervais' beaked whale are 99, 368, and 386, respectively, as indicated in the Navy's NMSDD estimates. There are no known biologically important areas for beaked whales in the Gulf of America. These stocks all occur year-round in deep water areas in the Gulf of America and Key West. Beaked whales in the Gulf of America face several chronic anthropogenic and non-anthropogenic risk factors, including energy exploration and development, entanglement, and climate change, among others.

As shown in table 85, the maximum annual allowable instances of take under this proposed rule by Level B harassment is 126, 460, and 125 for Blainville's beaked whale, goose-beaked whale, and Gervais' beaked whale, respectively. No mortality is anticipated or proposed for authorization, and nor is any auditory or non-auditory injury (Level A harassment). The total take allowable across all 7 years of the rule is indicated in table 49.

Regarding the potential takes associated with TTS, as described in the Temporary Threshold Shift section above, any takes in the form of TTS are expected to be lower-level, of short duration (from minutes to, at most, several hours or less than a day), and mostly not in a frequency band that would be expected to interfere with odontocete echolocation, overlap more than a relatively narrow portion of the vocalization range of any single species or stock, or preclude detection or interpretation of important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 154 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Beaked whales are medium-bodied odontocetes with a medium pace of life and likely moderately resilient to missed foraging opportunities due to acoustic disturbance. They are mixed breeders (*i.e.,* behaviorally income breeders) and they demonstrate capital breeding strategies during gestation and lactation (Keen *et al.,* 2021), so they may be more vulnerable to prolonged loss of foraging opportunities during gestation.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the number of takes by harassment as compared to the stock/species abundances (see table 85) and the fact that 60–65 percent of the takes occur around Key West, it is likely that some portion of the individuals taken are taken repeatedly over a small number of days. However, given the variety of activity types that contribute to take across separate exercises conducted at different times and in different areas, and the fact that many result from transient activities conducted at sea, it is unlikely that repeated takes would occur either in numbers or clumped across sequential days in a manner likely to impact foraging success and energetics or other behaviors such that reproduction or survival are likely to be impacted.

Given the magnitude and severity of the impacts discussed above to Northern Gulf of America stocks of beaked whales (considering annual take maxima and the total across 7 years) and their habitat, and in consideration of the other information presented, the Action Proponents' activities are unlikely to result in impacts on the reproduction or survival of any individuals and, thereby, unlikely to affect annual rates of recruitment or survival. Last, we are aware that some Northern Gulf of America stocks of beaked whales have experienced lower rates of reproduction and survival since the DWH oil spill, however, those effects are reflected in the SARs and other data considered in these analyses and do not change our findings. For these reasons, we have determined that the take by harassment anticipated and proposed for authorization would have a negligible impact on the Northern Gulf of America stocks of beaked whales.

Dolphins and Small Whales—

Of the 53 stocks of dolphins and small whales (Delphinidae) for which incidental take is proposed for authorization (see table 87), none are listed as endangered or threatened under the ESA. Only spinner dolphins are listed as depleted under the MMPA, however, about a third of the species are listed as strategic, including 14 stocks of bottlenose dolphins, Northern Gulf of America stocks of Clymene, striped, and spinner dolphins, and the Western Northern Atlantic stocks of spinner dolphins and short-finned pilot whales. As shown in table 87 and table 88, these Delphinids vary in stock abundance, body size, and movement ecology from, for example, the small-bodied, nomadic/migratory Western North Atlantic white-beaked dolphins that range well beyond the U.S. EEZ and outside the AFTT Study Area and have a SAR abundance over 500,000, to the medium-sized resident Bay stocks of bottlenose dolphins with abundances under 200, to the large-bodied nomadic Western North Atlantic killer whale, for which the abundance is unknown. While there are several small and resident populations of bottlenose dolphins, there are no other known biologically important areas (*e.g.,* foraging, reproduction) for any of these Delphinid stocks. Delphinids face a number of chronic anthropogenic and non-anthropogenic risk factors including biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change, the impacts of which vary depending whether the stock is more coastal (*e.g.,* biotoxins and some fishing interactions more seen in bottlenose dolphins), more or less deep-diving (*e.g.,* entanglement more common in deep divers like pygmy killer whales and pilot whales), in the Gulf of America (*e.g.,* lingering lower reproductive rates for some stocks affected by DWH oil spill impacts), and other behavioral differences (*e.g.,* vessels strikes more concern for killer whales).

TABLE 87—ANNUAL ESTIMATED TAKE BY LEVEL B HARASSMENT, LEVEL A HARASSMENT, AND MORTALITY AND RELATED INFORMATION FOR DOLPHINS IN THE AFTT STUDY AREA

Marine mammal species	Stock	NMFS stock abundance	NMSDD abundance	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	Maximum annual take	Maximum annual harassment as percentage of stock abundance	Season(s) with 40 percent of take or greater	Region(s) with 40 percent of take or greater	Greatest degree any individual expected to be taken repeatedly across multiple days
Atlantic spotted dolphin.	Northern Gulf of America.	*21,506	11,476	12,804	20	0	12,824	60	N/A	Gulf of America (100 percent).	Zero to small number of days.
Bottlenose dolphin	Gulf of America Eastern Coastal.	*16,407	13,382	80	0	0	80	0	N/A	Gulf of America (63 percent).	Zero to small number of days.
Bottlenose dolphin	Gulf of America Northern Coastal.	*11,543	7,031	7,146	17	0	7,163	62	N/A	Gulf of America (100 percent).	Zero to small number of days.
Bottlenose dolphin	Northern Gulf of America Oceanic.	7,462	*21,997	6,274	4	0	6,278	29	N/A	Gulf of America (70 percent).	Zero to small number of days.
Bottlenose dolphin	Gulf of America Western Coastal.	20,759	*26,100	3,331	1	0	3,332	13	N/A	Gulf of America (100 percent).	Zero to small number of days.
Bottlenose dolphin	Mississippi Sound, Lake Borgne, Bay Boudreau.	1,265	*1,057	1,758	1	0	1,759	166	N/A	Gulf of America (100 percent).	Small number of days.
Bottlenose dolphin	Northern Gulf of America Continental Shelf.	63,280	*109,059	71,331	29	0	71,360	65	N/A	Gulf of America (100 percent).	Zero to small number of days.
Bottlenose dolphin	Nueces Bay/Corpus Christi Bay.	58	*41	4	0	0	4	10	N/A	Gulf of America (100 percent).	Zero to small number of days.
Bottlenose dolphin	Sabine Lake	122	*148	1	0	0	1	1	N/A	Gulf of America (100 percent).	Zero to small number of days.
Bottlenose dolphin	St. Andrew Bay	*199	114	46	0	0	46	23	N/A	Gulf of America (100 percent).	Small number of days.
Bottlenose dolphin	St. Joseph Bay	*142	34	42	0	0	42	30	N/A	Gulf of America (100 percent).	Small number of days.
Bottlenose dolphin	Tampa Bay	Unk	*599	350	0	0	350	58	N/A	Gulf of America (100 percent).	Small number of days.
Clymene dolphin	Northern Gulf of America.	513	*3,126	599	3	0	602	19	N/A	Gulf of America (85 percent).	Zero to small number of days.
False killer whale	Northern Gulf of America.	494	*1,023	230	0	0	230	22	N/A	Gulf of America (84 percent).	Zero to small number of days.
Fraser's dolphin	Northern Gulf of America.	213	*1,081	241	0	0	241	22	N/A	Gulf of America (76 percent).	Zero to small number of days.
Killer whale	Northern Gulf of America.	267	*511	110	0	0	110	22	N/A	Gulf of America (85 percent).	Zero to small number of days.
Melon-headed whale.	Northern Gulf of America.	1,749	*3,579	771	1	0	772	22	N/A	Gulf of America (84 percent).	Zero to small number of days.
Pygmy killer whale	Northern Gulf of America.	613	*1,278	285	0	0	285	22	N/A	Gulf of America (85 percent).	Zero to small number of days.
Risso's dolphin	Northern Gulf of America.	*1,974	813	203	0	0	203	10	N/A	Gulf of America (72 percent).	Zero to small number of days.
Rough-toothed dolphin.	Northern Gulf of America.	Unk	*3.452	1,642	3	0	1,645	48	N/A	Gulf of America (92 percent).	Small number of days.
Short-finned pilot whale.	Northern Gulf of America.	1,321	*1,835	1,021	3	0	1,024	56	N/A	Gulf of America (90 percent).	Small number of days.
Striped dolphin	Northern Gulf of America.	1,817	*7,782	2,376	7	0.29	2,384	31	Winter (40 percent).	Gulf of America (70 percent).	Zero to small number of days.
Pantropical spotted dolphin.	Northern Gulf of America.	*37,195	35,057	6,316	9	0.71	6,327	17	N/A	Gulf of America (71 percent).	Zero to small number of days.
Spinner dolphin	Northern Gulf of America.	*2,991	1,422	656	0	0	656	22	N/A	Gulf of America (99 percent).	Zero to small number of days.
Atlantic white-sided dolphin.	Western North Atlantic	*93,233	14,869	22,094	32	0	22,126	36	N/A	Northeast (69 percent) Mid-Atlantic (31 percent).	Zero to small number of days.
Common dolphin	Western North Atlantic	*93,100	73,015	25,792	6	0	25,798	0	Winter (45 percent).	Mid-Atlantic (75 percent).	Small to moderate number of days.

Atlantic spotted dolphin.	Western North Atlantic	*31,506	28,226	120,798	87	0	120,885	384	N/A	Mid-Atlantic (59 percent).	Small to moderate number of days.
Bottlenose dolphin	Indian River Lagoon Estuarine System.	*1,032	484	1,576	0	0	1,576	153	Fall (43 percent)	Southeast (100 percent).	Small number of days.
Bottlenose dolphin	Jacksonville Estuarine System.	Unk	19	360	0	0	360	Und	Fall (45 percent)	Southeast (100 percent).	Moderate number of days.
Bottlenose dolphin	Northern Georgia/Southern South Carolina Estuarine System.	Unk	19	2	0	0	2	Und	N/A	Southeast (100 percent).	Zero to small number of days.
Bottlenose dolphin	Northern North Carolina Estuarine System.	823	*1,227	10,532	6	0	10,538	859	Summer (98 percent).	Mid-Atlantic (100 percent).	High number of days.
Bottlenose dolphin	Southern Georgia Estuarine System.	Unk	*619	123	1	0	124	20	N/A	Southeast (100 percent).	Small number of days.
Bottlenose dolphin	Southern North Carolina Estuarine System.	Unk	*486	162	0	0	162	33	Fall (60 percent)	Mid-Atlantic (99 percent).	Small number of days.
Tamanend's Bottlenose Dolphin.	Western North Atlantic, Central Florida Coastal.	2,541	*7,063	10,494	3	0	10,497	149	N/A	Southeast (100 percent).	Small number of days.
Tamanend's Bottlenose Dolphin.	Western North Atlantic, Northern Florida Coastal.	*3,619	2,598	21,385	5	0	21,390	591	N/A	Southeast (100 percent).	Moderate number of days.
Bottlenose dolphin	Western North Atlantic Northern Migratory Coastal.	6,639	*10,325	73,720	60	0	73,780	715	N/A	Mid-Atlantic (100 percent).	Moderate number of days.
Bottlenose dolphin	Western North Atlantic Offshore.	64,587	*150,704	187,046	103	0.29	187,151	124	N/A	Mid-Atlantic (60 percent).	Small number of days.
Tamanend's Bottlenose Dolphin.	Western North Atlantic South Carolina/Georgia Coastal.	*9,121	4,105	4,960	6	0.14	4,967	54	N/A	Southeast (95 percent)	Zero to small number of days.
Bottlenose dolphin	Western North Atlantic Southern Migratory Coastal.	3,751	*7,911	10,180	9	0	10,189	1,549	N/A	Mid-Atlantic (60 percent) Southeast (40 percent).	Small number of days.
Clymene dolphin	Western North Atlantic	*21,778	8,573	132,723	104	0.43	132,828	44	N/A	Mid-Atlantic (98 percent).	Moderate number of days.
False killer whale	Western North Atlantic	*1,298	97	572	1	0	573	Und	Winter (40 percent).	Mid-Atlantic (48 percent).	Zero to small number of days.
Fraser's dolphin	Western North Atlantic	Unk	*518	2,905	3	0	2,908	561	N/A	Southeast (52 percent)	Moderate number of days.
Killer whale	Western North Atlantic	Unk	*51	180	1	0	181	355	N/A	Mid-Atlantic (61 percent).	Small to moderate number of days.
Long-finned pilot whale.	Western North Atlantic	*39,215	5,392	21,680	12	0	21,692	55	N/A	Mid-Atlantic (84 percent).	Zero to small number of days.
Melon-headed whale.	Western North Atlantic	Unk	*495	4,598	3	0	4,601	929	N/A	Southeast (43 percent)	Moderate number of days.
Pantropical spotted dolphin.	Western North Atlantic	*2,757	1,147	13,068	5	0	13,073	474	N/A	High Seas (54 percent)	Moderate number of days.
Pygmy killer whale	Western North Atlantic	Unk	*54	477	1	0	478	885	N/A	Southeast (45 percent)	Moderate number of days.
Risso's dolphin	Western North Atlantic	*44,067	12,845	37,239	25	0	37,264	85	N/A	Mid-Atlantic (40 percent).	Zero to small number of days.
Rough-toothed dolphin.	Western North Atlantic	Unk	*824	4,753	6	0	4,759	578	N/A	Southeast (55 percent)	Moderate number of days.
Short-finned pilot whale.	Western North Atlantic	*18,726	6,235	33,035	15	0	33,050	176	N/A	Mid-Atlantic (54 percent).	Small number of days.
Spinner dolphin	Western North Atlantic	*3,181	646	5,356	2	0	5,358	168	Winter (40 percent).	N/A	Small number of days.
Striped dolphin	Western North Atlantic	*48,274	43,044	208,802	163	0	208,965	433	N/A	Mid-Atlantic (89 percent).	Small to moderate number of days.
White-beaked dolphin.	Western North Atlantic	*536,016	44	16	0	0	16	0	N/A	Northeast (92 percent)	Zero to small number of days.

Note: Unk = Unknown; N/A = Not Applicable. NMSDD abundances are averages only within the U.S. EEZ.

* Indicates which abundance estimate was used to calculate the maximum annual take as a percentage of abundance, either the NMFS SAR (Hayes *et al.,* 2024) or the NMSDD (table 2.4–1 in appendix A of the application). Please refer to the following section for details on which abundance estimate was selected.

TABLE 88—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO DOLPHINS IN THE AFTT STUDY AREA

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (Labrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality/serious injury
Atlantic spotted dolphin.	Northern Gulf of America.	Not Listed.	Not Depleted. Not Strategic.	Migratory	Small	Income	Med	Entanglement, fishery interaction, ocean noise, illegal feeding/harassment, energy exploration and development, oil spills, climate change.	No	No	No	None identified.	Unk	166	36
Bottlenose dolphin.	Gulf of America Eastern Coastal.	Not Listed.	Not Depleted. Not Strategic.	Nomadic-resident.	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	None identified.	Unk, potentially increasing.	114	9.2
Bottlenose dolphin.	Gulf of America Northern Coastal.	Not Listed.	Not Depleted. Not Strategic.	Nomadic-resident.	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	None identified.	Unk, potentially increasing.	89	28
Bottlenose dolphin.	Northern Gulf of America Oceanic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic-resident.	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	None identified.	Stable	58	32

Bottlenose dolphin.	Gulf of America Western Coastal.	Not Listed.	Not Depleted. Not Strategic.	Nomadic-resident.	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	None identified.	Unk, potentially stable.	167	36
Bottlenose dolphin.	Mississippi Sound, Lake Borgne, Bay Boudreau.	Not Listed.	Not Depleted. Strategic	Resident	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	Mississippi Sound and associated waters [a].	Unk, potentially stable.	8.5	59
Bottlenose dolphin.	Northern Gulf of America Continental Shelf.	Not Listed.	Not Depleted. Not Strategic.	Nomadic-resident.	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	None identified.	Unk, potentially increasing.	556	65
Bottlenose dolphin.	Nueces Bay/Corpus Christi Bay.	Not Listed.	Not Depleted. Strategic	Resident	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	Nueces Bay/Corpus Christi Bay, Corpus Christi/Aransas Pass [b].	Unk (insufficient data).	Und	0.2

TABLE 88—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO DOLPHINS IN THE AFTT STUDY AREA—Continued

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (Labrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality/serious injury
Bottlenose dolphin.	Sabine Lake.	Not Listed.	Not Depleted. Not Strategic.	Resident	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	Sabine Pass Channel, lower Sabine Lake south of Blue Buck Point, areal shipping channels [c].	Unk (insufficient data).	0.9	0
Bottlenose dolphin.	St. Andrew Bay.	Not Listed.	Not Depleted. Not Strategic.	Resident	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	St. Andrew Bay, West Bay, East Bay, and North Bay [d].	Unk (insufficient data).	1.5	0.2
Bottlenose dolphin.	St. Joseph Bay.	Not Listed.	Not Depleted. Not Strategic.	Resident	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	St. Joseph Bay, Crooked Island Sound [e].	Stable	1	Unk

Bottlenose dolphin.	Tampa Bay	Not Listed.	Not Depleted. Strategic	Nomadic-resident.	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	Tampa Bay [f]	Unk (Insufficient data).	Und	3
Clymene dolphin.	Northern Gulf of America.	Not Listed.	Not Depleted. Strategic	Nomadic	Small ..	Income	Fast	Fishery interaction, Deepwater horizon, energy exploration and development, oil spills, climate change.	No	No	No	None identified.	Likely increasing.	2.5	8.4
False killer whale.	Northern Gulf of America.	Not Listed.	Not Depleted. Not Strategic.	Resident-nomadic.	Med	Income	Med	Fishery interaction, contaminants, hunting, Deepwater Horizon and other oil spills, disease, climate change.	No	No	No	None identified.	Decreasing	2.8	2.2
Fraser's dolphin.	Northern Gulf of America.	Not Listed.	Not Depleted. Not Strategic.	Resident-nomadic.	Small ..	Income	Fast	Fishery interaction, energy exploration and development, oil spills, climate change.	No	No	No	None identified.	Unk	1	Unk
Killer whale	Northern Gulf of America.	Not Listed.	Not Depleted. Not Strategic.	Resident	Large ..	Income	Slow	Chemical contaminants, vessel traffic and noise, entanglement, oil spills, energy exploration and development, climate change.	No	No	No	None identified.	Unk	1.5	Unk
Melon-headed whale.	Northern Gulf of America.	Not Listed.	Not Depleted. Not Strategic.	Resident-nomadic.	Small ..	Income	Med	Fishery interaction, ocean noise, pollution, energy exploration and development, oil spills, climate change.	No	No	No	None identified.	Unk	10	9.5
Pygmy killer whale.	Northern Gulf of America.	Not Listed.	Not Depleted. Not Strategic.	Resident-nomadic.	Small ..	Income	Med	Entanglement, ocean noise, oil spill, oil and gas exploration, climate change.	No	No	No	None identified.	Unk	2.8	1.6

TABLE 88—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO DOLPHINS IN THE AFTT STUDY AREA—Continued

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (Labrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality/serious injury
Risso's dolphin.	Northern Gulf of America.	Not Listed.	Not Depleted. Not Strategic.	Resident-nomadic.	Small-Med.	Income	Med	Entanglement, environmental contamination, hunting, ocean noise, energy exploration and development, oil spills, climate change.	No	No	No	None identified.	Unk (Insufficient data).	14	5.3
Rough-toothed dolphin.	Northern Gulf of America.	Not Listed.	Not Depleted. Not Strategic.	Resident-nomadic.	Small	Income	Med	Entanglement, ocean noise, energy exploration and development, oil spills, climate change.	No	No	No	None identified.	Unk	Und	39
Short-finned pilot whale.	Northern Gulf of America.	Not Listed.	Not Depleted. Not Strategic.	Resident	Med	Income	Slow	Entanglement, fishery interaction, vessel strikes, energy exploration and development, oil spills, climate change.	No	No	No	None identified.	Unk	7.5	3.9
Striped dolphin.	Northern Gulf of America.	Not Listed.	Not Depleted. Strategic	Nomadic	Small	Income	Med	Entanglement, energy exploration and development, oil spills, disease, climate change.	No	No	No	None identified.	Unk	12	13
Pantropical spotted dolphin.	Northern Gulf of America.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Small	Income	Med	Fishery interaction, ocean noise, pollution, climate change.	No	No	No	None identified.	Unk (Insufficient data).	Unk	0
Spinner dolphin.	Northern Gulf of America.	Not Listed.	Not Depleted. Strategic	Nomadic	Small	Income	Med	Entanglement, Illegal feeding/harassment, climate change.	No	No	No	None identified.	Stable, potentially increasing.	19	0
Atlantic white-sided dolphin.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Small	Income	Fast	Entanglement, ocean noise, fishery interaction, hunting (Newfoundland, Canada, Greenland), climate change.	No	No	No	None identified.	Unk	544	28
Common dolphin.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Small	Income	Med	Entanglement, climate change.	No	No	No	None identified.	Unk	1,452	414
Atlantic spotted dolphin.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Unk, likely nomadic.	Small	Income	Med	Entanglement, ocean noise, illegal feeding/harassment, climate change.	No	No	No	None identified.	Decreasing	250	0

Bottlenose dolphin.	Indian River Lagoon Estuarine System.	Not Listed.	Not Depleted. Strategic	Resident	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	Indian River Lagoon Estuarine System [g].	Unk (insufficient data).	10	5.7
Bottlenose dolphin.	Jacksonville Estuarine System.	Not Listed.	Not Depleted. Strategic	Resident	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	Yes: Small and resident population.	Jacksonville Estuarine System [h].	Unk (insufficient data).	Unk	2
Bottlenose dolphin.	Northern Georgia/ Southern South Carolina Estuarine System.	Not Listed.	Not Depleted. Strategic	Resident	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	St. Helena Sound, South Carolina to Ossabaw Sound, Georgia [i].	Unk (insufficient data).	Unk	59
Bottlenose dolphin.	Northern North Carolina Estuarine System.	Not Listed.	Not Depleted. Strategic	Resident	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	Yes: Small and resident population.	Northern North Carolina Estuarine System [j].	Unk (potentially stable).	7.8	7.2–30

TABLE 88—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO DOLPHINS IN THE AFTT STUDY AREA—Continued

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (Labrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality/serious injury
Bottlenose dolphin.	Southern Georgia Estuarine System.	Not Listed.	Not Depleted. Not Strategic.	Resident	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	Yes: Small and resident population.	Southern Georgia Estuarine System [k].	Unk (insufficient data).	Und	0.1
Bottlenose dolphin.	Southern North Carolina Estuarine System.	Not Listed.	Not Depleted. Strategic	Resident	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	Yes: Small and resident population.	Southern North Carolina Estuarine System [l].	Unk	Und	0.4
Tamanend's Bottlenose Dolphin.	Western North Atlantic, Central Florida Coastal.	Not Listed.	Not Depleted. Strategic	Nomadic	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	None identified.	Unk (insufficient data).	18	0.2

Tamanend's Bottlenose Dolphin.	Western North Atlantic, Northern Florida Coastal.	Not Listed.	Not Depleted. Strategic	Nomadic	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	None identified.	Unk (insufficient data).	27	0.2
Bottlenose dolphin.	Western North Atlantic Northern Migratory Coastal.	Not Listed.	Not Depleted. Strategic	Migratory	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	None identified.	Decreasing	48	12.2–21.5
Bottlenose dolphin.	Western North Atlantic Offshore.	Not Listed.	Not Depleted. Not Strategic.	Migratory	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	None identified.	Stable, potentially decreasing.	507	28
Tamanend's Bottlenose Dolphin.	Western North Atlantic South Carolina/Georgia Coastal.	Not Listed.	Not Depleted. Strategic	Migratory	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	None identified.	Unk (insufficient data).	73	0.2–0.6

TABLE 88—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO DOLPHINS IN THE AFTT STUDY AREA—Continued

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (Labrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality/ serious injury
Bottlenose dolphin.	Western North Atlantic Southern Migratory Coastal.	Not Listed.	Not Depleted. Strategic	Migratory	Small-Med.	Income	Med	Biotoxins, chemical contaminants, fishery interaction, habitat alteration, illegal feeding/harassment, ocean noise, oil spills and energy exploration, vessel strikes, disease, climate change.	No	No	No	None identified.	Decreasing	24	0–18.3
Clymene dolphin.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Small	Income	Fast	Entanglement, fishery interaction, ocean noise, PCBs, hunting (Caribbean), climate change.	No	No	No	None identified.	Unk	126	0
False killer whale.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Med	Income	Med	Fishery interaction, contaminants, hunting, disease, climate change.	No	No	No	None identified.	Unk (Insufficient data).	7.6	0
Fraser's dolphin.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Small	Income	Fast	Fishery interaction, climate change.	No	No	No	None identified.	Unk	Unk	0
Killer whale	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Large	Income	Slow	Chemical contaminants, vessel traffic and noise, entanglement, oil spills, climate change.	No	No	No	None identified.	Unk	Unk	0
Long-finned pilot whale.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Med	Income	Slow	Entanglements, contaminants, ocean noise, disease, climate change.	No	No	No	None identified.	Unk	306	5.7
Melon-headed whale.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Small	Income	Med	Fishery interaction, ocean noise, pollution, climate change.	No	No	No	None identified.	Unk (Insufficient data).	Unk	0
Pantropical spotted dolphin.	Western North Atlantic.	Not Listed.	Depleted. Not Strategic.	Nomadic	Small	Income	Med	Entanglement, Illegal feeding/ harassment, climate change.	No	No	No	None identified.	Stable, potentially increasing.	19	0
Pygmy killer whale.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Small	Income	Med	Entanglement, ocean noise, climate change.	No	No	No	None identified.	Unk (Insufficient data).	Unk	0

Risso's dolphin.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Small-Med.	Income	Med	Entanglement, environmental contamination, hunting, ocean noise, climate change.	No	No	No	None identified.	Unk (Insufficient data).	307	18
Rough-toothed dolphin.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Small	Income	Med	Entanglement, ocean noise, climate change.	No	No	No	None identified.	Unk (Insufficient data).	Und	0
Short-finned pilot whale.	Western North Atlantic.	Not Listed.	Not Depleted. Strategic	Resident-nomadic.	Med	Income	Slow	Entanglement, fishery interaction, vessel strikes, climate change.	No	No	No	Mid-Atlantic Bight Canyons [m].	Stable	143	218
Spinner dolphin.	Western North Atlantic.	Not Listed.	Depleted Not Strategic.	Nomadic	Small	Income	Fast	Marine debris, ocean noise, disease.	No	No	No	None identified.	Unk	19	0
Striped dolphin.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic	Small	Income	Med	Entanglement, disease, climate change.	No	No	No	None identified.	Unk	529	0
White-beaked dolphin.	Western North Atlantic.	Not Listed.	Not Depleted. Not Strategic.	Nomadic-migratory.	Small	Income	Fast	Entanglement, climate change.	No	No	No	None identified.	Unk	4,153	0

Note: Unk = Unknown, Und = Undetermined.

[a] See Hubard *et al.* (2004), Mackey (2010), Arick *et al.* (2024), McBride (2013), Miller *et al.* (2013), Mullin *et al.* (2017), and Vollmer *et al.* (2021) for more information.

[b] See Ronje *et al.* (2022), Shane (1980, Weller (1998), and Würsig *et al.* (2022) for more information.

[c] See Ronje *et al.* (2020), Ronje *et al.* (2021), Ronje *et al.* (2022), Wells (2014), and Würsig *et al.* (2022) for more information.

[d] See Balmer *et al.* (2008), Balmer *et al.* (2010), Balmer *et al.* (2018), Balmer *et al.* (2019a), Balmer *et al.* (2019b), Blaylock and Hoggard (1994), Bouveroux *et al.* (2014), Colborn (1999), Hayes *et al.* (2020), Kendall *et al.* (1997), Pollock (1982), Pollock *et al.* (1990), Powell *et al.* (2018), Samuels and Bejder (2004), and Samuels and Spradlin (1995) for more information.

[e] See Balmer *et al.* (2008), Balmer *et al.* (2010), Balmer *et al.* (2016), Balmer *et al.* (2018), Balmer *et al.* (2019a), Balmer *et al.* (2019b), Bouveroux *et al.* (2014), Burnham and Overton (1978), Burnham and Overton (1979), Chapman (1951), Cush (2016), Cush *et al.* (2019), Darroch (1958), Hayes *et al.* (2020), Hubard *et al.* (2004), Kendall *et al.* (1997), Rosel *et al.* (2011), Schwacke et al (2010), and Toms (2019) for more information.

[f] See Bassos (1993), Bassos-Hull *et al.* (2013), Boyd *et al.* (2021), Duffield and Wells (2002), Irvine and Wells (1972), Irvine *et al.* (1981), Leatherwood and Show (1980), Mate *et al.* (1995), McCallister (2011), Odell and Reynolds (1980), Scott *et al.* (1989), Sellas *et al.* (2005), Simard *et al.* (2011), Thompson (1981), Urian *et al.* (2009), van Ginkel *et al.* (2018), Weigle (1990), Wells (1986), Wells (2014), Wells *et al.* (1998), Wells *et al.* (1996), Wells *et al.* (1987), and Wells *et al.* (2013) for more information.

[g] See Durden *et al.* (2017), Durden *et al.* (2021), Odell and Asper (1990), Mazzoil *et al.* (2005), Mazzoil *et al.* (2008a), Mazzoil *et al.* (2008b), and Mazzoil *et al.* (2020) for more information.

[h] See Caldwell (2001), and Mazzoil *et al.* (2020) for more information.

[i] See Gubbins (2000a), Gubbins (2000b), Gubbins (2000c), and Waring *et al.* (2014) for more information.

[j] See Garrison *et al.* (2017) and Gorgone *et al.* (2014) for more information.

[k] See Pulster and Maruya (2008) and Balmer *et al.* (2013) for more information.

[l] See Urian *et al.* (1999), Read *et al.* (2003), Waring *et al.* (2014), and Silva *et al.* (2020) for more information.

[m] See Thorne *et al.* (2017) for more information.

As shown in table 87, the maximum annual allowable instances of take by Level B harassment for Delphinid stocks ranges from 1 (Sabine Lake bottlenose dolphin stock) to 269,405 for the Western North Atlantic common dolphin, with 24 stocks below 2,000, seven stocks above 70,000, and the remainder between 2,000 and 38,000. Take by Level A harassment is 0 for 17 of the 53 stocks, above 15 for 11 stocks, and 11 or fewer for the remaining stocks. As indicated, the rule also allows for 1–2 takes annually by serious M/SI for five stocks (the Northern Gulf of America stocks of striped and pantropical dolphins, the Western North Atlantic offshore stock of bottlenose dolphins, the Western North Atlantic South Carolina/Georgia Coastal stock of Tamanend's bottlenose dolphin, and the Western North Atlantic stock of Clymene dolphins), the impacts of which are discussed above in the Mortality section. The total take allowable across all 7 years of the rule is indicated in table 49.

All but two Delphinid stocks are expected to incur some number of takes in the form of TTS. As described in the Auditory Injury from Sonar Acoustic Sources and Explosives and Non-Auditory Injury from Explosives section above, these temporary hearing impacts are expected to be lower-level, of short duration (from minutes to at most several hours or less than a day), and mostly not in a frequency band that would be expected to interfere with delphinid echolocation, overlap more than a relatively narrow portion of the vocalization range of any single species or stock, or preclude detection or interpretation of important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival. About two-thirds of the affected Delphinid stocks will incur some number of takes by AUD INJ, the majority of single digits, with higher numbers exceding 50 and up to 161 for several stocks. For reasons similar to those discussed for TTS, while AUD INJ impacts are permanent, given the anticipated effectiveness of the mitigation and the likelihood that individuals are expected to avoid higher levels associated with more severe impacts, the lower anticipated levels of PTS that could be reasonably expected to result from these activities are unlikely to affect the fitness of any individuals. Five stocks are projected to incur notably higher numbers of take by AUD INJ (85–161, the Western North Atlantic stocks of Atlantic spotted dolphins, common dolphins, Clymene dolphins, striped dolphins, and offshore bottlenose dolphins) and while the conclusions above are still applicable, it is further worth noting that these five stocks have relatively large abundances and limited annual mortality as compared to PBR. The rule also allows for a limited number of takes by non-auditory injury (1–3) for 15 stocks. As described above in the Auditory Injury from Sonar Acoustic Sources and Explosives and Non-Auditory Injury from Explosives section, given the small number of potential exposures and the anticipated effectiveness of the mitigation measures in minimizing the pressure levels to which any individuals are exposed, these non-auditory injuries are unlikely to be of a nature or level that would impact reproduction or survival.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 178 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Delphinids are income breeders with a medium pace of life, meaning that while they can be sensitive to the consequences of disturbances that impact foraging during lactation, from a population standpoint, they can be moderately quick to recover. Further, as described in the *Group and Species-Specific Analyses* section above and the Proposed Mitigation Measures section, mitigation measures are expected to further reduce the potential severity of impacts through real-time operational measures that minimize higher level/longer duration exposures and time/area measures that reduce impacts in higher value habitat.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In the case of just over half of the delphinid stocks (see the Maximum Annual Harassment As Percentage of Stock Abundance column in table 87), given the low number of takes by harassment as compared to the stock/species abundance alone, and also in consideration of their migratory movement pattern and whether take is concentrated in areas in which animals are known to congregate, it is unlikely that these individual Delphinids would be taken on more than a small number of days within a year and, therefore, the anticipated behavioral disturbance is not expected to affect reproduction or survival. In the case of the rest of the stocks, with the exception of the Northern North Carolina Estuarine System stock of bottlenose dolphins (addressed below), given the number of takes by harassment as compared to the stock/species abundance, it is likely that some portion of the individuals taken are taken repeatedly over a small to moderate number of days (as indicated in the Greatest Degree Any Individual Expected to be Taken Repeatedly Across Multiple days column of table 87). However, given the variety of activity types that contribute to take across separate exercises conducted at different times and in different areas, and the fact that many result from transient activities conducted at sea, for all but one of the stocks (addressed below), it is unlikely that the anticipated small to moderate number of repeated takes for a given individual would occur clumped across sequential days in a manner likely to impact foraging success and energetics or other behaviors such that reproduction or survival of any individuals are likely to be impacted. Further, many of these stocks are nomadic or migratory and apart from the few small resident dolphin populations, there are no known foraging areas or other areas within which animals are known to congregate for important behaviors, and nor are the takes concentrated within a specific region and season.

Regarding the magnitude of repeated takes for the Northern North Carolina Estuarine System stock of bottlenose dolphins, given the number of takes by harassment as compared to the stock/species abundance, the small resident population, the fact that the predicted takes all occur in summer and are primarily from hull-mounted sonar pierside or navigating out of Norfolk (see appendix A to the application), it is more likely that some number of individuals occupying that area during the summer months would experience a comparatively higher number of repeated takes over a potentially fair number of sequential days. Due to the higher number of repeated takes focused within a limited time period, it is thereby more likely that a portion of the individuals occupying the area near Norfolk in the summer (approximately 50 percent of which would be female) could be repeatedly interrupted during foraging in a manner and amount such that impacts to the energy budgets of a small number of females (from either losing feeding opportunities or expending considerable energy moving away from sound sources or finding alternative feeding options) could cause them to forego reproduction for a year (noting that bottlenose dolphin calving intervals are typically three or more years). Energetic impacts to males are generally meaningless to population rates unless they cause death, and it takes extreme energy deficits beyond what would ever be likely to result from these activities to cause the death of an adult marine mammal, male or female. This stock is considered potentially stable and, while strategic, is not depleted. Importantly, the increase in a calving interval by a year would have far less of an impact on a population rate than a mortality would and, accordingly, a small number of instances of foregone reproduction would not be expected to adversely affect this stock through effects on annual rates of recruitment or survival (noting also that no mortality is predicted or authorized for this stock).

Given the magnitude and severity of the take by harassment discussed above and any anticipated habitat impacts, and in consideration of the required mitigation measures and other information presented, the Action Proponents' activities are unlikely to result in impacts on the reproduction or survival of any individuals of Delphinid stocks, with the exception of the five stocks for which 1–2 takes by M/SI are predicted and the one stock for which an increased calving interval could potentially occur. Regarding the Northern North Carolina Estuarine System stock of bottlenose dolphins, as described above, we do not anticipate the relatively small number of individuals that might be taken over repeated days within the year in a manner that results in a year of foregone reproduction to adversely affect the stock through effects on rates of recruitment or survival, given the status of the stock. Regarding the Northern Gulf of America stocks of striped and pantropical dolphins, the Western North Atlantic offshore stock of bottlenose dolphins, the Western North Atlantic offshore South Carolina/Georgia stock of Tamanend's bottlenose dolphins, and the Western North Atlantic Clymene dolphins, as described in the Mortality section, given the status of the stocks and in consideration of other ongoing anthropogenic mortality, the amount of allowed M/SI take proposed here would not, alone, nor in combination with the impacts of the take by harassment discussed above (which are not expected to impact the reproduction or survival of any individuals for those stocks), be expected to adversely affect rates of recruitment and survival. Last, we are aware that some Northern Gulf of America stocks of delphinids have experienced lower rates of reproduction and survival since the DWH oil spill, however, those effects are reflected in the SARs and other data considered in these analyses and do not change our findings. For these reasons, we have determined that the total take (considering annual maxima and across seven years) anticipated and proposed for authorization would have a negligible impact on all Delphinid species and stocks.

Porpoises—

Harbor porpoise are not listed as endangered or threatened under the ESA, and the Gulf of Maine/Bay of Fundy stock is not considered depleted or strategic under the MMPA. The stock abundance is 85,765 animals. There are no UMEs or other factors that cause particular concern for this stock. A small and resident population BIA has been identified for this stock (LeBrecque *et al.,* 2015). There is no ESA-designated critical habitat for harbor porpoise, as the species is not ESA-listed. While the Gulf of Maine/Bay of Fundy stock of harbor porpoises can be found from Greenland to North Carolina, they are primarily concentrated in the southern Bay of Fundy and northern Gulf of Maine during warmer months (summer), and from Maine to New Jersey during colder months (fall and spring). Harbor porpoises face several chronic anthropogenic and non-anthropogenic risk factors, including fishery interaction, ocean noise, and climate change.

TABLE 89—ANNUAL ESTIMATED TAKE BY LEVEL B HARASSMENT, LEVEL A HARASSMENT, AND MORTALITY AND RELATED INFORMATION FOR PORPOISES IN THE AFTT STUDY AREA

Marine mammal species	Stock	NMFS stock abundance	NMSDD abundance	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	Maximum annual take	Maximum annual harassment as percentage of stock abundance	Season(s) with 40 percent of take or greater	Region(s) with 40 percent of take or greater
Harbor porpoise	Gulf of Maine/Bay of Fundy	*85,765	10,270	87,119	147	0	87,266	102	Winter (48 percent). Spring (45 percent).	Northeast (85 percent).

Note: NMSDD abundances are averages only within the U.S. EEZ.
* Indicates which abundance estimate was used to calculate the maximum annual take as a percentage of abundance, either the NMFS SAR (Hayes *et al.,* 2024) or the NMSDD (table 2.4–1 in appendix A of the application). Please refer to the following section for details on which abundance estimate was selected.

TABLE 90—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO PORPOISES IN THE AFTT STUDY AREA

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (LaBrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality/ serious injury
Harbor porpoise.	Gulf of Maine/ Bay of Fundy.	Not Listed	Not depleted; Not strategic.	Resident-nomadic.	Small	Income	Fast	Fishery interaction, ocean noise, climate change.	No	No	Yes: Small and resident population (n=1).	N/A	Unk	649	142.4

Note: N/A = Not Applicable; Unk = Unknown.

As shown in table 89, the maximum annual allowable instances of take under this proposed rule by Level A Harassment and Level B harassment is 147 and 87,119, respectively. No mortality is anticipated or proposed for authorization, and nor is any non-auditory injury. The total take allowable across all 7 years of the rule is indicated in table 49.

Regarding the potential takes associated with auditory impairment, as VHF cetaceans, harbor porpoises are more susceptible to auditory impacts in mid- to high frequencies and from explosives than other species. As described in the Temporary Threshold Shift section above, any takes in the form of TTS are expected to be lower-level, of short duration (even the longest recovering in less than a day), and mostly not in a frequency band that would be expected to interfere with porpoise communication or other important auditory cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival. For similar reasons, while auditory injury impacts last longer, the low anticipated levels of AUD INJ that could be reasonably expected to result from these activities are unlikely to have any effect on fitness.

Harbor porpoises are more susceptible to behavioral disturbance than other species. They are highly sensitive to many sound sources and generally demonstrate strong avoidance of most types of acoustic stressors. The information currently available regarding harbor porpoises suggests a very low threshold level of response for both captive (Kastelein *et al.,* 2000; Kastelein *et al.,* 2005) and wild (Johnston, 2002) animals. Southall *et al.* (2007) concluded that harbor porpoises are likely sensitive to a wide range of anthropogenic sounds at low received levels (approximately 90 to 120 dB). Research and observations of harbor porpoises for other locations show that this species is wary of human activity and will display profound avoidance behavior for anthropogenic sound sources in many situations at levels down to 120 dB re: 1 μPa (Southall, 2007). Harbor porpoises routinely avoid and swim away from large motorized vessels (Barlow *et al.,* 1988; Evans *et al.,* 1994; Palka and Hammond, 2001; Polacheck and Thorpe, 1990). Accordingly, and as described in the Estimated Take of Marine Mammals section, the threshold for behavioral disturbance is lower for harbor porpoises, and the number of estimated takes is higher, with many occurring at lower received levels than other taxa. Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 154 dB SPL and last from a few minutes to a few hours, at most. Associated responses would likely include avoidance, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours and not likely to exceed 24 hours.

As small odontocetes and income breeders with a fast pace of life, harbor porpoises are less resilient to missed foraging opportunities than larger odontocetes. Although reproduction in populations with a fast pace of life are more sensitive to foraging disruption, these populations are quick to recover. Further, as described in the *Group and Species-Specific Analyses* section above and the Proposed Mitigation Measures section, mitigation measures are expected to further reduce the potential severity of impacts through real-time operational measures that minimize higher level/longer duration exposures and time/area measures that reduce impacts in high value habitat.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. In this case, given the number of takes by harassment as compared to the stock/species abundance (see table 89), the small resident population and concentration of takes (85 percent) in the Northeast, it is likely that some portion of the individuals taken are taken repeatedly over a small number of days. However, given the variety of activity types that contribute to take across separate exercises conducted at different times and in different areas, and the fact that many result from transient activities conducted at sea, it is unlikely that repeated takes would occur either in numbers or clumped across sequential days in a manner likely to impact foraging success and energetics or other behaviors such that reproduction or survival of any individuals is are likely to be impacted.

Given the magnitude and severity of the impacts discussed above to harbor porpoises (considering annual take maxima and the total across seven years) and their habitat, and in consideration of the required mitigation measures and other information presented, the Action Proponents' activities are unlikely to result in impacts on the reproduction or survival of any individuals and, thereby, unlikely to affect annual rates of recruitment or survival. For these reasons, we have determined that the take by harassment anticipated and proposed for authorization would have a negligible impact on the Gulf of Maine/Bay of Fundy stock of harbor porpoises.

Pinnipeds

This section builds on the broader discussion above and brings together the discussion of the different types and amounts of take that different stocks will incur, the applicable mitigation for each stock, and the status and life history of the stocks to support the negligible impact determinations for each stock. We have already described above why we believe the incremental addition of the small number of low-level auditory injury takes will not have any meaningful effect towards inhibiting reproduction or survival. We have also described above in this section the unlikelihood of any masking or habitat impacts having effects that would impact the reproduction or survival of any of the individual marine mammals affected by the Action Proponents' activities. For pinnipeds, there is no predicted non-auditory injury from explosives for any stock, and no predicted mortality for any stock. Regarding the severity of individual takes by Level B harassment by behavioral disturbance for pinnipeds, the majority of these responses are anticipated to occur at received levels below 172 dB, and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, foraging interruptions, vocalization changes, or disruption of other social behaviors, lasting from a few minutes to several hours. Because of the small magnitude and severity of effects for all of the species, it is not necessary to break out the findings by species or stock.

In table 91 below for pinnipeds, we indicate the total annual mortality, Level A harassment, and Level B harassment, and a number indicating the instances of total take as a percentage of abundance. In table 92 below, we indicate the status, life history traits, important habitats, and threats that inform our analysis of the potential impacts of the estimated take on the affected pinniped stocks.

Gray seal, harbor seal, harp seal, and hooded seal are not listed as endangered or threatened under the ESA, and these stocks are not considered depleted or strategic under the MMPA. The abundance estimates for both Western North Atlantic gray seals and harbor seals are 27,911 and 61,336, but both of those estimates are for the U.S. portion of the stock only, while each stock's range extends into Canada. The estimated abundance of Western North Atlantic harp seals is 7,600,600, and a current abundance estimate for hooded seals is not available, though the most recent SAR (2018; Hayes *et al.,* 2019) estimated an abundance of 593,500 individuals. The range of both harp seals and hooded seals also extends into Canada. In 2018, NMFS declared a UME affecting both gray seals and harbor seals (Northeast Pinniped UME, see *Unusual Mortality Events* section), but the UME is currently non-active and pending closure, with infectious disease determined to be the cause of the UME. The only known important areas for pinnipeds in the AFTT Study Area are known gray whale pupping areas on Green Island, Maine; Seal Island, Maine; and Muskeget Island, Maine. Pinnipeds in the AFTT Study Area face several chronic anthropogenic and non-anthropogenic risk factors, including entanglement, disease, and climate change, among others.

TABLE 91—ANNUAL ESTIMATED TAKE BY LEVEL B HARASSMENT, LEVEL A HARASSMENT, AND MORTALITY AND RELATED INFORMATION FOR PINNIPEDS IN THE AFTT STUDY AREA

Marine mammal species	Stock	NMFS stock abundance	NMSDD abundance	Maximum annual Level B harassment	Maximum annual Level A harassment	Maximum annual mortality	Maximum annual take	Maximum annual harassment as percentage of stock abundance	Take in important areas	Season(s) with 40 percent of take or greater	Region(s) with 40 percent of take or greater
Gray seal	Western North Atlantic	* 27,911	24,717	15,724	24	0	15,748	56	No	Winter (44 percent)	Northeast (72 percent).
Harbor seal	Western North Atlantic	* 61,336	10,184	22,094	32	0	22,126	36	No	Winter (47 percent)	Northeast (69 percent).
Harp seal	Western North Atlantic	* 7,600,000	10,007	25,792	6	0	25,798	0	No	N/A	Northeast (100 percent).
Hooded seal	Western North Atlantic	* Unk	1,097	1,726	2	0	1,728	Unk	No	N/A	Northeast (100 percent).

Note: Unk = Unknown, N/A = Not Applicable. NMSDD abundances are averages only within the U.S. EEZ.

* Indicates which abundance estimate was used to calculate the maximum annual take as a percentage of abundance, either the NMFS SAR (Hayes *et al.,* 2024) or the NMSDD (table 2.4–1 in appendix A of the application). Please refer to the following section for details on which abundance estimate was selected.

TABLE 92—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO PINNIPEDS IN THE AFTT STUDY AREA

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (LaBrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality/serious injury
Gray seal	Western North Atlantic.	Not Listed	Not Depleted. Not Strategic.	Nomadic-migratory.	Small	Capital	Fast	Entanglement, illegal take/killing, chemical contaminants, oil spills and energy exploration, vessel strike/interaction, disease, climate change.	UME (declared 2018, pending closure).	No	No	Pupping: Green Island, ME; Seal Island, ME; Muskeget Island, MA.	Increasing	756	4,491
Harbor seal	Western North Atlantic.	Not Listed	Not Depleted. Not Strategic.	Nomadic-migratory.	Small	Capital	Fast	Entanglement, illegal feeding/harassment, habitat degradation, vessel strike, chemical contaminants, disease, climate change.	UME (declared 2018, pending closure).	No	No	None identified.	Stable/decline.	1,729	339
Harp seal	Western North Atlantic.	Not Listed	Not Depleted. Not Strategic.	Migratory	Small	Capital	Fast	Hunting, vessel strike, entanglement, pollution, oil spills/energy exploration, climate change, prey limitations.	No	No	No	None identified.	Increasing	426,000	178,573

TABLE 92—LIFE HISTORY TRAITS, IMPORTANT HABITAT, AND THREATS TO PINNIPEDS IN THE AFTT STUDY AREA—Continued

Marine mammal species	Stock	ESA status	MMPA status	Movement ecology	Body size	Reproductive strategy	Pace of life	Chronic risk factors	UME, oil spill, other	ESA-designated critical habitat	BIAs (LaBrecque *et al.* 2015)	Other important habitat	Population trend	PBR	Annual mortality/serious injury
Hooded seal.	Western North Atlantic.	Not Listed	Not Depleted. Not Strategic.	Migratory	Small	Capital	Fast	Vessel strike, habitat loss, entanglement, harassment, harmful algal blooms, climate change.	No	No	No	Three breeding areas in Canada.	Increasing	Unk	1,680

Note: Unk = Unknown.

As shown in table 91, the maximum annual allowable instances of take under this proposed rule by Level A Harassment and Level B harassment range from 2 (hooded seal) to 32 (harbor seal) and 1,726 (hooded seal) to 25,792 (harp seal), respectively. No mortality is anticipated or proposed for authorization, and nor is any non-auditory injury. The total take allowable across all 7 years of the rule for each stock is indicated in table 49.

Regarding the potential takes associated with auditory impairment, as described above, any takes in the form of TTS are expected to be lower-level, of short duration, and mostly not in a frequency band that would be expected to interfere with pinniped communication or other important low-frequency cues. Any associated lost opportunities or capabilities individuals might experience as a result of TTS would not be at a level or duration that would be expected to impact reproductive success or survival. For similar reasons, while auditory injury impacts last longer, the low anticipated levels of AUD INJ that could be reasonably expected to result from these activities are unlikely to have any effect on fitness.

Regarding the likely severity of any single instance of take by behavioral disturbance, as described above, the majority of the predicted exposures are expected to be below 172 dB SPL and last from a few minutes to a few hours, at most, with associated responses most likely in the form of moving away from the source, increased swimming speeds, increased surfacing time, or foraging interruptions, lasting from a few minutes to several hours. Pinnipeds have a fast pace of life, but have a relatively lower energy requirement for their body size, which may moderate any impact due to foraging disruption. However, of note, harp seals have a large inter-annual variability in reproductive rates due to variations in prey abundance (rely primarily on capelin as their preferred prey) and mid-winter ice coverage and may not reproduce as quickly as other pinnipeds. Also of note, gray seals are likely to be exposed to Navy noise sources when in their more southern habitats in the northeast region, especially in colder months when they breed and give birth.

As described above, in addition to evaluating the anticipated impacts of the single instances of takes, it is important to understand the degree to which individual marine mammals may be disturbed repeatedly across multiple days of the year. For gray seals and harbor seals the SARs do not provide stock abundances that reflect the full ranges of the stocks. For hooded seals, the SAR does not provide an up-to-date abundance estimate for any portion of the stock's range. The Navy's NMSDD abundance estimate for hooded seals was 1,097; however, this estimate appears to be underestimated by several orders of magnitude, as the most recent SAR estimate (2018 SAR; Hayes *et al.* 2019) was 593,500 animals. For all pinniped species, given the lower number of takes by harassment as compared to the stock/species abundance (accounting for the factors described above regarding abundance estimates; see table 91), and their migratory or nomadic-migratory movement patterns, it is unlikely that any individual pinnipeds would be taken on more than a small number of days within a year and, therefore, the anticipated behavioral disturbance is not expected to affect reproduction or survival.

Given the magnitude and severity of the impacts discussed above (considering annual maxima and across 7 years) and in consideration of the required mitigation measures and other information presented, for each pinniped stock, the Action Proponents' activities are not expected to result in impacts on the reproduction or survival of any individuals, much less affect annual rates of recruitment or survival. Last, we have both considered the effects of the Northeast Pinniped UME, pending closure, in our analysis and findings regarding the impact of the activity on these stocks and also determined that we do not expect the proposed take to exacerbate the effects of the UME or otherwise impact the populations. For these reasons, we have determined that the take by harassment anticipated and to be authorized would have a negligible impact on all pinniped stocks.

Preliminary Determination

Based on the analysis contained herein of the likely effects of the specified activities on marine mammals and their habitat, and taking into consideration the implementation of the proposed monitoring and mitigation measures, NMFS preliminarily finds that the total marine mammal take from the specified activity will have a negligible impact on all affected marine mammal species or stocks.

Unmitigable Adverse Impact Analysis and Determination

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

Classification

Endangered Species Act

There are six marine mammal species under NMFS jurisdiction that are listed as endangered or threatened under the ESA with confirmed or possible occurrence in the AFTT Study Area: blue whale, fin whale, NARW, Rice's whale, sei whale, and sperm whale. The NARW has critical habitat designated under the ESA in the AFTT Study Area (81 FR 4837, February 26, 2016) and the Rice's whale has proposed critical habitat in the AFTT Study Area (88 FR 47453, July 24, 2023).

The Action Proponents will consult with NMFS pursuant to section 7 of the ESA for the AFTT Study Area activities. NMFS will also consult internally on the issuance of the regulations and three LOAs under section 101(a)(5)(A) of the MMPA.

National Marine Sanctuaries Act

The Action Proponents and NMFS will work with NOAA's Office of National Marine Sanctuaries to fulfill our responsibilities under the National Marine Sanctuaries Act as warranted and will complete any NMSA requirements prior to a determination on the issuance of the final rule and LOAs.

National Environmental Policy Act

To comply with the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 *et seq.*) and NOAA Administrative Order (NAO) 216–6A, NMFS must review our proposed actions with respect to potential impacts on the human environment. Accordingly, NMFS plans to adopt the 2024 AFTT Draft Supplemental EIS/OEIS for the AFTT Study Area, provided our independent evaluation of the document finds that it includes adequate information analyzing the effects on the human environment of issuing regulations and LOAs under the MMPA. NMFS is a cooperating agency on the 2024 AFTT Draft Supplemental EIS/OEIS and has worked extensively with the Navy in developing the document. The 2024 AFTT Draft Supplemental EIS/OEIS was made available for public comment at *https://www.nepa.navy.mil/aftteis/,* which also provides additional information about the NEPA process, from September 20, 2024, to November 21, 2024. We will review all comments prior to concluding our NEPA process and making a final decision on the MMPA rulemaking and request for LOAs.

We will review all comments submitted in response to this notice prior to concluding our NEPA process or making a final decision on the MMPA rule and request for LOAs.

Regulatory Flexibility Act

The Office of Management and Budget has determined that this proposed rule is not significant for purposes of Executive Order 12866. Pursuant to the Regulatory Flexibility Act (RFA), the Chief Counsel for Regulation of the Department of Commerce has certified to the Chief Counsel for Advocacy of the Small Business Administration that this proposed rule, if adopted, would not have a significant economic impact on a substantial number of small entities. The RFA requires Federal agencies to prepare an analysis of a rule's impact on small entities whenever the agency is required to publish a notice of proposed rulemaking. However, a Federal agency may certify, pursuant to 5 U.S.C. 605(b), that the action will not have a significant economic impact on a substantial number of small entities. The Action Proponents are the only entities that would be affected by this rulemaking, and the Action Proponents are not a small governmental jurisdiction, small organization, or small business, as defined by the RFA. Any requirements imposed by an LOA issued pursuant to these regulations, and any monitoring or reporting requirements imposed by these regulations, would be applicable only to the Action Proponents. NMFS does not expect the issuance of these regulations or the associated LOAs to result in any impacts to small entities pursuant to the RFA. Because this action, if adopted, would directly affect only the Action Proponents and not any small entities, NMFS concludes that the action would not result in a significant economic impact on a substantial number of small entities.

List of Subjects in 50 CFR Part 218

Administrative practice and procedure, Endangered and threatened species, Fish, Fisheries, Marine mammals, Penalties, Reporting and recordkeeping requirements, Transportation, Wildlife.

Dated: April 30, 2025.

Samuel D. Rauch III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

For reasons set forth in the preamble, NMFS proposes to amend 50 CFR part 218 as follows:

PART 218—REGULATIONS GOVERNING THE TAKING AND IMPORTING OF MARINE MAMMALS

■ 1. The authority citation for part 218 continues to read as follows:

Authority: 16 U.S.C. 1361 *et seq.*

■ 2. Revise subpart I of part 218 to read as follows:

Subpart I—Taking and Importing Marine Mammals; Military Readiness Activities in the Atlantic Fleet Training and Testing Study Area

Subpart I—Taking and Importing Marine Mammals; Military Readiness Activities in the Atlantic Fleet Training and Testing Study Area

§ 218.80 Specified activity and geographical region.

(a) Regulations in this subpart apply only to the U.S. Navy (Navy) and U.S. Coast Guard (Coast Guard) (collectively referred to as the ''Action Proponents'') for the taking of marine mammals that occurs in the area described in paragraph (b) of this section and that occurs incidental to the activities listed in paragraph (c) of this section.

(b) The taking of marine mammals by the Action Proponents under this subpart may be authorized in Letters of Authorization (LOAs) only if it occurs within the Atlantic Fleet Training and Testing (AFTT) Study Area. The AFTT Study Area includes areas of the western Atlantic Ocean along the east coast of North America, the Gulf of America, and portions of the Caribbean Sea, covering approximately 2.6 million nmi^2 (8.9 million km^2) of ocean, oriented from the mean high tide line along the U.S. coast and extending east to 45° W longitude line, north to 65° N latitude line, and south to approximately the 20° N latitude line. It also includes Navy and Coast Guard pierside locations, port transit channels, bays, harbors, inshore waterways (*e.g.,* channels, rivers), civilian ports where military readiness activities occur, and vessel and aircraft transit routes among homeports, designated operating areas (OPAREAs), and testing and training ranges.

(c) The taking of marine mammals by the Action Proponents is only authorized if it occurs incidental to the Action Proponents conducting training and testing activities, including the following:

(1) Amphibious warfare;

(2) Anti-submarine warfare;

(3) Expeditionary warfare;

(4) Mine warfare;

(5) Surface warfare;

(6) Vessel evaluation;

(7) Unmanned systems;

(8) Acoustic and oceanographic science and technology;

(9) Vessel movement; and

(10) Other training and testing activities.

§ 218.81 Effective dates.

Regulations in this subpart are effective from November 14, 2025, through November 13, 2032.

§ 218.82 Permissible methods of taking.

(a) Under LOAs issued pursuant to §§ 216.106 of this chapter and 218.87, the Holder of the LOAs (hereinafter ''Action Proponents'') may incidentally, but not intentionally, take marine mammals within the area described in § 218.80(b) by Level A harassment and Level B harassment associated with the use of active sonar and other acoustic sources and explosives, as well as serious injury or mortality associated with vessel strikes and explosives, provided the activity is in compliance with all terms, conditions, and requirements of this subpart and the applicable LOAs.

(b) The incidental take of marine mammals by the activities listed in § 218.80(c) is limited to the following species:

TABLE 1 TO PARAGRAPH (b)

Species	Stock
North Atlantic right whale	Western.
Blue whale	Western North Atlantic.
Bryde's whale	Primary.
Fin whale	Western North Atlantic.
Humpback whale	Gulf of Maine.
Minke whale	Canadian Eastern Coast.
Rice's whale	Northern Gulf of America.
Sei whale	Nova Scotia.
Sperm whale	North Atlantic.
Sperm whale	Northern Gulf of America.
Dwarf sperm whale	Northern Gulf of America.
Pygmy sperm whale	Northern Gulf of America.
Dwarf sperm whale	Western North Atlantic.
Pygmy sperm whale	Western North Atlantic.
Blainville's beaked whale	Northern Gulf of America.
Goose-beaked whale	Northern Gulf of America.
Gervais' beaked whale	Northern Gulf of America.
Blainville's beaked whale	Western North Atlantic.
Goose-beaked whale	Western North Atlantic.
Gervais' beaked whale	Western North Atlantic.
Northern bottlenose whale	Western North Atlantic.
Sowerby's beaked whale	Western North Atlantic.
True's beaked whale	Western North Atlantic.
Atlantic spotted dolphin	Northern Gulf of America.
Bottlenose dolphin	Gulf of America Eastern Coastal.
Bottlenose dolphin	Gulf of America Northern Coastal.
Bottlenose dolphin	Gulf of America, Oceanic.
Bottlenose dolphin	Gulf of America Western Coastal.
Bottlenose dolphin	Mississippi Sound, Lake Borgne, and Bay Boudreau.
Bottlenose dolphin	Northern Gulf of America Continental Shelf.
Bottlenose dolphin	Nueces and Corpus Christi Bays.
Bottlenose dolphin	Sabine Lake.
Bottlenose dolphin	St. Andrew Bay.
Bottlenose dolphin	St. Joseph Bay.
Bottlenose dolphin	Tampa Bay.
Clymene dolphin	Northern Gulf of America.
False killer whale	Northern Gulf of America.
Fraser's dolphin	Northern Gulf of America.
Killer whale	Northern Gulf of America.
Melon-headed whale	Northern Gulf of America.
Pygmy killer whale	Northern Gulf of America.
Risso's dolphin	Northern Gulf of America.
Rough-toothed dolphin	Northern Gulf of America.
Short-finned pilot whale	Northern Gulf of America.
Striped dolphin	Northern Gulf of America.
Pantropical spotted dolphin	Northern Gulf of America.
Spinner dolphin	Northern Gulf of America.
Atlantic white-sided dolphin	Western North Atlantic.
Common dolphin	Western North Atlantic.
Atlantic spotted dolphin	Western North Atlantic.
Bottlenose dolphin	Indian River Lagoon Estuarine System.
Bottlenose dolphin	Jacksonville Estuarine System.
Bottlenose dolphin	Northern Georgia/Southern South Carolina Estuarine System.
Bottlenose dolphin	Northern North Carolina Estuarine System.
Bottlenose dolphin	Southern Georgia Estuarine System.
Bottlenose dolphin	Southern North Carolina Estuarine System.
Tamanend's bottlenose dolphin	Western North Atlantic Central Florida Coastal.
Tamanend's bottlenose dolphin	Western North Atlantic Northern Florida Coastal.
Bottlenose dolphin	Western North Atlantic Northern Migratory Coastal.
Bottlenose dolphin	Western North Atlantic Offshore.
Tamanend's bottlenose dolphin	Western North Atlantic South Carolina/Georgia Coastal.
Bottlenose dolphin	Western North Atlantic Southern Migratory Coastal.
Clymene dolphin	Western North Atlantic.
False killer whale	Western North Atlantic.
Fraser's dolphin	Western North Atlantic.
Killer whale	Western North Atlantic.
Long-finned pilot whale	Western North Atlantic.
Melon-headed whale	Western North Atlantic.
Pantropical spotted dolphin	Western North Atlantic.
Pygmy killer whale	Western North Atlantic.
Risso's dolphin	Western North Atlantic.
Rough-toothed dolphin	Western North Atlantic.

TABLE 1 TO PARAGRAPH (b)—Continued

Species	Stock
Short-finned pilot whale	Western North Atlantic.
Spinner dolphin	Western North Atlantic.
Striped dolphin	Western North Atlantic.
White-beaked dolphin	Western North Atlantic.
Harbor porpoise	Gulf of Maine/Bay of Fundy.
Gray seal	Western North Atlantic.
Harbor seal	Western North Atlantic.
Harp seal	Western North Atlantic.
Hooded seal	Western North Atlantic.

§ 218.83 Prohibitions.

(a) Except incidental take described in § 218.82 and authorized by a LOA issued under this subpart, it shall be unlawful for any person to do the following in connection with the activities described in this subpart:

(1) Violate, or fail to comply with, the terms, conditions, and requirements of this subpart or a LOA issued under §§ 216.106 of this chapter, 218.86, or 218.87;

(2) Take any marine mammal not specified in § 218.82(b);

(3) Take any marine mammal specified in § 218.82(b) in any manner other than as specified in the LOAs; or

(4) Take a marine mammal specified in § 218.82(b) after NMFS determines such taking results in more than a negligible impact on the species or stock of such marine mammal.

(b) [Reserved]

§ 218.84 Mitigation requirements.

(a) When conducting the activities identified in § 218.80(c), the mitigation measures contained in this section and any LOA issued under §§ 218.86 or 218.87 must be implemented by Action Proponent personnel or contractors who are trained according to the requirements in the LOA. If Action Proponent contractors are serving in a role similar to Action Proponent personnel, Action Proponent contractors must follow the mitigation applicable to Action Proponent personnel. These mitigation measures include, but are not limited to:

(1) *Activity-based mitigation.* Activity-based mitigation is mitigation that the Action Proponents must implement whenever and wherever an applicable training or testing activity takes place within the AFTT Study Area. The Action Proponents must implement the mitigation described in paragraphs (a)(1)(i) through (a)(1)(xxi) of this section, except as provided in paragraph (a)(1)(xxii).

(i) *Active acoustic sources with power down and shut down capabilities.* For active acoustic sources with power down and shutdown capabilities (low-frequency active sonar ≥200 dB, mid-frequency active sonar sources that are hull mounted on a surface ship (including surfaced submarines), and broadband and other active acoustic sources >200 dB):

(A) *Mitigation zones and requirements.* During active acoustic sources with power down and shutdown capabilities, the following mitigation zone requirements apply:

(*1*) At 1,000 yd (914.4 m) from a marine mammal, Action Proponent personnel must power down active acoustic sources by 6 decibels (dB) total.

(*2*) At 500 yd (457.2 m) from a marine mammal, Action Proponent personnel must power down active acoustic sources by 10 dB total.

(*3*) At 200 yd (182.9 m) from a marine mammal, Action Proponent personnel must shut down active acoustic sources.

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout in or on one of the following: aircraft; pierside, moored, or anchored vessel; underway vessel with space/crew restrictions (including small boats); or underway vessel already participating in the event that is escorting (and has positive control over sources used, deployed, or towed by) an unmanned platform.

(*2*) Two Lookouts on an underway vessel without space or crew restrictions.

(*3*) Lookouts must use information from passive acoustic detections to inform visual observations when passive acoustic devices are already being used in the event.

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of using active acoustic sources (*e.g.,* while maneuvering on station).

(*2*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals during use of active acoustic sources.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing or powering up active sonar transmission). The wait period for this activity is 30 minutes for activities conducted from vessels and for activities conducted by aircraft that are not fuel constrained and 10 minutes for activities involving aircraft that are fuel constrained (*e.g.,* rotary-wing aircraft, fighter aircraft).

(ii) *Active acoustic sources with shut down capabilities only (no power down capability).* For active acoustic sources with shut down capabilities only (no power down capability) (low-frequency active sonar <200 dB, mid-frequency active sonar sources that are not hull mounted on a surface ship (*e.g.,* dipping sonar, towed arrays), high-frequency active sonar, air guns, and broadband and other active acoustic sources <200 dB):

(A) *Mitigation zones and requirements.* During use of active acoustic sources with shut down capabilities only, the following mitigation zone requirements apply:

(*1*) At 200 yd (182.9 m) from a marine mammal, Action Proponent personnel must shut down active acoustic sources.

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout in or on one of the following: aircraft; pierside, moored, or anchored vessel; underway vessel with space/crew restrictions (including small boats); or underway vessel already participating in the event that is escorting (and has positive control over sources used, deployed, or towed by) an unmanned platform.

(*2*) Two Lookouts on an underway vessel without space or crew restrictions.

(*3*) Lookouts must use information from passive acoustic detections to inform visual observations when passive acoustic devices are already being used in the event.

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of using active acoustic sources (*e.g.,* while maneuvering on station).

(*2*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals during use of active acoustic sources.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing or powering up active sonar transmission. The wait period for this activity is 30 minutes for activities conducted from vessels and for activities conducted by aircraft that are not fuel constrained and 10 minutes for activities involving aircraft that are fuel constrained (*e.g.,* rotary-wing aircraft, fighter aircraft).

(iii) *Pile driving and extraction.* For pile driving and extraction:

(A) *Mitigation zones and requirements.* During vibratory and impact pile driving and extraction, the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease pile driving or extraction if a marine mammal is sighted within 100 yd (91.4 m) of a pile being driven or extracted.

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout in or on one of the following: shore, pier, or small boat.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation for 15 minutes prior to the initial start of pile driving or pile extraction.

(*2*) Action Proponent personnel must observe the mitigation zone for marine mammals during pile driving or extraction.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing vibratory and impact pile driving and extraction). The wait period for this activity is 15 minutes.

(iv) *Weapons firing noise.* For weapons firing noise:

(A) *Mitigation zones and requirements.* During explosive and non-explosive large-caliber gunnery firing noise (surface-to-surface and surface-to-air), the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease weapons firing if a marine mammal is sighted within 30 degrees on either side of the firing line out to 70 yd (64 m) from the gun muzzle (cease fire).

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout on a vessel.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of large-caliber gun firing (*e.g.,* during target deployment).

(*2*) Action Proponent personnel must observe the mitigation zone for marine mammals during large-caliber gun firing.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing explosive and non-explosive large-caliber gunnery firing noise (surface-to-surface and surface-to-air)). The wait period for this activity is 30 minutes.

(v) *Explosive bombs.* For explosive bombs:

(A) *Mitigation zones and requirements.* During the use of explosive bombs of any net explosive weight (NEW), the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease explosive bomb use if a marine mammal is sighted within 2,500 yd (2,286 m) from the intended target.

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout in an aircraft.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of bomb delivery (*e.g.,* when arriving on station).

(*2*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals during bomb delivery.

(*3*) After the event, when practical, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing use of explosive bombs of any NEW). The wait period for this activity is 10 minutes.

(vi) *Explosive gunnery.* For explosive gunnery:

(A) *Mitigation zones and requirements.* During air-to-surface medium-caliber, surface-to-surface medium-caliber, surface-to-surface large-caliber explosive gunnery, the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease air-to-surface medium-caliber use if a marine mammal is sighted within 200 yd (182.9 m) of the intended impact location.

(*2*) Action Proponent personnel must cease surface-to-surface medium-caliber use if a marine mammal is sighted within 600 yd (548.6 m) of the intended impact location.

(*3*) Action Proponent personnel must cease surface-to-surface large-caliber use if a marine mammal is sighted within 1,000 yd (914.4 m) of the intended impact location.

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout on a vessel or in an aircraft.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of gun firing (*e.g.,* while maneuvering on station).

(*2*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals during gunnery fire.

(*3*) After the event, when practical, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing air-to-surface medium-caliber, surface-to-surface medium-caliber, surface-to-surface large-caliber explosive gunnery). The wait period for this activity is 30 minutes for activities conducted from vessels and for activities conducted by aircraft that are not fuel constrained and 10 minutes for activities involving aircraft that are fuel constrained (*e.g.,* rotary-wing aircraft, fighter aircraft).

(vii) *Explosive line charges.* For explosive line charges:

(A) *Mitigation zones and requirements.* During the use of explosive line charges of any NEW, the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease explosive line charges if a marine mammal is sighted within 900 yd (823 m) of the detonation site.

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout on a vessel.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of detonations (*e.g.,* while maneuvering on station).

(*2*) Action Proponent personnel must observe the mitigation zone for marine mammals during detonations.

(*3*) After the event, when practical, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing use of explosive line charges of any NEW). The wait period for this activity is 30 minutes.

(viii) *Explosive mine countermeasure and neutralization (no divers).* For explosive mine countermeasure neutralization (no divers):

(A) *Mitigation zones and requirements.* During explosive mine countermeasure and neutralization using 0.1–5 pound (lb) (0.05–2.3 kilogram (kg)) NEW and >5 lb (2.3 kg) NEW, the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease 0.1–5 lb (0.05–2.3 kg) NEW use if a marine mammal is sighted within 600 yd (548.6 m) of detonation site.

(*2*) Action Proponent personnel must cease >5 lb (2.3 kg) NEW use if a marine mammal is sighted within 2,100 yd (1,920.2 m) of the detonation site.

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout on a vessel or in an aircraft during 0.1–5 lb (0.05–2.3 kg) NEW use.

(*2*) Two Lookouts: one on a small boat and one in an aircraft during >5 lb (2.3 kg) NEW use.

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of detonations (*e.g.,* while maneuvering on station; typically, 10 or 30 minutes depending on fuel constraints).

(*2*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals during detonations or fuse initiation.

(*3*) After the event, when practical, Action Proponent personnel must observe the detonation vicinity for 10 or 30 minutes (depending on fuel constraints) for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing explosive mine countermeasure and neutralization using 0.1–5 pound (lb) (0.05–2.3 kilogram (kg)) NEW and >5 lb (2.3 kg) NEW). The wait period for this activity is 30 minutes for activities conducted from vessels and for activities conducted by aircraft that are not fuel constrained and 10 minutes for activities involving aircraft that are fuel constrained (*e.g.,* rotary-wing aircraft, fighter aircraft).

(ix) *Explosive mine neutralization (with divers).* For explosive mine neutralization (with divers):

(A) *Mitigation zones and requirements.* During explosive mine neutralization (with divers) using 0.1–20 lb (0.05–9.1 kg) NEW (positive control), 0.1–20 lb (0.05–9.1 kg) NEW (time-delay), and >20–60 lb (9.1–27.2 kg) NEW (positive control), the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease 0.1–20 lb (0.05–9.1 kg) NEW (positive control) use if a marine mammal is sighted within 500 yd (457.2 m) of the detonation site (cease fire).

(*2*) Action Proponent personnel must cease 0.1–20 lb (0.05–9.1 kg) NEW (time-delay) and >20–60 lb (9.1–27.2 kg) NEW (positive control) use if a marine mammal is sighted within 1,000 yd (914.4 m) of the detonation site (cease fire).

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) Two Lookouts in two small boats (one Lookout per boat) or one small boat and one rotary-wing aircraft (with one Lookout each) during 0.1–20 lb (0.05–9.1 kg) NEW (positive control) use.

(*2*) Four Lookouts in two small boats (two Lookouts per boat) and one additional Lookout in an aircraft if used in the event during 0.1–20 lb (0.05–9.1 kg) NEW (time-delay) and >20–60 lb (9.1–27.2 kg) NEW (positive control) use.

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Time-delay devices must be set not to exceed 10 minutes.

(*2*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of detonations or fuse initiation for positive control events (*e.g.,* while maneuvering on station) or for 30 minutes prior for time-delay events.

(*3*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals during detonations or fuse initiation.

(*4*) When practical based on mission, safety, and environmental conditions:

(*i*) Boats must observe from the mitigation zone radius mid-point.

(*ii*) When two boats are used, boats must observe from opposite sides of the mine location.

(*iii*) Platforms must travel a circular pattern around the mine location.

(*iv*) Boats must have one Lookout observe inward toward the mine location and one Lookout observe outward toward the mitigation zone perimeter.

(*v*) Divers must be part of the Lookout Team.

(*5*) After the event, when practical, Action Proponent personnel must observe the detonation vicinity for 30 minutes for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing explosive mine neutralization (with divers) using 0.1–20 lb (0.05–9.1 kg) NEW (positive control), 0.1–20 lb (0.05–9.1 kg) NEW (time-delay), and >20–60 lb (9.1–27.2 kg) NEW (positive control)). The wait period for this activity is 30 minutes for activities conducted from vessels and for activities conducted by aircraft that are not fuel constrained and 10 minutes for activities involving aircraft that are fuel constrained (*e.g.,* rotary-wing aircraft, fighter aircraft).

(x) *Explosive missiles and rockets.* For explosive missiles and rockets:

(A) *Mitigation zones and requirements.* During the use of explosive missiles and rockets using 0.6–20 lb (0.3–9.1 kg) NEW (air-to-surface) and >20–500 lb (9.1–226.8 kg) NEW (air-to-surface), the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease 0.6–20 lb (0.3–9.1 kg) NEW (air-to-surface) use if a marine mammal is sighted within 900 yd (823 m) of the intended impact location (cease fire).

(*2*) Action Proponent personnel must cease >20–500 lb (9.1–226.8 kg) NEW (air-to-surface) use if a marine mammal is sighted within 2,000 yd (1,828.8 m) of the intended impact location (cease fire).

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout in an aircraft.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of missile or rocket delivery (*e.g.,* during a fly-over of the mitigation zone).

(*2*) Action Proponent personnel must observe the applicable mitigation zone for marine mammals during missile or rocket delivery.

(*3*) After the event, when practical, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing use of explosive missiles and rockets using 0.6–20 lb (0.3–9.1 kg) NEW (air-to-surface) and >20–500 lb (9.1–226.8 kg) NEW (air-to-surface)). The wait period for this activity is 30 minutes for activities conducted from vessels and for activities conducted by aircraft that are not fuel constrained and 10 minutes for activities involving aircraft that are fuel constrained (*e.g.,* rotary-wing aircraft, fighter aircraft).

(xi) *Explosive sonobuoys and research-based sub-surface explosives.* For explosive sonobuoys and research-based sub-surface explosives:

(A) *Mitigation zones and requirements.* During the use of explosive sonobuoys and research-based sub-surface explosives using any NEW of sonobuoys and 0.1–5 lb (0.05–2.3 kg) NEW for other types of sub-surface explosives used in research applications, the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease use of explosive sonobuoys and research-based sub-surface explosives using any NEW of sonobuoys and 0.1–5 lb (0.05–2.3 kg) NEW for other types of sub-surface explosives used in research applications if a marine mammal is sighted within 600 yd (548.6 m) of the device or detonation sites (cease fire).

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout on a small boat or in an aircraft.

(*2*) Conduct passive acoustic monitoring for marine mammals; use information from detections to assist visual observations.

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of detonations (*e.g.,* during sonobuoy deployment, which typically lasts 20–30 minutes).

(*2*) Action Proponent personnel must observe the mitigation zone for marine mammals during detonations.

(*3*) After the event, when practical, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing use of explosive sonobuoys and research-based sub-surface explosives using any NEW of sonobuoys and 0.1–5 lb (0.05–2.3 kg) NEW for other types of sub-surface explosives used in research applications). The wait period for this activity is 30 minutes for activities conducted from vessels and for activities conducted by aircraft that are not fuel constrained and 10 minutes for activities involving aircraft that are fuel constrained (*e.g.,* rotary-wing aircraft, fighter aircraft).

(xii) *Explosive torpedoes.* For explosive torpedoes:

(A) *Mitigation zones and requirements.* During the use of explosive torpedoes of any NEW, the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease use of explosive torpedoes of any NEW if a marine mammal is sighted within 2,100 yd (1,920.2 m) of the intended impact location.

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout in an aircraft.

(*2*) Conduct passive acoustic monitoring for marine mammals; use information from detections to assist visual observations.

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the mitigation zone for marine mammals, floating vegetation, and jellyfish aggregations immediately prior to the initial start of detonations (*e.g.,* during target deployment).

(*2*) Action Proponent personnel must observe the mitigation zone for marine mammals and jellyfish aggregations during torpedo launches.

(*3*) After the event, when practical, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing use of explosive torpedoes of any NEW). The wait period for this activity is 30 minutes for activities conducted from vessels and for activities conducted by aircraft that are not fuel constrained and 10 minutes for activities involving aircraft that are fuel constrained (*e.g.,* rotary-wing aircraft, fighter aircraft).

(xiii) *Ship shock trials.* For ship shock trials:

(A) *Mitigation zones and requirements.* During ship shock trials using any NEW, the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease ship shock trials of any NEW if a marine mammal is sighted within 3.5 nmi (6.5 km) of the target ship hull (cease fire).

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) On the day of the event, 10 observers (Lookouts and third-party observers combined), spread between aircraft or multiple vessels as specified in the event-specific mitigation plan.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must develop a detailed, event-specific monitoring and mitigation plan in the year prior to the event and provide it to NMFS for review.

(*2*) Beginning at first light on days of detonation, until the moment of detonation (as allowed by safety measures) Action Proponent personnel must observe the mitigation zone for marine mammals, floating vegetation, jellyfish aggregations, large schools of fish, and flocks of seabirds.

(*3*) If any dead or injured marine mammals are observed after an individual detonation, Action Proponent personnel must follow established incident reporting procedures and halt any remaining detonations until Action Proponent personnel or third-party observers can consult with NMFS and review or adapt the event-specific mitigation plan, if necessary.

(*4*) During the 2 days following the event (minimum) and up to 7 days following the event (maximum), and as specified in the event-specific mitigation plan, Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing ship shock trials). The wait period for this activity is 30 minutes.

(xiv) *Sinking Exercises.* For Sinking Exercises (SINKEX):

(A) *Mitigation zones and requirements.* During SINKEX using any NEW, the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease SINKEX of any NEW if a marine mammal is sighted within 2.5 nmi (4.6 km) of the target ship hull (cease fire).

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) Two Lookouts: one on a vessel and one in an aircraft.

(*2*) Conduct passive acoustic monitoring for marine mammals; use information from detections to assist visual observations.

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) During aerial observations for 90 minutes prior to the initial start of weapon firing, Action Proponent personnel must observe the mitigation zone for marine mammals, floating vegetation, and jellyfish aggregations.

(*2*) From the vessel during weapon firing, and from the aircraft and vessel immediately after planned or unplanned breaks in weapon firing of more than 2 hours, Action Proponent personnel must observe the mitigation zone for marine mammals.

(*3*) Action Proponent personnel must observe the detonation vicinity for injured or dead marine mammals for 2 hours after sinking the vessel or until sunset, whichever comes first. If any injured or dead marine mammals are observed, Action Proponent personnel must follow established incident reporting procedures.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing SINKEX). The wait period for this activity is 30 minutes.

(xv) *Non-explosive aerial-deployed mines and bombs.* For non-explosive aerial-deployed mines and bombs:

(A) *Mitigation zones and requirements.* During the use of non-explosive aerial-deployed mines and non-explosive bombs, the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease using non-explosive aerial-deployed mines and non-explosive bombs use if a marine mammal is sighted within 1,000 yd (914.4 m) of the intended target (cease fire).

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout in an aircraft.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the initial start of mine or bomb delivery (*e.g.,* when arriving on station).

(*2*) Action Proponent personnel must observe the mitigation zone for marine mammals during mine or bomb delivery.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing use of non-explosive aerial-deployed mines and non-explosive bombs). The wait period for this activity is 10 minutes.

(xvi) *Non-explosive gunnery.* For non-explosive gunnery:

(A) *Mitigation zones and requirements.* During the use of non-explosive surface-to-surface large-caliber ordnance, non-explosive surface-to-surface and air-to-surface medium-caliber ordnance, and non-explosive surface-to-surface and air-to-surface small-caliber ordnance, the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease non-explosive surface-to-surface large-caliber ordnance, non-explosive surface-to-surface and air-to-surface medium-caliber ordnance, and non-explosive surface-to-surface and air-to-surface small-caliber ordnance use if a marine mammal is sighted within 200 yd (182.9 m) of the intended impact location (cease fire).

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout on a vessel or in an aircraft.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the start of gun firing (*e.g.,* while maneuvering on station).

(*2*) Action Proponent personnel must observe the mitigation zone for marine mammals during gunnery firing.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing use of non-explosive surface-to-surface large-caliber ordnance, non-explosive surface-to-surface and air-to-surface medium-caliber ordnance, and non-explosive surface-to-surface and air-to-surface small-caliber ordnance). The wait period for this activity is 30 minutes for activities conducted from vessels and for activities conducted by aircraft that are not fuel constrained and 10 minutes for activities involving aircraft that are fuel constrained (*e.g.,* rotary-wing aircraft, fighter aircraft).

(xvii) *Non-explosive missiles and rockets.* For non-explosive missiles and rockets:

(A) *Mitigation zones and requirements.* During the use of non-explosive missiles and rockets (air-to-surface), the following mitigation zone requirements apply:

(*1*) Action Proponent personnel must cease non-explosive missile and rocket (air-to-surface) use if a marine mammal is sighted within 900 yd (823 m) of the intended impact location.

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout in an aircraft.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the mitigation zone for marine mammals and floating vegetation immediately prior to the start of missile or rocket delivery (*e.g.,* during a fly-over of the mitigation zone).

(*2*) Action Proponent personnel must observe the mitigation zone for marine mammals during missile or rocket delivery.

(D) *Commencement or recommencement conditions.* Action Proponent personnel must ensure one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met prior to the initial start of the activity (by delaying the start) or during the activity (by not recommencing use of non-explosive missiles and rockets (air-to-surface)). The wait period for this activity is 30 minutes for activities conducted from vessels and for activities conducted by aircraft that are not fuel constrained and 10 minutes for activities involving aircraft that are fuel constrained (*e.g.,* rotary-wing aircraft, fighter aircraft).

(xviii) *Manned surface vessels.* For manned surface vessels:

(A) *Mitigation zones and requirements.* During the use of manned surface vessels, including surfaced submarines, the following mitigation zone requirements apply:

(*1*) Underway manned surface vessels must maneuver themselves (which may include reducing speed) to maintain the following distances as mission and circumstances allow:

(*i*) 500 yd (457.2 m) from whales.

(*ii*) 200 yd (182.9 m) from other marine mammals.

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One or more Lookouts on manned underway surface vessels in accordance with the most recent navigation safety instruction.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the mitigation zone for marine mammals immediately prior to manned surface vessels getting underway and while underway.

(*2*) [Reserved]

(xix) *Unmanned vehicles.* For unmanned vehicles:

(A) *Mitigation zones and requirements.* During the use of unmanned surface vehicles and unmanned underwater vehicles already being escorted (and operated under positive control) by a manned surface support vessel, the following mitigation zone requirements apply:

(*1*) A surface support vessel that is already participating in the event, and has positive control over the unmanned vehicle, must maneuver the unmanned vehicle (which may include reducing its speed) to ensure it maintains the following distances as mission and circumstances allow:

(*i*) 500 yd (457.2 m) from whales.

(*ii*) 200 yd (182.9 m) from other marine mammals.

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout on a surface support vessel that is already participating in the event, and has positive control over the unmanned vehicle.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the mitigation zone for marine mammals immediately prior to unmanned vehicles getting underway and while underway.

(*2*) [Reserved]

(xx) *Towed in-water devices.* For towed in-water devices:

(A) *Mitigation zones and requirements.* During the use of in-water devices towed by an aircraft, a manned surface vessel, or an Unmanned Surface Vehicle or Unmanned Underwater Vehicle already being escorted (and operated under positive control) by a crewed surface vessel, the following mitigation zone requirements apply:

(*1*) Manned towing platforms, or surface support vessels already participating in the event that have positive control over an unmanned vehicle that is towing an in-water device, must maneuver itself or the unmanned vehicle (which may include reducing speed) to ensure towed in-water devices maintain the following distances as mission and circumstances allow:

(*i*) 250 yd (228.6 m) from marine mammals.

(*ii*) [Reserved]

(*2*) [Reserved]

(B) *Lookout requirements.* The following Lookout requirements apply:

(*1*) One Lookout on the manned towing vessel, or on a surface support vessel that is already participating in the event and has positive control over an unmanned vehicle that is towing an in-water device.

(*2*) [Reserved]

(C) *Mitigation zone observation.* Action Proponent personnel must observe the mitigation zones in accordance with the following:

(*1*) Action Proponent personnel must observe the mitigation zone for marine mammals immediately prior to and while in-water devices are being towed.

(*2*) [Reserved]

(xxi) *Commencement or recommencement conditions.* Action Proponents must not commence or recommence an activity after a marine mammal is observed within a relevant mitigation zone until one of the following conditions has been met:

(A) *Observed exiting.* A Lookout observes the animal exiting the mitigation zone;

(B) *Concluded to have exited.* A Lookout concludes that the animal has exited the mitigation zone based on its observed course, speed, and movement relative to the mitigation zone;

(C) *Clear from additional sightings.* A Lookout affirms the mitigation zone has been clear from additional sightings for the activity-specific wait period; or

(D) *Stressor transit.* For mobile events, the stressor has transited a distance equal to double the mitigation zone size beyond the location of the last sighting.

(xxii) *Exceptions to activity-based mitigation.* Activity-based mitigation for acoustic stressors will not apply to:

(A) Sources not operated under positive control (*e.g.,* moored oceanographic sources);

(B) Sources used for safety of navigation (*e.g.,* fathometers);

(C) Sources used or deployed by aircraft operating at high altitudes (*e.g.,* bombs deployed from high altitude (since personnel cannot effectively observe the surface of the water));

(D) Sources used, deployed, or towed by unmanned platforms except when escort vessels are already participating in the event and have positive control over the source;

(E) Sources used by submerged submarines (*e.g.,* sonar (since they cannot conduct visual observation));

(F) De minimis sources (*e.g.,* those >200 kHz);

(G) Long-duration sources, including those used for acoustic and oceanographic research; and

(H) Vessel-based, unmanned vehicle-based, or towed in-water sources when marine mammals (*e.g.,* dolphins) are determined to be intentionally swimming at the bow or alongside or directly behind the vessel, vehicle, or device (*e.g.,* to bow-ride or wake-ride).

(2) *Geographic mitigation areas.* The Action Proponents must implement the geographic mitigation requirements described in paragraphs (a)(2)(i) through (a)(2)(viii) of this section.

(i) *Ship shock trial mitigation area.* Figure 1 to this paragraph (a)(2) shows the location of the mitigation areas. Within the ship shock trial mitigation areas, the following requirements apply:

(A) *Jacksonville Operating Area.* Navy personnel must not conduct ship shock trials within the portion of the ship shock trial box that overlaps the Jacksonville Operating Area from November 15 through April 15.

(B) *Pre-event planning.* Pre-event planning for ship shock trials must include the selection of one primary and two secondary sites (within one of the ship shock trial boxes) where marine mammal abundance is expected to be the lowest during an event, with the primary and secondary locations located more than 2 nmi (3.7 km) from the western boundary of the Gulf Stream for events planned within the portion of the ship shock trial box that overlaps the Jacksonville Operating Area.

(C) *Environmentally unsuitable site.* If Action Proponent personnel determine during pre-event visual observations that the primary site is environmentally unsuitable (*e.g.,* continuous observations of marine mammals), personnel must evaluate the potential to move the event to one of the secondary sites as described in the LOAs.

(ii) *Major training exercise planning awareness mitigation areas.* Figure 1 to this paragraph (a)(2) shows the location of the mitigation area. Within the major training exercise planning awareness mitigation areas, the following requirements apply:

(A) *Northeast.* Within Major Training Exercise Planning Awareness Mitigation Areas located in the Northeast (*i.e.,* the combined areas within the Gulf of Maine, over the continental shelves off Long Island, Rhode Island, Massachusetts, and Maine), the Action Proponents must not conduct any full or partial Major Training Exercises (MTEs).

(B) *Mid-Atlantic.* Within Major Training Exercise Planning Awareness Mitigation Areas located in the Mid-Atlantic (*i.e.,* the combined areas off Maryland, Delaware, and North Carolina), the Action Proponents must not conduct any full or partial MTEs to the maximum extent practical, and must not conduct more than four full or partial MTEs per year.

(iii) *Northeast North Atlantic right whale mitigation area.* Figure 1 to this paragraph (a)(2) shows the location of the mitigation area. Within the northeast North Atlantic right whale mitigation area, the following requirements apply:

(A) *Active sonar.* The Action Proponents must minimize the use of low-frequency active sonar, mid-frequency active sonar, and high-frequency active sonar in the mitigation area to the maximum extent practical.

(B) *In-water explosives.* The Action Proponents must not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) within the mitigation area.

(C) *Explosive sonobuoys.* The Action Proponents must not detonate explosive sonobuoys within 3 nmi (5.6 km) of the mitigation area.

(D) *Non-explosive bombs.* The Action Proponents must not use non-explosive bombs within the mitigation area.

(E) *Non-explosive torpedoes.* During non-explosive torpedoes events within the mitigation area:

(*1*) The Action Proponents must conduct activities during daylight hours in Beaufort sea state 3 or less;

(*2*) The Action Proponents must post two Lookouts in an aircraft during dedicated aerial surveys, and one Lookout on the submarine participating in the event (when surfaced), in addition to Lookouts required as described in § 218.84(a)(1)(xvii).

(*i*) Lookouts must begin conducting visual observations immediately prior to the start of an event.

(*ii*) If floating vegetation or marine mammals are observed in the event vicinity, the event must not commence until the vicinity is clear or the event is relocated to an area where the vicinity is clear.

(*iii*) Lookouts must continue to conduct visual observations during the event.

(*iv*) If marine mammals are observed in the vicinity, the event must cease until one of the commencement or recommencement conditions in § 218.84(a)(1)(xxi) is met.

(*3*) During transits and normal firing, surface ships must maintain a speed of no more than 10 knots (kn; 18.5 kilometer/hour (km/hr)); during submarine target firing, surface ships must maintain speeds of no more than 18 kn (33.3 km/hr); and during vessel target firing, surface ship speeds may exceed 18 kn (33.3 km/hr) for brief periods of time (*e.g.,* 10–15 minutes).

(F) *Vessel transits.* For vessel transits within the mitigation area:

(*1*) The Action Proponents must conduct a web query or email inquiry to the North Atlantic Right Whale Sighting Advisory System or WhaleMap (*https://whalemap.org/*) to obtain the latest North Atlantic right whale sightings data prior to transiting the mitigation area.

(*2*) The Action Proponents must provide Lookouts the sightings data prior to standing watch. Lookouts must use that data to help inform visual observations during vessel transits.

(G) *Speed reductions.* Surface ships must implement speed reductions after observing a North Atlantic right whale, if transiting within 5 nmi (9.3 km) of a sighting reported to the North Atlantic Right Whale Sighting Advisory System within the past week, and when transiting at night or during periods of reduced visibility.

(iv) *Gulf of Maine marine mammal mitigation area.* Figure 1 to this paragraph (a)(2) shows the location of the mitigation area. Within the Gulf of Maine marine mammal mitigation area, the following requirements apply:

(A) *Surface ship hull-mounted mid-frequency active sonar.* The Action Proponents must not use more than 200 hours of surface ship hull-mounted mid-frequency active sonar annually within the mitigation area.

(B) [Reserved]

(v) *Jacksonville Operating Area North Atlantic right whale mitigation area.* Figure 1 to this paragraph (a)(2) shows the location of the mitigation area. Within the Jacksonville Operating Area North Atlantic right whale mitigation area, the following requirements apply:

(A) *November 15 to April 15.* From November 15 to April 15 within the mitigation area, prior to vessel transits or military readiness activities involving active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or non-explosive ordnance deployed against surface targets (including aerial-deployed mines), the Action Proponents must initiate communication with Fleet Area Control and Surveillance Facility, Jacksonville to obtain Early Warning System data. The facility must advise of all reported North Atlantic right whale sightings in the vicinity of planned vessel transits and military readiness activities. Sightings data must be used when planning event details (*e.g.,* timing, location, duration) to minimize impacts to North Atlantic right whale to the maximum extent practical.

(B) *Sightings data to Lookouts.* Action Proponent personnel must provide the sightings data to Lookouts prior to standing watch to help inform visual observations.

(vi) *Southeast North Atlantic right whale mitigation area.* Figure 1 to this paragraph (a)(2) shows the location of the mitigation area. Within the Southeast North Atlantic right whale mitigation area, the following requirements apply:

(A) *Helicopter dipping sonar and low-frequency or surface ship hull-mounted mid-frequency active sonar during navigation training or object detection.* From November 15 to April 15 within the mitigation area, to the maximum extent practical, the Action Proponents must minimize use of helicopter dipping sonar (a mid-frequency active sonar source) and low-frequency or surface ship hull-mounted mid-frequency active sonar during navigation training or object detection.

(B) *All other high-frequency, mid-frequency, or low-frequency active sonars.* From November 15 to April 15 within the mitigation area, the Action Proponents must not use high-frequency active sonar; or low-frequency or mid-frequency active sonar with the exception of the sources listed in paragraph (a)(2)(vi)(A) of this section in accordance with that paragraph.

(C) *Explosives.* From November 15 to April 15 within the mitigation area, the Action Proponents must not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets).

(D) *Physical disturbance.* From November 15 to April 15 within the mitigation area, the Action Proponents must not deploy non-explosive ordnance against surface targets (including aerial-deployed mines).

(E) *Vessel strike.* From November 15 to April 15 within the mitigation area, surface ships must minimize north-south transits to the maximum extent practical, and must implement speed reductions to the maximum extent practicable after they observe a North Atlantic right whale, if they are within 5 nmi (9.3 km) of an Early Warning System sighting reported within the past 12 hours, and at night and in poor visibility.

(F) *Acoustic, explosives, and physical disturbance and vessel strike.* From November 15 to April 15 within the mitigation area, prior to vessel transits or military readiness activities involving active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or non-explosive ordnance deployed against surface targets (including aerial-deployed mines), the Action Proponents must initiate communication with Fleet Area Control and Surveillance Facility, Jacksonville to obtain Early Warning System sightings data. The facility must advise of all reported North Atlantic right whale sightings in the vicinity of planned vessel transits and military readiness activities. The Action Proponents must provide Lookouts the sightings data prior to standing watch to help inform visual observations.

(vii) *Dynamic North Atlantic right whale mitigation areas.* The applicable dates and locations of this mitigation area must correspond with NMFS' Dynamic Management Areas, which vary throughout the year based on the locations and timing of confirmed North Atlantic right whale detections. Within the Dynamic North Atlantic right whale mitigation areas, the following requirements apply:

(A) *North Atlantic right whale Dynamic Management Area notifications.* The Action Proponents must provide North Atlantic right whale Dynamic Management Area information (*e.g.,* location and dates) to applicable assets transiting and training or testing in the vicinity of the Dynamic Management Area. The broadcast awareness notification messages must alert assets (and their Lookouts) to the possible presence of North Atlantic right whale in their vicinity.

(B) *Visual observations.* Lookouts must use the information to help inform visual observations during military readiness activities that involve vessel movements, active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or non-explosive ordnance deployed against surface targets in the mitigation area.

(viii) *Rice's whale mitigation area.* Figure 1 to this paragraph (a)(2) shows the location of the mitigation area. Within the Rice's whale mitigation area, the following requirements apply:

(A) *Surface ship mid-frequency active sonar.* The Action Proponents must not use more than 200 hours of surface ship hull-mounted mid-frequency active sonar annually within the mitigation area.

(B) *Explosives.* The Action Proponents must not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) within the mitigation area, except during mine warfare activities.

(ix) *National Security Requirement.* Should national security require the Action Proponents to exceed a requirement in paragraphs (a)(2)(i) through (a)(2)(viii) of this section, Action Proponent personnel must provide NMFS with advance notification and include the information (*e.g.,* sonar hours, explosives usage, or restricted area use) in its annual activity reports submitted to NMFS

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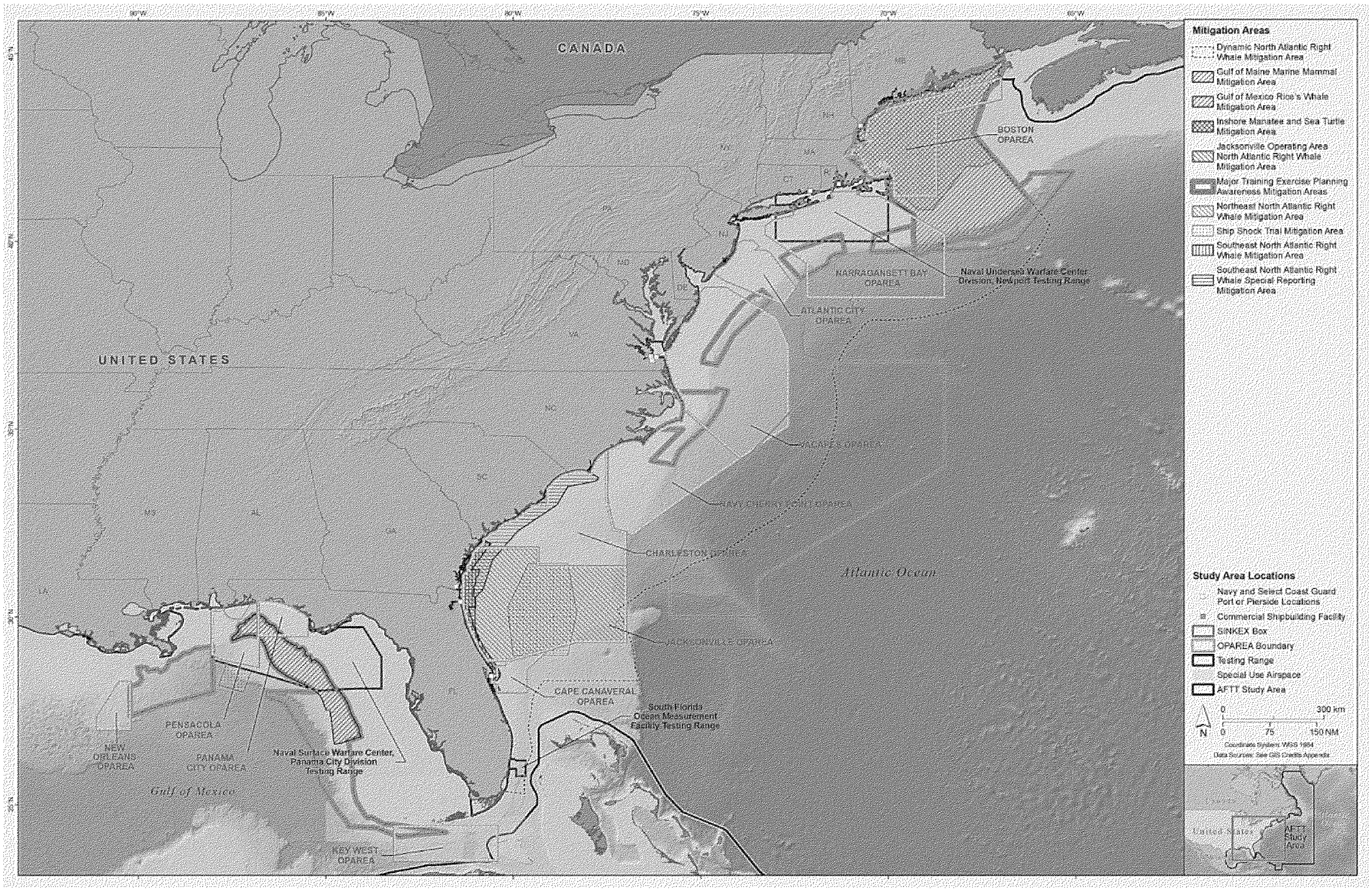
Figure 1 to Paragraph (a)(2)—Geographic Mitigation Areas for Marine Mammals in the AFTT Study Area



(b) [Reserved]

§ 218.85 Requirements for monitoring and reporting.

The Action Proponents must implement the following monitoring and reporting requirements when conducting the specified activities:

(a) *Notification of take.* Action proponent personnel must notify NMFS immediately (or as soon as operational security considerations allow) if the specified activity identified in § 218.80 is thought to have resulted in the mortality or serious injury of any marine mammals, or in any Level A harassment or Level B harassment of marine mammals not identified in this subpart.

(b) *Monitoring and reporting under the LOAs.* The Action Proponents must conduct all monitoring and reporting required under the LOAs.

(c) *Notification of injured, live stranded, or dead marine mammals.* Action Proponent personnel must abide by the Notification and Reporting Plan, which sets out notification, reporting, and other requirements when dead, injured, or live stranded marine mammals are detected. The Notification and Reporting Plan is available at *https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-military-readiness-activities.*

(d) *Annual AFTT Study Area marine species monitoring report.* The Action Proponents must submit an annual AFTT Study Area marine species monitoring report describing the implementation and results from the previous calendar year. Data collection methods will be standardized across range complexes and the AFTT Study Area to allow for comparison in different geographic locations. The draft report must be submitted to the Director, Office of Protected Resources, NMFS, annually. NMFS will submit comments or questions on the report, if any, within 3 months of receipt. The report will be considered final after the Action Proponents have addressed NMFS' comments, or 3 months after submittal of the draft if NMFS does not provide comments on the draft report. The report must describe progress of knowledge made with respect to intermediate scientific objectives within the AFTT Study Area associated with the Integrated Comprehensive Monitoring Program (ICMP). Similar study questions must be treated together so that progress on each topic can be summarized across all Navy ranges. The report need not include analyses and content that do not provide direct assessment of cumulative progress on the monitoring plan study questions.

(e) *Quick look reports.* In the event that the sound levels analyzed in promulgation of these regulations were exceeded within a given reporting year, the Action Proponents must submit a preliminary report(s) detailing the exceedance within 21 days after the anniversary date of issuance of the LOAs.

(f) *Annual AFTT Training and Testing Reports.* Regardless of whether analyzed sound levels were exceeded, the Navy must submit a detailed report (AFTT Annual Training Exercise Report and Testing Activity Report) and the Coast Guard must submit a detailed report (AFTT Annual Training Exercise Report) to the Director, Office of Protected Resources, NMFS annually. NMFS will submit comments or questions on the reports, if any, within 1 month of receipt. The reports will be considered final after the Action Proponents have addressed NMFS' comments, or 1 month after submittal of the drafts if NMFS does not provide comments on the draft reports. The annual reports must contain a summary of all sound sources used (total hours or quantity (per the LOAs) of each bin of sonar or other non-impulsive source; total annual number of each type of explosive exercises; and total annual expended/detonated rounds (missiles, bombs, sonobuoys, *etc.*) for each explosive bin). The annual reports must also contain cumulative sonar and explosive use quantity from previous years' reports through the current year. Additionally, if there were any changes to the sound source allowance in the reporting year, or cumulatively, the reports would include a discussion of why the change was made and include analysis to support how the change did or did not affect the analysis in the 2024 AFTT Draft Supplemental EIS/OEIS and MMPA final rule. The annual reports must also include the details regarding specific requirements associated with the mitigation areas listed in paragraph (f)(4) of this section. The analysis in the detailed report must be based on the accumulation of data from the current year's report and data collected from previous annual reports. The final annual/close-out report at the conclusion of the authorization period (year 7) will also serve as the comprehensive close-out report and include both the final year annual incidental take compared to annual authorized incidental take as well as a cumulative 7-year incidental take compared to 7-year authorized incidental take. The AFTT Annual Training and Testing Reports must include the specific information described in the LOAs.

(1) *MTEs.* This section of the report must contain the following information for MTEs conducted in the AFTT Study Area.

(i) *Exercise information (for each MTE).* For exercise information (for each MTE):

(A) Exercise designator.

(B) Date that exercise began and ended.

(C) Location.

(D) Number and types of active sonar sources used in the exercise.

(E) Number and types of passive acoustic sources used in exercise.

(F) Number and types of vessels, aircraft, and other platforms participating in each exercise.

(G) Total hours of all active sonar source operation.

(H) Total hours of each active sonar source bin.

(I) Wave height (high, low, and average) during exercise.

(ii) *Individual marine mammal sighting information for each sighting in each exercise where mitigation was implemented.* For individual marine mammal sighting information for each sighting in each exercise where mitigation was implemented:

(A) Date, time, and location of sighting.

(B) Species (if not possible, indication of whale/dolphin/pinniped).

(C) Number of individuals.

(D) Initial Detection Sensor (*e.g.,* passive sonar, Lookout).

(E) Indication of specific type of platform observation was made from (including, for example, what type of surface vessel or testing platform).

(F) Length of time observers maintained visual contact with marine mammal.

(G) Sea state.

(H) Visibility.

(I) Sound source in use at the time of sighting.

(J) Indication of whether animal was less than 200 yd (182.9 m), 200 to 500 yd (182.9 to 457.2 m), 500 to 1,000 yd (457.2 m to 914.4 m), 1,000 to 2,000 yd (914.4 m to 1,828.8 m), or greater than 2,000 yd (1,828.8 m) from sonar source.

(K) Whether operation of sonar sensor was delayed, or sonar was powered or shut down, and the length of the delay.

(L) If source in use was hull-mounted, true bearing of animal from the vessel, true direction of vessel's travel, and estimation of animal's motion relative to vessel (opening, closing, parallel).

(M) Lookouts must report, in plain language and without trying to categorize in any way, the observed behavior of the animal(s) (such as animal closing to bow ride, paralleling course/speed, floating on surface and not swimming, *etc.*) and if any calves were present.

(iii) *An evaluation (based on data gathered during all of the MTEs) of the effectiveness of mitigation measures designed to minimize the received level to which marine mammals may be exposed.* For an evaluation (based on data gathered during all of the MTEs) of the effectiveness of mitigation measures designed to minimize the received level to which marine mammals may be exposed:

(A) This evaluation must identify the specific observations that support any conclusions the Navy reaches about the effectiveness of the mitigation.

(B) [Reserved]

(2) *Sinking Exercises.* This section of the report must include the following information for each SINKEX completed that year in the AFTT Study Area:

(i) *Exercise information.* For exercise information:

(A) Location.

(B) Date and time exercise began and ended.

(C) Total hours of observation by Lookouts before, during, and after exercise.

(D) Total number and types of explosive source bins detonated.

(E) Number and types of passive acoustic sources used in exercise.

(F) Total hours of passive acoustic search time.

(G) Number and types of vessels, aircraft, and other platforms participating in exercise.

(H) Wave height in feet (high, low, and average) during exercise.

(I) Narrative description of sensors and platforms utilized for marine mammal detection and timeline illustrating how marine mammal detection was conducted.

(ii) *Individual marine mammal observation (by Action Proponent Lookouts) information for each sighting where mitigation was implemented.* For individual marine mammal observation (by Action Proponent Lookouts) information for each sighting where mitigation was implemented:

(A) Date/Time/Location of sighting.

(B) Species (if not possible, indicate whale, dolphin, or pinniped).

(C) Number of individuals.

(D) Initial detection sensor (*e.g.,* sonar or Lookout).

(E) Length of time observers maintained visual contact with marine mammal.

(F) Sea state.

(G) Visibility.

(H) Whether sighting was before, during, or after detonations/exercise, and how many minutes before or after.

(I) Distance of marine mammal from actual detonations (or target spot if not yet detonated): Less than 200 yd (182.9 m), 200 to 500 yd (182.9 to 457.2 m), 500 to 1,000 yd (457.2 m to 914.4 m), 1,000 to 2,000 yd (914.4 m to 1,828.8 m), or greater than 2,000 yd (1,828.8 m).

(J) Lookouts must report, in plain language and without trying to categorize in any way, the observed behavior of the animal(s) (such as animal closing to bow ride, paralleling course/speed, floating on surface and not swimming *etc.*), including speed and direction and if any calves were present.

(K) The report must indicate whether explosive detonations were delayed, ceased, modified, or not modified due to marine mammal presence and for how long.

(L) If observation occurred while explosives were detonating in the water, indicate munition type in use at time of marine mammal detection.

(3) *Summary of sources used.* This section of the report must include the following information summarized from the authorized sound sources used in all training and testing events:

(i) *Totals for sonar or other acoustic source bins.* Total annual hours or quantity (per the LOA) of each bin of sonar or other acoustic sources (*e.g.,* pile driving and air gun activities); and

(ii) *Total for explosive bins.* Total annual expended/detonated ordnance (missiles, bombs, sonobuoys, *etc.*) for each explosive bin.

(4) *Special reporting for geographic mitigation areas.* This section of the report must contain the following information for activities conducted in geographic mitigation areas in the AFTT Study Area:

(i) *Northeast North Atlantic Right Whale Mitigation Area.* The Action Proponents must report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used in the mitigation area.

(ii) *Gulf of Maine Marine Mammal Mitigation Area.* The Action Proponents must report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used in the mitigation area.

(iii) *Southeast North Atlantic Right Whale Mitigation Area.* The Action Proponents must report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used in the mitigation area from November 15 to April 15.

(iv) *Southeast North Atlantic Right Whale Special Reporting Mitigation Area.* The Action Proponents must report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used within the mitigation area from November 15 to April 15.

(v) *Rice's Whale Mitigation Area.* The Action Proponents must report the total annual hours and counts of active sonar and in-water explosives (including underwater explosives and explosives deployed against surface targets) used in the mitigation area.

(vi) *National security requirement.* If an Action Proponent(s) evokes the national security requirement described in § 218.84(a)(2)(ix), the Action Proponent personnel must include information about the event in its Annual AFTT Training and Testing Report.

(g) *MTE sonar exercise notification.* The Action Proponents must submit to NMFS (contact as specified in the LOAs) an electronic report within 15 calendar days after the completion of any MTE indicating:

(1) *Location.* Location of the exercise;

(2) *Dates.* Beginning and end dates of the exercise; and

(3) *Type.* Type of exercise.

§ 218.86 Letters of Authorization.

(a) To incidentally take marine mammals pursuant to this subpart, the Action Proponents must apply for and obtain LOAs.

(b) An LOA, unless suspended or revoked, may be effective for a period of time not to exceed the expiration date of this subpart.

(c) In the event of projected changes to the activity or to mitigation, monitoring, or reporting measures (excluding changes made pursuant to the adaptive management provision of § 218.87(c)(1)) required by an LOA, the Action Proponent must apply for and obtain a modification of the LOA as described in § 218.87.

(d) Each LOA will set forth:

(1) Permissible methods of incidental taking;

(2) Geographic areas for incidental taking;

(3) Means of effecting the least practicable adverse impact (*i.e.,* mitigation) on the species and stocks of marine mammals and their habitat; and

(4) Requirements for monitoring and reporting.

(e) Issuance of the LOA(s) must be based on a determination that the level of taking is consistent with the findings made for the total taking allowable under the regulations of this subpart.

(f) Notice of issuance or denial of the LOA(s) will be published in the **Federal Register** within 30 days of a determination.

§ 218.87 Modifications of Letters of Authorization.

(a) An LOA issued under §§ 216.106 of this chapter and 218.86 for the activity identified in § 218.80(c) shall be modified, upon request by the LOA Holder, provided that:

(1) The specified activity and mitigation, monitoring, and reporting measures, as well as the anticipated impacts, are the same as those described and analyzed for the regulations in this subpart (excluding changes made pursuant to the adaptive management provision in paragraph (c)(1) of this section); and

(2) NMFS determines that the mitigation, monitoring, and reporting measures required by the previous LOAs under this subpart were implemented.

(b) For LOA modification requests by the applicants that include changes to the activity or to the mitigation, monitoring, or reporting measures (excluding changes made pursuant to the adaptive management provision in paragraph (c)(1) of this section), the LOA should be modified provided that:

(1) NMFS determines that the change(s) to the activity or the mitigation, monitoring or reporting do not change the findings made for the regulations and do not result in more than a minor change in the total estimated number of takes (or distribution by species or stock or years), and

(2) NMFS may publish a notice of proposed modified LOA in the **Federal Register**, including the associated analysis of the change, and solicit public comment before issuing the LOA.

(c) An LOA issued under §§ 216.106 and 218.86 of this chapter for the activities identified in § 218.80(c) may be modified by NMFS Office of Protected Resources under the following circumstances:

(1) After consulting with the Action Proponents regarding the practicability of the modifications, through adaptive management, NMFS may modify (including remove, revise or add to) the existing mitigation, monitoring, or reporting measures if doing so creates a reasonable likelihood of more effectively accomplishing the goals of the mitigation and monitoring measures set forth in this subpart.

(i) Possible sources of data that could contribute to the decision to modify the mitigation, monitoring, or reporting measures in an LOA include, but are not limited to:

(A) Results from the Action Proponents' monitoring report and annual exercise reports from the previous year(s);

(B) Results from other marine mammal and/or sound research or studies; or

(C) Any information that reveals marine mammals may have been taken in a manner, extent, or number not authorized by this subpart or subsequent LOAs.

(ii) If, through adaptive management, the modifications to the mitigation, monitoring, or reporting measures are substantial, NMFS shall publish a notice of proposed LOA(s) in the **Federal Register** and solicit public comment.

(2) If the NMFS Office of Protected Resources determines that an emergency exists that poses a significant risk to the well-being of the species or stocks of marine mammals specified in LOAs issued pursuant to §§ 216.106 of this chapter and 218.86, a LOA may be modified without prior notice or opportunity for public comment. Notice would be published in the **Federal Register** within 30 days of the action.

§§ 218.88–218.89 [Reserved]

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